U.S. Department of Transportation

2024 - 2027 Climate Adaptation Plan

June 2024

FOREWORD

Communities across our country are facing extreme weather events that damage our transportation infrastructure and cost large sums to repair, not to mention the cost to the economy and individual lives from disrupted travel. These events—including heat waves, wildfires, tropical storms, high winds, storm surges and heavy downpours—are becoming more frequent and severe as the climate changes. The Department of Transportation is working to integrate consideration of climate resilience and risk across transportation decision-making and to ensure that transportation investments incorporate evidence-based climate resilience measures or features.

I am proud of the accomplishments this Department has made since the release of our 2021 Climate Adaptation Plan. We have launched the Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) program, the first of its kind federal transportation program to help make surface transportation more resilient through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk costal infrastructure. In addition, we have incorporated climate resilience considerations into criteria for discretionary grant funding across the Department, as appropriate and consistent with statute. When it comes to our internal operations and facilities, we have issued a new DOT Order 4360: Climate Change Adaptation and Resilience Policy for DOT Operational Assets and completed climate risk assessments for dozens of mission-critical DOT facilities.

And now with the publication of our 2024-2027 Climate Adaptation Plan, we will continue to build on this work, supporting continued investments in climate-smart transportation infrastructure and incorporating natural hazard and climate risk information into federal property management decisions. I look forward to working with other Federal agencies as they implement their own Climate Adaptation Plans, as well as state and local communities on the front lines of climate impacts, as we work together to address the risks of climate change.

Pete Buttigieg

Secretary of Transportation

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U.S. Department of Transportation
2024 - 2027 Climate Adaptation Plan

INTRODUCTION

The U.S. Department of Transportation (DOT or Department) has prepared this Climate Adaptation Plan (CAP or Plan) in accordance with: Section 211 of Executive Order (E.O.) 14008, *Tackling the Climate Crisis at Home and Abroad;* section 5(d) of E.O. 14030*, Climate-Related Financial Risk*; section 503 of E.O.14057*, Catalyzing Clean Energy Industries And Jobs Through Federal Sustainability*; and with the Council on Environmental Quality's (CEQ) Implementing Instructions. The 2024-2027 CAP builds on the previous DOT Climate Adaptation Plans prepared in 2012, 2014, and the *Climate Action Plan: Revitalizing Efforts to Bolster Adaptation and Increase Resilience* published in 2021. The 2012 Action Plan focused on climate change impacts to DOT's critical mission activities—safety, state of good repair and sustainability of federally owned buildings. The 2014 CAP provided updates on DOT's recent accomplishments and new priorities. The 2021 plan and 2022 progress update highlighted the commitment of the Department to ensure that DOT funding programs, policies, guidance, and operations consider climate impacts and incorporate resilience solutions. Looking forward, the Department will support continued investments in climate-smart transportation infrastructure and incorporate natural hazard and climate risk information into federal property management decisions, funding programs, policies, guidance, and operations, prioritizing investments that achieve the quadruple benefit of advancing resilience, supporting adaptation, addressing environmental justice, and strengthening climate mitigation.

Recent Climate Adaptation and Resilience Accomplishments:

- Launched the first federal program to protect transportation infrastructure from extreme weather through the Federal Highway Administration (FHWA) Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) program which will provide a total of over $9 billion for climate resilience projects.
- Incorporated climate resilience considerations into grant funding criteria for all DOT modal administrations, as appropriate.
- Issued the new DOT Order 4360: Climate Change Adaptation and Resilience Policy for DOT Operational Assets on September 18, 2023.
- Completed climate risk assessments for dozens of mission-critical[1] DOT facilities with progress metrics tracked in a summary dashboard.
- Implemented a Buy Clean program including a lower carbon procurement pilot project and carbon pollution free energy procurement to build energy resilience.
- Collaborated across the government with numerous departments and agencies to implement CAP priorities:

[1] Mission-critical buildings are DOT-leased or owned facilities that support activities that cannot be disrupted. Mission-critical assets include non-building infrastructure (e.g., ships or equipment), operations, and activities that support statutory goals, provide vital services, and maintain the safety and health of the public.

- Deployed Climate Change and Transportation 101 training for DOT staff and stakeholders, including extensive collaboration with the National Oceanic and Atmospheric Administration (NOAA) on climate science.
- Presented a resilience symposium in cooperation with the Transportation Research Board of the National Academy of Sciences.
- Included Federal Emergency Management Agency (FEMA)-designated Community Disaster Resilience Zones as a consideration in the updated DOT Discretionary Grant Guidance.

2024-2027 CAP Priorities:

- Support investments in climate-smart infrastructure across all transportation modes with continued guidance, technical assistance, and decision support tools.
- Expand coordination between climate resilience and environmental justice activities through grant programs and technical assistance.
- Leverage federal climate data services to provide decision support resources for climate resilience and adaptation activities to DOT stakeholders.
- Implement projects to reduce climate impacts on federal property, operations, and supply chains identified through ongoing natural hazard risk assessments.

This Plan follows the CEQ instructions for preparing agency CAPs under E.O. 14008 and focuses on climate adaptation and resilience across agency programs and the management of Federal procurement, real property, public lands and waters, and financial programs. The Department is engaged in a wide variety of activities related to reducing transportation sector greenhouse gas (GHG) emissions; however, this Plan focuses on actions to bolster adaptation and increase resilience.

Through its CAP, the Department is also able to advance environmental justice as part of its mission, consistent with E.O. 14008 and with E.O. 14096 on *Revitalizing Our Nation's Commitment to Environmental Justice for All*. As the Department implements its CAP to increase the resilience of its facilities and operations, the agency will use its best efforts to, as appropriate and consistent with applicable law: address disproportionate and adverse environmental and health effects (including risks) and hazards, including those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns; and, provide opportunities for the meaningful engagement of persons and communities with environmental justice concerns.

In addition, as a member of the White House Environmental Justice Interagency Council, the Department received recommendations on Climate Planning, Preparedness, Response, Recovery and Impacts from the White House Environmental Justice Advisory Council (WHEJAC). The report includes many recommendations that are relevant to the work of the Department. The Department is reviewing the recommendations and, as appropriate and consistent with applicable law, is taking steps to address the WHEJAC's recommendations.

SECTION 1: AGENCY PROFILE

Mission	To deliver the world's leading transportation system, serving the American people and economy through the safe, efficient, sustainable, and equitable movement of people and goods.
Adaptation Plan Scope	▪ Office of the Secretary (OST) - Research & Technology (-R); Administration (-M); Policy (-P), and International (-X) ▪ Build America Bureau ▪ Bureau of Transportation Statistics (BTS) ▪ Federal Aviation Administration (FAA) ▪ Federal Highway Administration (FHWA) ▪ Federal Motor Carrier Safety Administration (FMCSA) ▪ Federal Railroad Administration (FRA) ▪ Federal Transit Administration (FTA) ▪ Maritime Administration (MARAD) ▪ National Highway Traffic Safety Administration (NHTSA) ▪ Pipeline and Hazardous Materials Safety Administration (PHMSA) ▪ Great Lakes St. Lawrence Seaway Development Corporation (GLS)
Agency Climate Adaptation Official	Ann Shikany (DOT Deputy Assistant Secretary for Transportation Policy)
Agency Risk Officer	John Giorgis, Director, Performance, Evidence, and Enterprise Risk, Office of the Secretary
Point of Public Contact for Environmental Justice	Kelsey Owens, Senior Policy Analyst, Office of the Secretary - Office of Policy
Owned Buildings	Over 9,100 owned buildings of approximately 17M square feet. (Real Estate Management System (REMS). Data is through November 2023.)
Leased Buildings	Over 1,000 leased buildings of approximately 7.5M square feet. (Real Estate Management System (REMS). Data is through November 2023.)
Employees	Total Employees: 55,930 Total FTEs: 54,164 Total Contractors: 6,900 (Workforce Information, Onboard Data by Month, November 2023; From MAX Budget Season Report: FY 2025 BUDGET – CIVILIAN FTE REPORT. Schedule Q, Personnel Summary Presidential Budget Level (PB25PS01). Pulled 05 January 2024; Security/Badging Office.)
Federal Lands and Waters	The Office of Federal Lands Highway (FLH) in FHWA provides financial resources and transportation engineering assistance for public roads, bridges, and other transportation infrastructure that service the transportation needs for the approximately 650 million acres of land owned and managed by the federal government, and Indian lands, in the United States.

Budget	$148.9 billion FY22 Enacted (P.L. 117-103, Consolidated Appropriations Act, 2022) $145.1 billion FY23 Enacted (P.L. 117-328, Consolidated Appropriations Act, 2023) $145.0 billion FY24 Enacted (P.L. 118-42, Consolidated Appropriations Act, 2024) $146.2 billion FY25 President's Budget (FY2025 Budget Highlights (transportation.gov))
Key Areas of Climate Adaptation Effort	• Incorporate Resilience into DOT Grant and Loan Programs • Enhance Resilience Throughout the Project Planning and Development Process • Ensure Resiliency of DOT Facilities and Operational Assets • Ensure Climate-ready Services and Supplies • Improve Climate Education and Research on Resilience

Building Resilience and Adaptive Capacity at DOT

DOT has a long history of considering climate hazard impacts on the national transportation system. The U.S. DOT Center for Climate Change and Environmental Forecasting (DOT Climate Change Center) was established in 1999, and the FHWA started to issue reports on the potential impacts of climate change on transportation as early as 2002. For over two decades DOT has issued policy and guidance, supported research and case studies, and provided technical assistance to build resilience and adaptive capacity with the goal of reducing climate hazard impacts on transportation infrastructure, including federally funded projects. Most recently DOT has amplified these efforts through progress on the following actions from the 2021 CAP:

- Incorporating resilience into grant and loan programs
- Enhancing resilience throughout the project planning and development process
- Ensuring resiliency of DOT facilities and operational assets
- Ensuring climate-ready services and supplies
- Improving climate education and research on resilience

DOT issued new internal guidance for incorporating Administration priorities such as safety, climate change and sustainability, and equity and Justice40 into grant funding opportunities, as appropriate and consistent with existing law. The guidance aims to streamline the grant process to enable all applicants, regardless of capacity or experience with DOT grants to understand federal and program requirements. DOT resources to support applicants include a Grant Application Checklist for Climate Change in the DOT Navigator, which serves as a resource to help communities understand the best ways to apply for grants. The Justice40 Initiative sets a goal that 40 percent of the overall benefits of certain Federal climate and other investments flow to disadvantaged communities that are marginalized by underinvestment and overburdened by pollution. Disadvantaged communities are identified using the using the Climate and Economic Justice Screening Tool (CEJST) developed by CEQ. DOT also launched the Equitable Transportation Community (ETC) Explorer, an interactive web application to explore the

cumulative burden communities experience as a result of under investment in transportation. It is designed to complement CEQ's CEJST by providing users deeper insight into the Transportation Disadvantaged component of CEJST.

Led by the Chief Sustainability Officer and the Office of the Assistant Secretary for Administration, DOT has continued efforts to ensure that its facilities and operational assets are climate smart. DOT developed a Climate Hazard Exposure and Risk (CHER) tool to support system-wide analysis of climate exposure for DOT operational assets. Facility-level climate hazard exposure data were made available to DOT facility managers in 2022 to inform planning and project development. The risk-based management framework combines facility manager ratings of the vulnerability of critical systems to each climate hazard (based on sensitivity and adaptive capacity) with exposure metrics to score each mission-critical asset. The risk assessments in turn inform high-priority resilience strategies for project planning and development. The DOT team continues to integrate new climate projections from federal data sources into the CHER tool through annual updates.

In addition, DOT evaluated facility climate hazard exposure using CEQ's Federal Climate Mapping for Resilience and Adaptation Application (Federal Mapping App) released in late Fall 2023 to support the preparation of this CAP (see Appendix A). The App provides a broad view of climate exposure across all DOT facilities (including unstaffed and leased facilities) from the federal property management database. The DOT actions for operational assets outlined in this plan utilize the more detailed CHER tool climate risk scores.

To ensure climate-ready services and supplies, DOT has completed multiple projects that address energy supply resilience. DOT has also initiated updates to Acquisition Management Systems, guidance documents, and acquisition professionals' training to incorporate climate resilience.

The Department's actions to bolster resilience and adaptive capacity are implemented through collaborative efforts of the Policy, Research, Administration, and International offices. Activities are coordinated through the revitalized DOT Climate Change Center, along with interagency and internal working groups and task forces. The DOT Climate Change Center is the focal point for policy and action on climate change within the Department. The policy and research units within the Office of the Secretary of Transportation (OST) co-chair the center, and its membership comprises the DOT operating administrations (OAs) and OST offices. Participation in DOT Climate Change Center meetings and activities is open to all DOT employees to leverage the passion, expertise, and diverse perspectives they bring. The regular meetings include technical climate and resilience presentations, discussion of how climate resilience or mitigation can be incorporated into DOT activities, and coordination between OAs on policy updates, climate challenges, and other priority activities. Through these efforts, the Department is building a transportation system that is resilient to the impacts of climate change, while advancing climate and environmental justice.

SECTION 2: RISK ASSESSMENT

DOT used the Federal Mapping App—which was developed for federal agencies by CEQ and NOAA to conduct a high-level screening of climate hazard exposure for federal facilities and personnel. DOT assessed the exposure of its buildings; employees; and lands, waters, and cultural and natural resources to five climate hazards: extreme heat, extreme precipitation, sea level rise, flooding, and wildfire risk.

Climate Data Used in Agency Risk Assessment

Hazard	Description	Scenario	Geographic Coverage
Extreme Heat	Measured as whether an asset is projected to be exposed to an increased number of days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), calculated with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the Localized Constructed Analogs (LOCA) dataset prepared for the Fourth National Climate Assessment.	RCP 4.5	CONUS
		RCP 8.5	CONUS
Extreme Precipitation	Measured as whether an asset is projected to be exposed to an increased number of days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amounts (calculated annually), with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the LOCA dataset prepared for the 4th National Climate Assessment.	RCP 4.5	CONUS
		RCP 8.5	CONUS and AK
Sea Level Rise (SLR)	Measured as whether an asset is within the inundation extents from NOAA Coastal Digital Elevation Models and the 2022 Interagency Sea Level Rise Technical Report. Intermediate and Intermediate-High SLR scenarios used as proxies for RCP 4.5 and 8.5, respectively.	RCP 4.5	CONUS and PR
		RCP 8.5	CONUS and PR
Wildfire Risk	Measured as whether an asset is in a location is rated as high, very high, or extreme risk based on the U.S. Forest Service Wildfire Risk to Potential Structures (a data product of Wildfire Risk to Communities), which estimates the likelihood of structures being lost to wildfire based on the probability of a fire occurring in a location and likely fire intensity. Data reflects wildfires and other major disturbances as of 2014.	Historical	All 50 States
Flooding	Measured as whether an asset is located within a 100-year floodplain (1% annual chance of flooding) or 500-year floodplain (0.2% annual chance of flooding), as mapped by the Federal Emergency Management Agency National Flood Hazard Layer.	Historical	All 50 States and PR

Exposure to extreme heat, extreme precipitation, and sea level rise were evaluated at mid- (2050) and late-century (2080) under two emissions scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. Exposure to flooding and wildfire risk were only evaluated for the present day due to data constraints.

Climate Scenarios Considered in Agency Risk Assessment

Scenario Descriptor		Summary Description from the Fifth National Climate Assessment
RCP 8.5	Very High Scenario	Among the scenarios described in NCA5, RCP 8.5 reflects the highest range of carbon dioxide (CO_2) emissions and no mitigation. Total annual global CO_2 emissions in 2100 are quadruple emissions in 2000. Population growth in 2100 doubles from 2000. This scenario includes fossil fuel development.
RCP 4.5	Intermediate Scenario	This scenario reflects reductions in CO_2 emissions from current levels. Total annual CO_2 emissions in 2100 are 46% less than the year 2000. Mitigation efforts include expanded renewable energy compared to 2000.

Additional details about the data used in this assessment are provided in Appendix A.

2A. Climate Hazard Exposures and Impacts Affecting Federal Buildings

Indicators of Exposure of Buildings to Climate Hazards	RCP 4.5 2050	RCP 4.5 2080	RCP 8.5 2050	RCP 8.5 2080
Extreme Heat: Percent of buildings projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually) from 1976-2005[2]	100%	100%	100%	100%
Extreme Precipitation: Percent of buildings projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually) from 1976-2005[1]	99%	100%	97%	96%
SLR: Percent of buildings projected to be inundated by SLR	3%	4%	3%	4%

Indicator of Exposure of Buildings to Wildfire	High Risk	Very High Risk	Extreme Risk
Wildfire: Percent of buildings at highest risk to wildfire	11%	1%	1%

Indicator of Exposure of Buildings to Flooding	100- or 500- year floodplain
Flooding: Percent of buildings located within floodplains	6% (100-yr) or 6% (500-yr)

The DOT operational assets included in the CEQ Federal Mapping App include buildings that seven OAs and OST own or manage. The analysis using the Federal Mapping App of owned DOT buildings suggests that nearly all will be exposed to increased temperature and precipitation by 2050 and 2080. In contrast, fewer than 6 percent of DOT buildings will be exposed to SLR, are located within a 500-year floodplain, or face extreme wildfire exposure.

In addition to the system-wide analysis of DOT owned buildings (shown in the table above in Section 2A), the Department also conducted a regional analysis for owned buildings using data

[2] Heat and precipitation data are not available in the Federal Mapping App for approximately 5 to 20 percent of DOT buildings; the percentage values in the table only represent climate hazard exposure for DOT buildings with available data.

from the CEQ Federal Mapping App. The regional analysis considers the 10 regions in the Fourth and Fifth National Climate Assessment, and highlighted results for each hazard are as follows:

- Wildfire: The Southwest region has the most buildings with elevated wildfire exposure (36 total including three extreme). The Northwest region has three buildings with extreme wildfire exposure, even though the total number of buildings with elevated exposure is small across the region.
- Flooding: The Southeast region has the highest number and percentage of buildings in the 100-year and 500-year floodplains. The Southwest region also has several buildings in the 100-year floodplain. Floodplain data have limited geographic coverage, meaning the estimates of exposure are likely conservative.
- Extreme Temperature: All buildings (with available data) are expected to see increased exposure to extreme heat in both the near (2050) and more distant (2080) future compared to historical precedent. In both time periods and under both emissions scenarios, the greatest increase in extreme heat is expected in the Southeast region. By 2080, between 8 percent (lower emissions scenario) and 100 percent (higher emissions scenario) of buildings in this region can expect to experience in excess of 50 extreme heat days per year. The high emissions scenario predicts much more extreme heat in 2080 than the low emissions scenario. Nonetheless, in each region the majority of buildings will experience in excess of 20 extreme heat days per year by 2080, even under the low emissions scenario (except in the Northwest, 49 percent).
- Extreme Precipitation: Nearly all buildings (with available data) are expected to see increased exposure to extreme precipitation in both the near (2050) and more distant (2080) future, but the increases are moderate. Only for certain buildings in Alaska is the number of extreme precipitation days expected to exceed 10 days per year (compared to the historical 3.67 days/year) in either 2050 or 2080. Nonetheless, facilities that already see impacts from major precipitation events can expect to see greater and more frequent impacts in the future.
- SLR: Under both emissions scenarios and in 2050 and 2080, the regions that show the greatest exposure to SLR are the Northeast, Southeast, and Southwest. Although more facilities will face inundation in 2080 compared with 2050, both scenarios show similar patterns in 2050 and in 2080.

The CEQ Federal Mapping App includes all DOT buildings and real property entries from the federal property management system. DOT has identified a subset of the buildings and operational assets as mission-critical for resilience assessments. To address priority actions identified in the 2014 and 2016 Climate Action Plans, DOT developed the CHER Tool in 2021-2022 to guide OAs through climate risk assessments for mission-critical operational assets. For each mission-critical building, the tool provides climate hazard exposure scores that combine with user ratings for asset criticality, dependencies, and vulnerability to generate site-level climate risk scores. DOT compiled original historical and projected climate exposure data from several federal resources to provide OAs with consistent, high-quality information that will support system-wide comparisons of climate risk.

In accordance with DOT Order 4360, Climate Change Adaptation and Resilience Policy for DOT Operational Assets issued in September 2023, OAs are required to use the CHER Tool to

assess location-specific vulnerabilities and risk facing mission-critical DOT operational assets. The risk assessments will inform the prioritization of adaptation and resilience strategies. DOT will track and report progress on the implementation of resilience measures that reduce vulnerability, thereby mitigating risk to natural hazard and climate exposures.

2B. Climate Hazard Exposures and Impacts Affecting Federal Employees

Indicators of Exposure of Employees to Climate Hazards	RCP 4.5 2050	RCP 4.5 2080	RCP 8.5 2050	RCP 8.5 2080
Extreme Heat: Percent of employees duty-stationed in counties projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976-2005	100%	100%	100%	100%
Extreme Precipitation: Percent of employees duty-stationed in counties projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually), from 1976-2005	100%	100%	100%	98%
SLR: Percent of employees duty-stationed in counties projected to be inundated by SLR	16%	37%	17%	41%

Indicators of Exposure of Employees to Wildfire	High Risk	Very High Risk	Extreme Risk
Wildfire: Percent of employees duty-stationed in counties at highest risk to wildfire	12%	3%	4%

DOT staff are highly concentrated at DOT headquarters and large research facilities, meaning that the most important exposures facing staff may differ from those of DOT facilities as a whole. Resilience priorities and solutions may also differ given discrepancies between hazard impacts on staff versus infrastructure. To supplement the system-wide analysis of DOT employees (shown in the table above in Section 2B), the DOT also conducted a regional analysis for all DOT employees using data from the CEQ Federal Mapping App. Most DOT staff, and most DOT Non-seasonal Full-time Permanent (NSFTP) staff, are in the Northeast, Southeast, Southern Great Plains, Southwest, and Midwest regions. Fewer than 10 percent of all staff are in the Northwest, Alaska, Northern Great Plains, and Hawaii regions combined.

- Wildfire: The Southwest region has the greatest wildfire exposure for employees. The Southeast also has high exposure to this hazard, including a large number of employees exposed at extreme levels.
- Extreme Temperature: The Southeast region stands out as showing the greatest increase in extreme heat days. By 2080, between 57 percent (low emissions scenario) and 100 percent (high emissions scenario) of the more than 10,000 employees in this region are expected to see an average of 20 or more extreme heat days each year.
- Extreme Precipitation: The number of extreme precipitation days that staff will experience does not exceed 10 days under any of the scenarios or regions in the CEQ Federal Mapping App. The Northwest region will experience the most widespread change by 2080, but few staff will be affected.

- SLR: Under both scenarios and in 2050 and 2080, the regions that show the greatest exposure of employees to SLR are the Northeast, Southeast, and Southwest. Both scenarios show similar patterns in 2050. Under the higher emissions scenario in 2080, over 12,000 employees in the Northeast are expected to be in counties affected by SLR, and every region has at least 1,000 employees in exposed counties. However, the Southeast region may have more widespread impacts from SLR inundation (in excess of 20 sq. mi. per county).

The system-wide and regional exposures to employees that have been identified using the CEQ Federal Mapping App will inform DOT's ongoing efforts to assess and mitigate climate risks to employee health and safety and to mission-critical operations.

2C. Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters, and Cultural Resources

Federal Asset	Current Climate Hazard Impact or Exposure	Future Climate Hazard Impact or Exposure
Unstaffed and primarily leased land parcels devoted to air navigation and air traffic purposes (includes 90% of DOT-affiliated lands listed in the CEQ Federal Mapping App).	Assets on unstaffed land parcels are currently not considered to be highly vulnerable to climate hazards. Although a subset of sites has high exposure to specific climate hazards such as SLR or exposure to the 100-year floodplain, the assets on these lands are built to withstand a wide variety of weather and environmental hazards. Additionally, these systems have high levels of redundancy across sites.	Nearly all land parcels will see small increases in extreme precipitation days (on average fewer than 6 extreme precipitation days per year total under both scenarios in 2050 and 2080, compared to the historical precedent of 3.7 days per year). A small percentage of all DOT-affiliated properties face exposure to the 100-year floodplain (6%), elevated wildfire risk (12%), or sea level rise (4.2 to 5.1% depending on the scenario and timeframe).

The CEQ Federal Mapping App contains 5,122 DOT-affiliated lands, of which nearly 4,000 are leased. Climate projection data in the App suggest that all lands will see an increase in extreme heat days. Nearly all lands will see an increase in extreme precipitation days, although the overall change is small (on average fewer than 6 extreme precipitation days per year total under both scenarios in 2050 and 2080, compared to the historical precedent of 3.7 days per year). A much lower percentage of properties face exposure to the 100-year floodplain (6 percent), elevated wildfire risk (12 percent), or SLR (4.2 to 5.1 percent depending on scenario and timeframe).

DOT will continue to review and update the most appropriate siting, construction, operation, and maintenance standards for its lands and landed assets in response to changing climate hazards. Over 90 percent of all DOT-affiliated lands are unstaffed parcels devoted to air navigation and air traffic purposes (such as ground-based navigational transmission and wind alert systems). The assets on these lands are built to withstand a wide variety of weather and environmental hazards. Additionally, these systems have high levels of redundancy across sites.

A select number of properties owned by DOT are listed in the National Register of Historic Places. For example, MARAD's historic properties include one historic district, one building,

and one National Historic Landmark. The coastal properties are exposed to flooding, high winds, extreme heat, extreme precipitation, and sea level rise.

DOT also supports the resilience of transportation assets on other federal lands that are not included in the CEQ Federal Mapping App. For instance, FHWA's Office of Federal Lands Highway (FLH) provides technical services to Federal Land Management Agencies (FLMAs), States, Territorial partners, Local governments, and Tribal governments to improve transportation to and within Federal and Tribal lands. Examples include a 2022 publication: Infrastructure Resilience to Extreme Events & Climate Change - Federal Lands Sensitivity Case Studies and a FLMA Southeast Region Climate Change Transportation Tool.

2D. Climate Hazard Exposures and Impacts Affecting Mission, Operations, and Services

Summary Of Key Current And Projected Climate Hazard Impacts And Exposures

Area of Impact or Exposure	Identified Climate Hazard	Description
National transportation system infrastructure	Wildfires	Directly damages roadways, railways, and pipelines and leads to landslides during subsequent rain events that threaten lives, and property and cause more extensive infrastructure damage; Causes road closures, health impacts, and reduced visibility for drivers and pilots over large regions during active events; Induces the release of toxic chemicals from plastic pipeline infrastructure; Smoke impacts the health of employees operating and maintaining National Airspace System (NAS) infrastructure or working outdoors.
National transportation system infrastructure	Extreme precipitation	Causes erosion and saturated soil that damage roadways, airport runways, railways, waterways, and pipelines; Increases risk of landslides that may impact infrastructure viability; Damages culvert and drainage infrastructure which may increase current and future flooding; Results in pipeline shift or fracture.
National transportation system infrastructure	Extreme heat	Causes railways, roadways, sidewalks, and runways to buckle, crack, and rut; Reduces service life of infrastructure; Induces permafrost melt that destroys infrastructure; Creates unsafe working conditions; Necessitates that trains operate at lower speeds; Induces catenary line sag thus impacting train operability; Reduces NAS capacity via impacts on required lift for larger aircraft.
National transportation system infrastructure	SLR, storm surge	Leads to more frequent/severe flooding of underground tunnels and low-lying infrastructure, requiring improved drainage and pumping, repair, or replacement; Causes coastal airport water intrusion.
DOT Operational Assets	Extreme precipitation	Causes riverine or pluvial flooding that damages assets located in basements or ground level; Prevents facility access for employees or emergency response personnel; Causes hazardous waste releases if accumulation areas are vulnerable to flooding.
DOT Operational Assets	Extreme heat	Hinders communication systems on site (e.g., radio, telephones), halting activities and increasing safety risks; Compromises personal health and safety of employees; Causes extended power outages that impact facility operations, laboratories, ships, and critical national airspace equipment.

DOT and its OAs oversee the safe, efficient, sustainable, and equitable operation of the United States transportation system including more than 4.1 million miles of public roads, 617,000 bridges, 136,851 railroad route miles, 3.3 million miles of pipelines, 25,000 miles of commercially navigable waterways, 3,321 public-use airports, 950 urban transit agencies, and more than 300 coastal, Great Lakes, and inland waterways ports.[3] The Fifth National Climate Assessment highlights the current and projected negative impacts of extreme weather on transportation modes and human safety.[4] Significant portions of the U.S. transportation system are currently impacted by climate hazards including extreme temperatures, storms, drought, and fire with exposure projected to increase over the next several decades.

The range of impacts on the national transportation system from exposure to climate hazards includes runway, roadway, bridge, railway, port, and pipeline damage from heat and thawing permafrost, soil subsidence, flooding, and coastal airport water intrusion; increased risk of landslides; limited waterway access; unsafe working conditions, and adverse health effects for active transport. Extreme weather conditions reduce the life of capital assets, increase operational disruptions, and create the need for new infrastructure such as evacuation routes. Addressing the impacts of climate hazard exposure for vulnerable infrastructure requires significant adjustments to standard planning, design, construction, and operational processes. DOT has deployed numerous climate adaptation and resilience efforts including guidance, memos, memoranda of understanding (MOUs), technical support and funding programs to reduce the impacts of climate hazard exposure on the mission and services.

The Department is committed to reducing climate hazard impacts on internal operations and improving resilience. DOT owns or operates research facilities and laboratories, ship fleets, academic buildings, heavy machinery, vehicle fleets, electrical substations, safety test tracks, data centers, air traffic control facilities and equipment, communication assets, historic properties, and office buildings. The DOT actions to improve resilience of these assets are consistent with the Disaster Resiliency Planning Act (DRPA). The Department has been systematically incorporating natural hazard and climate vulnerability assessments into real property risk management practices for over 10 years. DOT initially utilized resources from the U.S. Climate Resilience Toolkit, guidance and lessons learned from FHWA pilot studies, and the National Climate Assessments, among others. In 2021 DOT initiated the CAP priority action to develop the CHER Tool.

2E. Impacts from and Exposure to Additional Hazards

The CHER Tool is designed to guide OAs through risk assessments for mission-critical operational assets. The tool combines climate hazard exposure data (including climate projections) from many federal sources with user ratings of asset criticality, dependencies, and vulnerability to generate site-level climate risk scores (refer to appendix A for a list of climate hazards included in the CHER tool). The tool was designed to address a significant barrier that facility managers faced when completing climate vulnerability assessments: expertise required to research, download, compile, and interpret climate hazard exposure data. Using a consistent approach provides the Department with a system-wide overview of climate hazard exposure to

[3] Landmark Fifth National Climate Assessment Highlights Key Climate Change Risks and Opportunities for the Transportation Sector
[4] Transportation (globalchange.gov)

inform which sites to prioritize for vulnerability assessments. The CHER tool integrates facility manager ratings of the vulnerability of critical systems for each site with climate hazard exposure data to rate climate risk and inform resilience solutions.

Several mission-critical buildings are exposed to increasingly regular high-tide flooding and salt-water intrusion that can damage building structures, utility systems, and communications. National Reserve Defense Fleet stations experience damage from increased storm surges and tides. Extreme precipitation causes flooding that prevents facility access for employees or emergency response personnel. Extreme heat can stress utility systems, reduce the service life of structural materials, and impact NAS capacity. In contrast, DOT buildings and employees have only limited direct exposure and vulnerability to wildfire.

The CHER tool provides location-specific exposure data for climate hazards (over 20 in the 2023 version) so that facilities managers can provide information on facility vulnerability, allowing for an overall estimate of risk as well as risk from each climate hazard. Of the climate hazards included in the CHER tool (fourteen historical and nine projection-based), mission-critical, staffed DOT facilities have the highest exposure to future (2050) high temperatures and extreme precipitation, coastal flooding, and hurricanes. In using the CHER tool, OAs have identified their greatest vulnerabilities as hurricanes, coastal flooding, ice storms, and strong winds. Thus, the overall ranking of climate hazards that pose the greatest risk (a measure that combines exposure, criticality, dependency, and vulnerability) can differ from hazard importance estimated by exposure alone.

Both vulnerability and exposure are key to understanding climate impacts, and the CHER tool demonstrates how a fuller understanding of both can inform project planning, development, and prioritization. DOT OAs have used the CHER tool to complete resilience assessments for dozens of mission-critical facilities. The Department has created a Climate Risk Dashboard to track progress towards completing the vulnerability assessments for all DOT mission-critical facilities and to automate the process to synthesize the results across the organization.[5] DOT is continuing to update the CHER tool as climate hazard exposure data are published or revised and as the Department's climate assessment activities mature.

[5] See Appendix A

SECTION 3: IMPLEMENTATION PLAN

3A. Addressing Climate Hazard Impacts and Exposure

1. Prioritized Actions To Address Climate Hazard Exposures and Impacts Affecting Federal Buildings

Climate Hazard Impact on and/or Exposure to Buildings	Priority Action	Timeline for Implementation (2024-2027)
National Impacts: All climate and natural hazards included in the CHER tool (historical exposure for all variables and projected exposure for extreme temperatures, precipitation, and SLR)	Complete vulnerability assessments of all mission-critical facilities using the CHER tool as part of ongoing sustainment activities.	Complete assessments for mission-critical facilities by the end of FY 2026. Review assessments for approximately 25% of mission-critical facilities annually, such that all are reassessed every four years.
National Impacts: Extreme heat	Consider the impacts of projected increases in extreme heat on cooling day requirements when planning for 100% carbon-free electricity (CFE) and utility costs.	Ongoing activity to support performance contracts, deep energy retrofits, optimizing or right-sizing heating, ventilation, and air conditioning (HVAC) equipment, and onsite renewable energy projects.
National Impacts: Extreme temperature, precipitation, flooding, and SLR	Install renewable energy and microgrid projects to improve energy resilience and reduce dependency on outside resources (energy, suppliers). Action will support the E.O. 14057 CFE goals.	Ongoing activity to support the installation of onsite renewable energy projects that power DOT facilities.
National Impacts: Extreme temperature, precipitation, flooding, and SLR	Evaluate benefits of monitoring and control system improvements to identify and correct impending system failures.	Ongoing activity to support performance contracts.
National Impacts: Extreme temperature, precipitation, flooding, and SLR	Update design processes to evaluate new information, strategies, and materials that enhance the climate resiliency of operational infrastructure.	Ongoing requirement in all major renovation and new construction projects.
National Impacts: Extreme precipitation and Flooding	Move high-value items from the basement and ground floor levels to reduce the potential for preventable flood damage. Plan to move all such assets out of flood-prone areas.	Ongoing requirement in all major renovation and new construction projects.
Regional Impacts: Extreme precipitation, flooding, storm surge, and SLR	Renovate seawalls and evaluate nature-based solutions to attenuate wave action and reduce damage to shoreside assets.	Include SLR and storm surge projections in design requirements for new seawall infrastructure in 2024.
Regional Impacts: Extreme precipitation	Upgrade stormwater management systems at large campuses and facilities to reduce flooding and runoff from extreme precipitation events.	Complete major upgrades for one large DOT campus by the end of 2025.
Regional Impacts: Extreme weather events	Review Heavy Weather Mooring plans and update them to withstand 100-year storm events under future SLR and storm surge conditions.	Identify recommended updates in FY 2024 and complete revisions by the end of FY 2025.

The Department owns or operates more than 10,000 staffed and unstaffed assets across 10 climatic regions identified in the newly released fifth National Climate Assessment. Many air traffic control assets, offices, research laboratories, and other mission-critical buildings in widely dispersed locations will experience a range of climate impacts, from extreme storms worsened by sea level rise to longer lasting and more extreme heat waves and extreme cold, to increased numbers and severities of hurricanes, wildfires, tornadoes, and floods. In accordance with DRPA, DOT is considering climate risk information and enhancing the resilience of agency assets by identifying and implementing priority adaptation actions.

DOT developed the CHER tool (described in Section 2E above) to integrate climate exposure data with asset criticality and system vulnerability to estimate climate risk across the portfolio of DOT facilities and operational assets. Most OAs have completed an initial round of assessments using the CHER tool with results compiled in an interactive dashboard for easy reference when making investment decisions.[6] DOT Order 4360 is aligned with the guidance and requirements of E.O. 14008, E.O. 14057, the *Disaster Resiliency Planning Act*, OMB circular A-11, and OMB memo M-24-03.

The CHER tool risk assessments will inform the prioritization of the resilience strategies highlighted in the table above, and other site-specific adaptations to reduce sensitivity to climate hazard exposure. For instance, OAs in areas with increased wildfire exposure can update HVAC systems to reduce impacts from wildfire smoke. OAs are already taking several steps to address vulnerabilities associated with climate change. Examples include introducing changes in building design at the time of new construction, locating data centers on higher floors to avoid possible flooding and the use of different, more resilient construction materials. OAs are upgrading structural elements, including sea walls and mooring systems to withstand greater force from surging seas. A large DOT facility is updating the stormwater management system to reduce flooding impacts and run-off during extreme precipitation events. OAs are also installing alternative and back-up power systems, including micro-grids. Onsite renewable energy facilities can increase resilience by reducing reliance on power grids and avoiding power outages while at the same time addressing sustainability and net zero emissions goals.

DOT actively participates in the White House Flood Resiliency Interagency Working Group to coordinate implementation of the Federal Flood Risk Management Standard (FFRMS). The Department is drawing on interim resources, including the Congressional Research Service FFRMS report,[7] while the final policy is under development. For example, OAs are using site-specific flood exposure maps to evaluate climate risks when renewing leases or relocating facilities. Additional engagement with interagency working groups for resilience, nature-based solutions, and climate services will provide the needed data and information for addressing climate hazard impacts and exposure.

[6] See Appendix A.
[7] IN12193 (congress.gov)

2. Prioritized Actions To Address Climate Hazard Exposures and Impacts Affecting Federal Employees

Climate Hazard Impact on and/or Exposure to Employees	Priority Actions	Timeline for implementation (2024-2027)
National Impacts: Extreme temperature, precipitation, flooding, and SLR. Severe weather or other climate-related events could expose personnel to personal health and safety risks.	Increase general knowledge among employees and supervisors about the potential impacts of severe weather and environmental hazards through the DOT Climate and Transportation 101 training and other resources. Provide support for personnel impacted by climate disasters.	Distribute annual summaries of available climate information and decision support resources to DOT personnel on internal web pages at least twice per year. Provide advisory information on how to prepare for and reduce the impacts of extreme weather events on communities and personal property.
National Impacts: Extreme temperature, precipitation, flooding, and SLR. Inclement weather or other climate-related events could expose personnel to personal health and safety risks.	Include impacts of climate hazard exposure on personnel health and safety as a top criterion when evaluating lease renewals or selecting new lease or property purchase locations.	Include guidance for climate hazard exposure in DOT Sustainable Buildings Order when revised in 2024.
National Impacts: Extreme heat	Adjust working hours of employees working in field locations to avoid extreme heat exposure. Review current procedures (Occupational Safety and Health Administration (OSHA) protocols) to protect worker safety. Utilize telework and Continuity of Operations Plan (COOP) protocols to avoid exposure to extreme heat when feasible. Rail testing schedules will be adjusted to more night schedules than day schedules to take advantage of cooler evening temperatures.	Include guidance or references for when to adjust working hours in the DOT Overarching Sustainability Order to be revised in 2024. Review telework and COOP guidance to include considerations for field personnel exposure to extreme weather under future climate conditions by 2025.
Coastal Impacts: Warmer temperatures	Warmer water temperatures may result in the increase of insect populations and vulnerability to personnel from disease.	Track local health advisories and offer resources to support protective actions as relevant to reduce risk of personnel exposure.

The CHER tool helps DOT evaluate the impacts of climate hazard exposure on property and buildings. CEQ's Federal Mapping App more directly evaluates employee exposure, and indicates that for the Department, the most significant climate hazard exposure for employees is from flooding, wildfires, extreme heat, and SLR.

Exposure to natural climate hazards can make it difficult for mission-critical personnel to accomplish their work, which could have broad consequences for the DOT mission and programs. If personnel are able to continue working, their personal health and safety may be compromised under certain conditions. For example, if operations can continue during extreme

weather or flooding, personnel are often required to continue working which can result in unexpected and longer operating shifts in adverse conditions. Personnel who work in outdoor settings are susceptible to exposure to extreme heat. The integrity and safety of systems may be compromised with climate change related conditions. For example, low availability of water in extreme heat may lead to cancellations of emergency testing or system maintenance due to lack of water for personnel or if testing itself requires significant amounts of water. Communication between DOT personnel at different locations with emergency responders and Headquarters could be hindered. Thus, operations continuity and repair of system damages could be delayed and impaired.

The Department will prioritize actions that will both reduce the exposure of personnel to these natural climate hazards and reduce the impacts of exposure. These actions will include education through the DOT Climate 101 training, adjustments to work requirements, and consideration of climate impacts when selecting work locations.

3. Prioritized Actions To Address Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters and Cultural Resources

Type of Land or Water Asset	Climate Hazard Impact on and/or Exposure to the Asset	Priority Action
Unstaffed parcels devoted to air navigation and air traffic purposes (includes 90% of DOT-affiliated lands listed in the CEQ Federal Mapping App).	DOT assets on unstaffed parcels have not been identified as highly vulnerable to current or future climate hazards. The assets on these lands are built to withstand a wide variety of weather and environmental hazards, and these systems have high levels of redundancy across sites.	Mission-critical land and water assets will be included in DOT climate hazard assessments to inform investment priorities. DOT will continue to review and update the most appropriate siting, construction, operation, and maintenance standards for its lands and landed assets in response to changing climate hazards.

The majority of DOT lands included in the CEQ Federal Mapping App are leased unstaffed parcels devoted to air navigation and air traffic purposes (such as ground-based navigational transmission and wind alert systems). The assets on these lands are built to withstand a wide variety of weather and environmental hazards. Additionally, these systems have high levels of redundancy across sites. These DOT assets on unstaffed parcels have not been identified as highly vulnerable to current or future climate hazards. DOT will continue to review and update the most appropriate siting, construction, operation, and maintenance standards for its lands and landed assets in response to changing climate hazards.

Advancing the America the Beautiful Initiative	
DOT discretionary grant programs now include standard language for integrating climate resilience and nature-based solutions into project planning, development, and capital funding decisions.	DOT grant programs such as Culvert Aquatic Organism Passage (Culvert AOP) and Neighborhood Access and Equity (NAE) encourage projects that incorporate the use of natural infrastructure, also known as nature-based solutions, including: • Conservation, • Restoration, • Construction of wetlands, • Native vegetation, • Stormwater bioswales, • Parks, • Urban forests and shade trees. These efforts can result in projects that reduce flood risks, erosion, wave damage, and heat impacts while also creating habitat, filtering pollutants, and providing recreational benefits.

DOT is home to several innovative grant programs that fund projects at the critical nexus of conservation and climate resilience, as well as programs that broadly advance national conservation goals. Additional information on these programs is found below, including general timelines for award announcements and open application periods.

FHWA's Culvert AOP Grant program delivers $1 billion in Bipartisan Infrastructure Law (BIL) funding over five years (2022-2026) to replace, remove, and repair culverts and weirs to meaningfully improve or restore fish passages for anadromous fish. In August 2023, FHWA announced the first round of grants under this program to fix or remove almost 170 barriers and improve approximately 550 miles of stream habitat across the country, with a total of $196 million dollars in grant funding to 59 Tribal, state, and local governments. Projects will not only improve habitat connectivity for anadromous fish but may also have co-benefits such as increased resiliency of aquatic ecosystems and of transportation assets. The next application period is scheduled to start mid-2024.

FHWA's Wildlife Crossings Pilot Program (WCPP) delivers $350 million in BIL funding over five years (2022-2026) to protect motorists and wildlife by reducing wildlife-vehicle collisions and improving habitat connectivity for terrestrial and aquatic species. Each year, it is estimated that there are more than one million wildlife vehicle collisions in the U.S. Wildlife-vehicle collisions involving animals result in injuries to drivers and their passengers, representing approximately 200 human fatalities and 26,000 injuries to drivers and their passengers each year. These collisions also cost the public more than $10 billion annually. This includes economic costs caused by wildlife crashes, such as loss of income, medical costs, property damage, and more. Improving migrations of species is critical to protecting biodiversity, especially in a changing climate. Protecting biodiversity ensures healthy and thriving ecosystems that, in turn, provide resilience benefits such as stormwater management and flood protection. In April 2023, FHWA announced the first Notice of Funding Opportunity (NOFO) for this program by making available nearly $112 million in WCPP funds. In August 2023, FHWA received 67 applications

from applicants in 34 States requesting $549 million in WCPP funds. This represents nearly five times the amount available in the first NOFO, and over one and a half times the amount available for the program over the life of the BIL. In December 2023, FHWA announced the first round of grant awards under this program for 19 wildlife crossing projects in 17 states, including four Indian Tribes.

Another program DOT is working to implement is the Neighborhood Access and Equity (NAE) Grant Program, which demonstrates how federal mechanisms can weave funding for nature-based and climate resilience solutions together to strengthen local transportation planning. More specifically, the NAE program offers approximately $3.2 billion to improve walkability, safety, and affordable transportation access through projects that are context-sensitive and mitigate or remediate negative impacts on the human or natural environment resulting from a transportation facility in a disadvantaged community. Of the total amount, $1.3 billion is dedicated to projects in disadvantaged communities. A portion of the program funds community planning initiatives that include monitoring and assessing local gaps in tree canopy and green space, urban heat islands (UHI), extreme precipitation, flooding, and other climate risks. This holistic approach helps communities address hyper-local challenges, select the most appropriate sets of interventions, and plan how best to integrate natural infrastructure into adaptation-focused transportation investments, such as:

- Planning and/or construction of greenways, highway capping, pedestrian, and bicycle trails.
- Expansion of and access to green space for nature deprived communities.
- Increased tree planting and vegetated areas to help mitigate flooding and manage stormwater impacts to critical bridges, roads, and evacuation routes.

3B. Climate-Resilient Operations

1. Accounting for Climate Risk in Planning and Decision Making

DOT has a long history of incorporating climate risk considerations into planning and decision making to increase the resilience of transportation infrastructure and operational systems. DOT senior leadership participates in Climate Principals conversations and DOT Climate Change Center meetings facilitate the incorporation of climate adaptation priorities into decision making across the organization. The DOT Climate Change Center website includes a list of climate adaptation resources and tools produced by the department and resources from other agencies.[8] DOT continues to develop resilience assessment guidance and tools, provide technical assistance, and implement projects to conduct vulnerability and adaptation assessments for different transportation modes, locations, and systems. Each of DOT's nine OAs will develop CAPs to address climate hazards and resilience in project development, programs, and operations as part of the implementation of this CAP.

The Department includes climate resilience criteria in discretionary grant programs where appropriate. DOT issued revised internal discretionary grant guidance in December 2023 that includes information on how to incorporate criteria for evidence-based climate resilience and

[8] Climate Adaptation Resources and Tools | U.S. Department of Transportation

adaptation measures or features. Numerous grant programs provide funding for projects that use the best-available climate data and tools to assess climate-related vulnerabilities and risks, and to develop resilience solutions to address those risks. For example, the Federal Railroad Administration (FRA) considers resiliency in the review of grants for the Consolidated Rail Infrastructure and Safety Improvement program which funds rail infrastructure development and maintenance. In addition, the BIL established the PROTECT Program to provide formula and discretionary grant funding for Planning, Resilience Improvements, Community Resilience and Evacuation Routes, and At-Risk Coastal Infrastructure. The program website has compiled an extensive list of DOT and other federal resources that provide information on methods and tools for assessing and addressing resilience, including Resilience Improvement Plans (RIP).[9]

The Department completed a Consensus Study on Resilience Metrics in the Fall of 2021 with the National Academies of Science/Transportation Research Board (Investing in Transportation Resilience: A Framework for Informed Choices). The Department is working to address recommendations from the Consensus Study on Resilience Metrics, including promoting the use of benefit-cost analysis. The Department is also conducting a priority research project to develop a tool to assess the costs and benefits of building resilient transportation infrastructure. The Resilience Disaster Recovery tool analyzes resilience investments for Long-Range Transportation Planning and is now being implemented at state and local levels.

In September 2023, DOT issued Order 4360: *Climate Change Adaptation and Resilience Policy for DOT Operational Assets*. The Order delegates authority and assigns responsibility to ensure that DOT and its OAs integrate climate change adaptation (climate adaptation or adaptation) and climate change resilience (climate resilience or resilience) requirements into agency planning, supply chain sustainability, and mission-critical assets for internal operations. The Order outlines the DOT policy to pursue cost-effective, innovative strategies that build climate adaptation and resilience through planning, governance, oversight, financial management, and acquisition. OAs are required to use the DOT-developed CHER tool for vulnerability and risk assessments of DOT buildings and other property, with DOT Order 4360 outlining the process to apply results to planning and decision making for DOT operational assets.

OST and DOT OAs have created many climate resilience resources and tools that provide decision support for a variety of transportation infrastructure and operational system applications:

- FHWA: More than 40 resources[10] including information on Addressing Resilience to Climate Change & Extreme Weather in Transportation Asset Management (2023), the Vulnerability Assessment Scoring Tool (VAST) and adaptation framework (2017 update), Pavement Resilience (2023), and nationwide resilience pilot projects; the National Highway Institute (NHI) course "Addressing Climate Resilience in Highway Project Development and Preliminary Design".
- FAA: Airport Resilience Assessment Framework (ARAF), under development (2022-2026) to assist FAA and airport operators to better incorporate resilience analysis and prioritization into airport project planning and funding.[11]

[9] Resources - PROTECT - Environment - FHWA (dot.gov)
[10] Publications - Resilience - Sustainability - Environment - FHWA (dot.gov)
[11] Improving Airport Resilience, September 2022 (faa.gov)

- OST-R: Resilience and Disaster Recovery (RDR) Tool enables transportation agencies to assess resilience investments under a range of potential hazard conditions for Long-Range Transportation Planning. RDR is now being used as a decision support tool.
- OST-R: A white paper for industry groups, decision-makers, the public and others interested in the transportation sector on the needs and challenges of integrating quantitative metrics for assessing resilience into transportation infrastructure along with findings on how to address these identified needs and challenges.
- OST-R: Best practices for utilizing industrial waste as supplementary cementitious materials to substantially lowering the levels of embodied GHG emissions associated with construction materials and building an environmentally sustainable and climate-resilient infrastructure system.
- Federal Transit Administration (FTA): Climate considerations website with FTA research on adapting public transportation to climate change impacts and information from FTA-funded climate adaptation pilots.[12]
- FRA: Includes resiliency considerations and information in infrastructure project grant applications for the Consolidated Rail Infrastructure and Safety Improvements (CRISI) grant program. FRA is conducting research on climate impacts on rail infrastructure and recommendations for the rail industry.
- MARAD and the Great Lakes St. Lawrence Seaway Development Corporation (GLS) will continue to address resilience for shipping and ports with the U.S. Committee on the Marine Transportation System (CMTS) and the Ocean Climate Action Plan.

The Transportation Vulnerability and Resilience Data Program (TVRDP) is a new Bureau of Transportation Statistics (BTS) initiative to fill data gaps and provide access to data, statistics, and analyses tools needed to measure the vulnerability of transportation systems to the direct and indirect disruptions caused by natural, manufactured, and cyber events. The evaluation of the ability of the national transportation system to recover from those disruptions will support DOT efforts to meet local decision-maker needs for community resilience to extreme weather identified in the Work Plan to Provide Federal Support for Local Decision-making[13] required by Section 25003 of BIL.

2. Incorporating Climate Risk Assessment into Budget Planning

OST is responsible for the oversight of climate-related risks and opportunities, through the leadership of the Deputy Assistant Secretary for Policy and Chief Sustainability Officer (CSO), in coordination with the Department's OAs, the Office of the General Counsel, and the Office of the Chief Financial Officer. Additionally, the Office of Policy, within OST, coordinates climate adaptation actions with support from DOT's Climate Change Center.

The FY 2023 DOT Agency Financial Report (AFR) includes a summary of DOT's budget and financial risk management processes. Included in the AFR and related to real property and climate risk management, the Department has implemented a multi-step climate resiliency process. Given the great diversity of asset types held, the Department is utilizing multiple strategies to ensure climate resilience at its facilities. The Department has identified its major mission-critical buildings and operational assets. In addition, mission-critical operations include activities completed in support of DOT's own business processes. The Department will continue

[12] Climate Considerations | FTA (dot.gov)
[13] https://doi.org/10.21949/1528355

performing climate change vulnerability assessments for mission-critical buildings and operational assets using the internally developed CHER tool. Each OA has completed initial assessments of their mission-critical assets and OST is analyzing the results. Upon completion of the assessment, each mission-critical building will have an overall climate risk score and a risk score for each environmental hazard, which can be ranked in priority order and addressed through adaptation strategies as resources are available. To proactively integrate climate resilience into existing management processes, OAs can incorporate priority adaptation and mitigation strategies into their Capital Asset Plans, new building design standards, and facility operation and maintenance schedules.

OST has also developed internal energy, environmental, and sustainability performance metrics. Aligned with the Administration's ambitious climate and environmental priorities, these metrics will include adaptation targets to enhance resiliency along with other important energy, environmental, and procurement actions. The internal report will also establish accountability and governance across the agency, ensuring DOT leads by example through continued progress. The Department's Office of the Budget, CSO, and the DOT Climate Change Center, with representatives from across all DOT offices, will oversee and coordinate these efforts.

3. Incorporating Climate Risk into Policy and Programs

Agency Policies Reviewed

Topics	Policies and Guidance	Examples
Climate Adaptation and Resilience	Every DOT OA and Office has reviewed policies and guidance documents to incorporate Administration priorities including climate adaptation and resilience where relevant. The Department has also issued or is developing numerous new policies and programs that support climate adaptation and resilience. Examples include: • FY 2022-26 DOT Strategic Plan: climate as a strategic priority • 2021 DOT CAP and 2022 CAP Progress Report • The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation • FAA: 2021 Aviation Climate Action Plan • FHWA: Addressing Resilience to Climate Change & Extreme Weather in Transportation Asset Management • FHWA: Pavement Resilience: State of the Practice Report • FHWA: Geohazards, Extreme Weather Events and Climate Change Resilience Manual	DOT issued new Order 4360: Climate Adaptation and Resilience Policy for DOT Operational Assets on September 18, 2023. DOT issued revised internal discretionary grant guidance on December 22, 2023, that includes guidance for how to incorporate criteria for evidence-based climate resilience and adaptation measures or features. The BIL provided a legislative definition of resilience and included resilience activities as explicitly eligible under multiple DOT grant programs, including the National Highway Performance Program, Surface Transportation Block Grant Program, and FHWA's Emergency Relief Program. FHWA has shared information with States to make sure they know of these eligibilities. BIL established the PROTECT program to fund projects to improve transportation resilience and program guidance incorporates resilience considerations thoroughly. The Department will continue to evaluate policies to confirm that climate adaptation and

	• FHWA: Infrastructure Resilience to Extreme Events and Climate Change - Federal Lands Sensitivity Case Studies • FHWA: Highways in the River Environment - Floodplains, Extreme Events, Risk, and Resilience • FTA: Climate Resilience Guidebook (in development) • OST-R: Resilience and Disaster Recovery Tool Suite OST-X: Global Engagement Program *MOMENTUM*	resilience considerations are fully incorporated. The Climate Adaptation and Resilience Review will evaluate all policies to identify any that need to be updated. • For example, FHWA Order 5520 from 2014 on preparedness and resilience to climate change and extreme weather events is one order that could be replicated for other DOT OAs.
Nature-Based Solutions	DOT encourages the use of nature-based solutions or green infrastructure through policy and a significant body of technical guidance. The BIL prioritizes natural infrastructure as a resilience solution, provides a definition of natural infrastructure, and expands opportunities to utilize funding for natural infrastructure within the new PROTECT program. DOT issued revised internal discretionary grant guidance on December 22, 2023, that includes guidance for how to incorporate criteria for evidence-based climate resilience and adaptation measures or features including nature-based solutions.	FHWA has long encouraged nature-based solutions to improve the resilience of transportation projects. Examples of policies or guidance that include nature-based solutions or green infrastructure include: • A summary of fourteen case studies published in 2018 on green infrastructure pilots completed from 2009-2015 • Inflation Reduction Act (IRA): Neighborhood Access and Equity Grants • FHWA's Nature-Based Solutions for Coastal Highway Resilience Implementation Guide • FHWA Case Studies in Realizing Co-Benefits of Multimodal Roadway Design and Gray and Green Infrastructure • Public Roads Magazine: Nature-Based Solutions for Coastal Highway Resilience (2021) • FHWA Eco-logical Approach (Environmental Review Toolkit)
Environmental Justice	DOT has incorporated Environmental Justice considerations into numerous policies, guidance, or planning documents that influence activities related to climate adaptation and resilience across DOT OAs including: • DOT Justice40 Initiative • DOT Climate Change Center • DOT Asian American, Native Hawaiian, and Pacific Islander Action Plan • DOT Environmental Justice Orders ○ FAA Order 1050.1F, CHG 1 (July 16, 2015) • FHWA Guidance on Environmental Justice and NEPA • FHWA Environmental Justice Reference Guide • DOT Equitable Transportation Community (ETC) Explorer, designed to complement the CEQ	DOT issued revised internal discretionary grant guidance on December 22, 2023, that includes guidelines for incorporating Administration priorities related to climate change and sustainability, equity, and Justice40. DOT is updating the Environmental Justice strategy and will coordinate activities related to resilience. The Department is taking steps to address the WHEJAC's recommendations, including disaster preparedness and relief. Several OAs administer emergency relief programs, such as: FTA Emergency Relief Program, FHWA Emergency Relief Program, and the Public Transportation Emergency Relief Program. These programs provide communities with the necessary funding to replace, and repair infrastructure, and incorporate resilience into transportation systems following extreme weather events and natural disasters.

	Climate and Economic Justice Screening Tool • FHWA Environmental Justice FAQ • FAA Office of Airports on Environmental Justice and Related Issues • FTA Environmental Justice FAQs • FTA Environmental Justice Circular for FTA recipients • FRA Justice40 Rail Explorer mapping tool • DOT Climate Action Plan: Revitalizing Efforts to Bolster Adaptation & Increase Resilience Plan • DOT Climate Action Plan for Resilience: 2022 Progress Report • DOT co-chairs the White House effort to develop an EJ Science, Data, and Research Plan, per E.O. 14096 • DOT participated in the Ocean Justice Strategy	DOT Environmental Justice Subject Matter Experts participate in the White House Environmental Justice Interagency Council (IAC) - NEPA Committee/Working Group.
Tribal Nations	The DOT Tribal Transportation Self-Governance program provides federally recognized Tribes and Tribal organizations with greater control, flexibility, and decision-making authority over DOT funds used to carry out tribal transportation programs, functions, services, and activities in tribal communities. • DOT signed the first compact under the program with the Cherokee Nation in June 2022. • DOT signed the second compact with Ohkay Owingeh tribal leaders in January 2024. As a follow-up action to the President's January 26, 2021, Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships, the U.S. DOT, after consultations with Tribes, issued an update to its Tribal Consultation Policy and Tribal Consultation Plan to improve and implement the policies and directives of Executive Order 13175. DOT hosted a tribal consultation on BIL in February 2022 and on the Strengthening Mobility and Revolutionizing Transportation (SMART) grant program in July 2022 regarding funding opportunities available to Tribes.	DOT administers many programs and policies for consultation with Tribal Nations that inform agency actions including activities to enhance resilience, in accordance with federal policy: • Tribal Consultation Presidential Memorandum • PHMSA Tribal Assistance Protocol • Thriving Communities Program • PROTECT • Tribal Transportation Self-Governance Program • FTA Public Transportation on Indian Reservations Program; Tribal Transit Competitive Program (Example: National RTAP Tribal Transit Mini Conference) • FHWA Tribal Transportation Program • Tribal Transportation Program Safety Fund (TTPSF) • Tribal Transportation Facility Bridge Program • Tribal High Priority Projects Program • Nationally Significant Federal Lands and Tribal Projects Program • Public Transportation on Indian Reservations (Tribal Transit) Program • Rural and Tribal Assistance Pilot Program • Hazardous Materials Emergency Preparedness (HMEP) Tribal Grant • Tribal College Initiative Grants Program

	FTA conducted a listening session during the Tribal Transit Symposium in Oklahoma City in May 2023 regarding potential policy changes under the Tribal Transit Competitive Program. FHWA FLH Program administers the Tribal Transportation Program (TTP) to provide stewardship and oversight for direct funding agreements with 135 federally recognized Tribes. TTP is the largest program in FLH, with the stated objective "to contribute to the economic development, self-determination, and employment of Indians and Native Americans." BIL includes set-aside funds for Tribal High Priority projects and authorization for general treasury funds for transportation projects. DOT has incorporated resilience into eligibility criteria for funding opportunities.	• Indian Highway Safety Occupant Protection Grant • Indian Highway Safety Law Enforcement Grants • DERA Tribal and Insular Area Grants To ensure Tribal and rural communities can take advantage of existing resources and funding opportunities, the U.S. DOT is developing a Tribal and Rural Climate Adaptation and Resilience Toolkit. The toolkit will address the challenges tribal and rural communities face with respect to the impacts of extreme weather and climate changes on transportation infrastructure, and provide user-friendly information on how to identify vulnerability, and plan, fund, and implement adaptation and resilience measures.
Co-Benefits of Adaptation	Every DOT OA and Office has reviewed policies and guidance documents to incorporate Administration priorities including climate adaptation and resilience where relevant. Resilience and climate adaptation principles have been considered in all new DOT actions related to climate mitigation. The Department has also amplified efforts to consider climate hazard exposure and vulnerability when evaluating energy efficiency or other mitigation projects through the development and application of the CHER tool.	The 2021 MOU between the U.S. Department of Energy and the U.S. DOT to establish the Joint Office to support the deployment of zero-emission, convenient, accessible, equitable transportation infrastructure. The MOU highlights community resilience and electric vehicle integration as a priority. The 2023 U.S. National Blueprint for Transportation Decarbonization highlights the need for coordinated actions to enhance infrastructure resiliency, while simultaneously improving quality of life, health outcomes, and economic opportunity, particularly in overburdened and historically underserved communities. DOT issued guidance to help states use their existing transportation rights-of-ways to support decarbonization and enhance energy system resilience by leveraging pre-existing sites to host critical infrastructure, such as electric vehicle charging infrastructure, electricity transmission lines and renewable energy systems with lower approval barriers. Additionally, states are utilizing rights-of-way (ROWs) to advance biological sequestration projects, such as rain gardens and native plant installations that ameliorate localized stormwater management.[14]

[14] State DOTs Leveraging Alternative Uses of the Highway Right-of-Way Guidance - Corridor Management - Right-of-Way - Real Estate - FHWA

BIL included new formula programs to reduce GHG emissions from America's transportation network, while also enhancing resilience to increasingly extreme weather and other climate impacts. The BIL provided a legislative definition of resilience[15] and dedicates billions of dollars to transportation resilience programs. DOT is working to ensure the transportation system can withstand the impacts of climate change by providing funding for resilience projects through the FHWA's PROTECT program and by incorporating climate resilience as a consideration in many formula and discretionary grants.

4. Climate-Smart Supply Chains and Procurement

The Department has evaluated the estimated GHG emissions for all of its suppliers based on data the General Services Administration (GSA) provided. Building on this analysis, the Department continues to explore and refine climate hazard risk for critical supplies and services by piloting the novel integration of contract-level information and detailed emission profile data. The Department continues to develop strategies and goals intended to mitigate climate hazard risks.

The procurement of climate-ready services and supplies contributes to sound management of the Department's financial resources along with building and non-building (e.g., ships, vehicles, and radar equipment) infrastructure. To ensure essential services and supplies are delivered to DOT sites across the nation, the Office of the Senior Procurement Executive (OSPE) will work with program managers to ensure climate considerations and sustainability requirements are included throughout the acquisition process, including the Acquisition Strategy Review Board meetings. Also, OSPE will encourage source selection criteria to include life cycle cost-effective adaptation actions. Additionally, OSPE will work to align contractor profitability more tightly with Department goals and employ appropriate contract types (such as investigating use of incentive type contracts).

At Risk Supplies or Services	Actions to Address Hazard(s)	Progress Towards Addressing Hazard(s)
Utilities: The Department is dependent on the continuous supply of utilities (e.g., electricity, water, and natural gas) to ensure its buildings and equipment operate completely to fulfill mission requirements. Power distribution lines located above ground are susceptible to extreme heat, intense storms, flooding, and wind, as well as snow.	Employ alternative emergency power systems to ensure uninterrupted operation of critical equipment. Implement renewable energy projects to provide independent utility sources of energy. Partner with utility providers that incorporate climate-smart principles into their infrastructure and operations.	DOT has identified vulnerable transportation systems from assessments of mission-critical facilities using the CHER tool, which will facilitate prioritization of utility-related resilience projects at current high-risk facilities. DOT continues to pursue new partnerships with utilities and energy services companies to enhance site resilience through conservation measures and other best practices.

[15]A project with the ability to anticipate, prepare for, or adapt to conditions or withstand, respond to, or recover rapidly from disruptions, including the ability— (A)(i) to resist hazards or withstand impacts from weather events and natural disasters; or (ii) to reduce the magnitude or duration of impacts of a disruptive weather event or natural disaster on a project; and (B) to have the absorptive capacity, adaptive capacity, and recoverability to decrease project vulnerability to weather events or other natural disasters. (Section 11103 codified at 23 U.S.C. § 101(a)(24)).

Fleet Vehicles: The Department owns or operates nearly 6,000 automobiles to perform essential equipment maintenance, safety inspections, and enforcement actions. Additionally, the Department maintains a fleet of ships (approximately 50 in the Ready Reserve Fleet) to respond to natural and man-made disasters along with a fleet of airplanes (approximately 10) to provide essential safety training and flight instruction. SLR and flooding can affect vehicle function as well as impeding access and mobility. SLR and storm surge can also damage moorings and ships.	Complete climate assessments of vehicle locations for fleet vehicles that perform critical DOT operations and evaluate changes to siting or siting design as necessary to maintain function in the face of climate hazards. Review mooring plans and identify any changes necessary to accommodate SLR and future storm surge.	DOT has identified vulnerable transportation systems using the CHER tool, which will facilitate prioritization of resilient transportation support at current high-risk facilities.
Engineering/Construction Services: The Department uses engineering and construction service companies to reliably operate and maintain many of its buildings and equipment. Additionally, these companies provide essential operation and maintenance for transportation safety equipment and design services for external infrastructure. Impacts of climate hazard exposure on service company operations may disrupt completion of services for contracts awarded by DOT.	Update contractual language to promote climate-smart design and use of materials. Specify that architects and civil engineers will evaluate materials and design strategies that reduce risks from climate changes.	DOT established the Buy Clean Program that incorporates sustainability and resilience attributes and preferences. Lower carbon materials include those with longer service life that require less maintenance and withstand extreme weather events to reduce repair or replacement requirements and materials with efficient production processes. DOT continues to update design processes that will enhance the climate resiliency of operational infrastructure.
Information Technology Equipment and Services: The Department relies on many vendors and specialists to operate and maintain its network of computers, information databases, data centers, and other transportation safety equipment operating systems. Impacts of climate hazard exposure on service company operations may disrupt completion of services for contracts awarded by DOT.	Ensure backups of critical digital resources are retained in climate-secure and/or cloud-based backup systems.	DOT has identified vulnerable IT systems using the CHER tool, which will facilitate prioritization of IT and communication resilience projects at current high-risk facilities.
Technical/Consulting/Administrative services: Essential procurement, accounting, human resources, strategic planning, research/data analysis, and training services are provided by many vendors to ensure the Department continues to perform mission-critical actions. Providers that have high climate vulnerability or that have not evaluated their climate vulnerability may be susceptible to disruptions of their service.	As information is available, evaluate climate risk disclosures from DOT service providers. Consider climate risk of providers as selection criteria.	Established the DOT Buy Clean Program that incorporates sustainability attributes and preferences into acquisitions. Collaborations with NOAA for climate training. Exploring opportunities related to disclosing climate risks.

In 2022, the Department launched a lower carbon procurement pilot for key products and services to address embodied carbon emissions associated with products used in the construction, operation and maintenance of DOT buildings and facilities. In FY 2024, DOT is transitioning to an overarching sustainable acquisition program that will include lower carbon strategies along with all other sustainability attributes. This program will also focus on climate risks, including decarbonization and Scope 3 GHG emissions, in DOT's supply chain. The new Buy Clean Program will integrate successes and lessons learned from the pilot, but also prioritize the use of multi-attribute sustainable products and services, such as ecolabels; and new solutions for addressing electronic stewardship, lowering carbon emissions, obtaining per- and polyfluoroalkyl substances (PFAS)-free alternatives, and eliminating single use plastics in all new procurements and modifications. More importantly, these actions will drive market innovation and advance the decarbonization of our supply chain thereby making DOT more resilient by ensuring critical products, materials and services are provided during natural and man-made disasters.

The Buy Clean Program will incorporate sustainability attributes and preferences in all new and existing acquisitions to the maximum extent practicable. It will enable DOT to successfully meet the acquisition-related goals and requirements of Executive Order 14057, OMB Memorandum M-22-06, and Implementing Instructions: *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability,* including the achievement of net zero procurement by 2050 at DOT.

DOT is also exploring opportunities to consider GHG emission and mitigation disclosures from government services providers when awarding contracts. The Department will further evaluate impacts of climate hazards on supply chains if federal-wide processes to disclose climate-related financial risks are implemented.

5. Climate Informed Funding to External Parties

To ensure DOT is investing in climate-smart infrastructure, the Department is including consideration of climate resilience in discretionary grant Notices of Funding Opportunities, as appropriate and consistent with existing law. DOT has developed and refined standard language that program managers can incorporate into funding availability notices. Applications for funding should consider climate resilience in the planning stage and in project delivery, such as through incorporating specific design elements that address climate change impacts and including approaches consistent with the FFRMS. Examples include an FTA funding opportunity issued in 2022 to develop standards for exportable power systems from electric and fuel cell-powered buses, which can supply electricity to community buildings, emergency shelters and hospitals during power disruptions. The Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant program, which funds critical freight and passenger transportation infrastructure projects, and the Port Infrastructure Development Program (PIDP), which funds projects to improve the safety, efficiency, or reliability of goods movement through ports, are examples of funding opportunities that incorporate adaptation and resilience evaluation criteria.

PROTECT is DOT's first funding program dedicated exclusively to making surface transportation more resilient to natural hazards, including climate change, sea level rise, flooding, extreme weather events, and other natural disasters. PROTECT deploys $7.3 billion in formula funding to states and $1.4 billion in competitive grants over five years (2022-2026), and

an additional $400 million so far in supplemental appropriations, for over $9 billion in total program investments. The program funds projects for surface transportation resilience to natural hazards including climate change, SLR, flooding, extreme weather events, and other natural disasters through support of planning activities, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure. Under this program, nature-based solutions are an encouraged approach to adapting transportation infrastructure. The first round of PROTECT discretionary awards was announced in April 2024 and another grant cycle is expected to open later in 2024.

The DOT Climate Change Center and DOT Navigator are online resources to help staff and grant applicants find climate change resources and communities understand how to apply for grants, and plan for and deliver transformative infrastructure projects and services. A Climate mitigation, adaptation, and resilience checklist for grant applicants is an example of a resource available on DOT Navigator. The Thriving Communities Program is bringing resources to communities that need technical assistance and other support. The Thriving Communities Program funds organizations ("Capacity Builders") to provide technical assistance, planning, and capacity building support to disadvantaged and under-resourced communities, enabling them to advance transportation projects that support community-driven economic development, health, environment, mobility, and access goals.

DOT also has several formula grant programs that advance the national conservation goal by allowing the Department to support states, tribes, and other applicants' efforts to increase access to Federal lands such as parks, wilderness preserves, and natural areas. First, FHWA's Recreational Trails Program, which is a set-aside of the Transportation Alternatives within Surface Transportation Block Grants, is a formula program that provides States approximately $80 million dollars each year to support access to park and recreation facilities. Also, FHWA's Federal Lands Access Program improves transportation facilities that provide access to, are adjacent to, or are located within Federal lands. The program provides approximately $1.5 billion over the course of the BIL to supplement State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on access to high use recreation sites and economic generators.

Similarly, the FHWA's Federal Land Transportation Program provides approximately $375 million in FY 2022 and $2.2 billion over the course of BIL (FY 2022-2026) in partnership with the Departments of the Interior, Agriculture and the Army Corps of Engineers for projects that support transportation access to our federal lands. These funds support safe, multi-modal access, including roads, trails, and transit, within our treasured Federal lands that, together, support over 980 million visitors annually.

Lastly, FHWA's Nationally Significant Federal Lands and Tribal Projects program provides $55 million in funding each year of the BIL for the construction, reconstruction, and rehabilitation of nationally significant projects within, adjacent to, or accessing Federal and Tribal lands. This program provides an opportunity to address significant access challenges across the nation for transportation facilities that serve Federal natural areas and Tribal nations.

The Department has also established a Climate Change and Transportation Research Initiative to advance the research and technology needed to tackle the Nation's climate and transportation challenges. The initiative will be led by University of California, Davis with several partner institutions and funded at $1.7 million in the first year, subject to renewal for up to five years. The initiative will focus on advancing research and technologies that support the Nation's goals to decarbonize the transportation sector by 2050, strengthen resilience of the Nation's transportation infrastructure, and address adverse environmental impacts created by the transportation system.

3C. Climate Training and Capacity Building for a Climate Informed Workforce

The DOT is working to ensure that all Department staff have the knowledge to make decisions that are grounded in the best-available scientific understanding of climate change risks, impacts, and vulnerabilities. A commitment to improving climate education across the DOT was included as part of the Department's 2021 Climate Action Plan for Resilience and the FY 2022-2026 Strategic Plan. The reinvigorated DOT Climate Change Center began bringing representatives from all OAs and relevant OST offices together in early 2021 to discuss climate-related activities across DOT. The Center serves as a cross-modal resource to implement the BIL with the strongest climate lens possible. Activities have included convening working groups around specific issues such as transportation decarbonization, alternative uses of the transportation ROW, and DOT staff performance plans and climate training. The Climate Center regularly hosts presentations from other Federal agencies, non-profits, and other stakeholders.

In 2023, the DOT Climate Change Center organized a climate training entitled "Climate Change and Transportation 101" that covers the basics of incorporating climate change considerations into the work of the DOT. The three training modules are: 1) Introduction and why climate change matters to transportation; 2) The Science and its Implications (developed by scientists and communications specialists at the NOAA), and 3) DOT Climate Action and What You Can Do. "Climate Change and Transportation 101" was available to all employees as a webinar on Earth Day, 2023 and is maintained as a training opportunity in the DOT Learns platform and the Department intranet. According to data from the DOT Learns platform, the Climate 101 training has been completed by 891 employees in a live session and an additional 245 employees online, or over 10 percent of all DOT staff since 2021. Over 13 percent of staff from the U.S. DOT Volpe Center have taken the course through the DOT learning system, in addition to 0.3 percent of senior leadership. In addition, the recording is posted for viewing on demand by DOT employees.

In celebration of Earth Month in April 2023, DOT's Office of the Assistant Secretary for Administration (M) hosted weekly Lunch-N-Learn (LNL) speaker series showcasing the diverse sustainability activities the Department is engaged in (both internally and externally) to prevent climate change and advance actions to meet the President's ambitious goals in E.O. 14057. The series included a series of six presentations:

- Sustainable Procurement in the Federal Government
- Sustainable Buildings in the Federal Government
- Sustainability at Department of Transportation

- Climate Resiliency in the Federal Government
- Zero Emission Vehicles in the Federal Government
- Active Commuting in the Federal Government

Individual operating administrations are also developing climate training relevant to their specific missions and systems. For example, FHWA has released several training courses focused on resilience to climate change and extreme weather events. Individual courses guide trainees through gathering relevant climate information, vulnerability assessment techniques, adaptation analysis and project decision making, and incorporating resilience into design.

3D. Summary of Major Milestones

Section of the Implementation Plan	Description of Milestone	Climate Risk Addressed	Indicators for Success
3A. Sustainability Orders	DOT will update the energy, buildings, acquisitions, and overarching sustainability orders to incorporate resilience by the end of 2024	Revised orders will provide guidance for how to address risk for climate hazards relevant to the facility	Number of revised Orders issued
3A. CHER tool assessments	DOT will complete resilience assessments for all mission-critical DOT facilities by the end of 2026	The assessments consider the vulnerability of DOT facilities to climate hazard exposure to prioritize actions that reduce risk	Number and percent of mission-critical facilities with completed assessments
3B. OA CAPs	DOT modes will prepare individual CAPs by 2025	The plans will address all climate risks relevant to mission-critical activities	Number of modes with completed plans
3B, 3C. DOT Climate Change Center	Continue the Center as a communication hub for DOT through 2027	All risks	Continued regular meetings and engagement from DOT stakeholders
3B. BTS-Transportation Vulnerability and Resilience Data Program (TVRDP)	BTS will prepare a climate data services and metrics web hub (platform) by 2025	Provide data to support climate risk assessments and decision-making for transportation projects at all levels of government.	Release of climate data services and metrics web hub
3B. Tribal and Rural Resilience Toolkit	Target completion in 2025	Provide data to support climate risk assessments for rural and tribal transportation projects	Release of toolkit materials
3B. RDR Tool	DOT will work to refine the analysis. Target completion in 2025	Provide benefit-cost analysis for resilience investments and disaster recovery.	Broad dissemination of tool after pilot at various State and local agencies
3B. Resilience Coalition white paper on quantitative assessment of resilience infrastructure challenges	Target completion in 2024	Provide barriers/challenges and needs/gaps for Resilience Planning and Implementation	Published white paper
3B. Best-practice guide	Target completion 2027	Provide guidance on reducing the construction materials' carbon footprint	Best-practice guide

Section 4: Demonstrating Progress

4A. Measuring progress

Key Performance Indicator: Climate adaptation and resilience objectives and performance measures are incorporated in agency program planning and budgeting by 2027.

Section of the CAP	Process Metric	DOT Status
3A –Addressing Climate Hazard Impacts and Exposure	Step 1: Agency has an implementation plan for 2024 that connects climate hazard impacts and exposures to discrete actions that must be taken. Step 2: Agency has a list of discrete actions that will be taken through 2027 as part of their implementation plan.	Step 1: Yes, resilience assessments for mission-critical facilities incorporate planned actions to address risks. Step 2: Yes, the DOT AFR incorporates resilience assessments to inform planning and budget decisions.
3B.1 – Accounting for Climate Risk in Decision-making	Agency has an established method of including results of climate hazard risk exposure assessments into planning and decision-making processes.	Yes, DOT and the Department OAs have many established methods of including results of climate hazard risk exposure assessments into planning and decision-making processes that are appropriate to the mode and discipline of focus.
3B.2 –Incorporating Climate Risk Assessment into Budget Planning	Agency has an agency-wide process and/or tools that incorporate climate risk into planning and budget decisions.	Yes, the FY 2023 DOT Agency Financial Report (AFR) includes a summary of DOT's budget and financial risk management processes. Included in the AFR and related to real property and climate risk management, the Department has implemented a multi-step climate resiliency process.
3B.5 – Climate Informed Funding to External Parties	Step 1: By July 2025, the agency will identify grants that can include consideration and/or evaluation of climate risk. Step 2: Agency modernizes all applicable funding announcements/grants to include a requirement for the grantee to consider climate hazard exposures.	Step 1: Yes, DOT has incorporated consideration or evaluation of climate risk into grant opportunities, as appropriate. Step 2: Yes, Grant guidance and standard language was released in December 2023.

Key Performance Indicator: Data management systems and analytical tools are updated to incorporate relevant climate change information by 2027.

Section of the CAP	Process Metric	DOT Status
3A –Addressing Climate Hazard Impacts and Exposure	Agency has identified the information systems that need to incorporate climate change data and information and will incorporate climate change information into those systems by 2027.	Partially. OST-M will update the climate exposure data used in the CHER tool annually to support facility-level resilience assessments for operational assets and personnel. DOT will continue existing partnerships with NOAA, the United States Global Change Research Program (USGCRP), and others on climate services data and tools. BTS TVRDP program will produce a state of practice report and develop a plan for a Transportation Vulnerability and Resilience data and tools sharing web-hub (platform).

Key Performance Indicator: Agency CAPs address multiple climate hazard impacts and other stressors, and demonstrate nature-based solutions, equitable approaches, and mitigation co-benefits to adaptation and resilience objectives.

Section of the CAP	Process Metric	DOT Status
3B.3 –Incorporating Climate Risk into Policy and Programs	By July 2025, 100% of climate adaptation and resilience policies have been reviewed and revised to (as relevant) incorporate nature-based solutions, mitigation co-benefits, and equity principles.	Yes. The Climate Adaptation and Resilience Review will track status. Nature-based solutions Standard Language developed.

Key Performance Indicator: Federal assets and supply chains are evaluated for risk to climate hazards and other stressors through existing protocols and/or the development of new protocols; response protocols for extreme events are updated by 2027.

Section of the CAP	Process Metric	DOT Status
3B.4 – Climate-Smart Supply Chains and Procurement	Step 1: Agency has assessed climate exposure to its top 5 most mission-critical supply chains. Step 2: By July 2026, agency has assessed services and established a plan for addressing/overcoming disruption from climate hazards.	Step 1: DOT is working to assess climate exposure more thoroughly for its top five most mission-critical supply chains, but climate risk disclosure information is not widely available from service providers. Step 2: Actions are planned to assess services but depend on availability of risk disclosure information.
	Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services.	Yes, the Department continues to develop strategies and goals intended to mitigate climate hazard risks. Specifically, in 2022 the Department launched a lower carbon procurement pilot for key products and services to address embodied carbon emissions associated with products used in the construction, operation and maintenance of DOT buildings and facilities.

Key Performance Indicator: By 2027, agency staff are trained in climate adaptation and resilience and related agency protocols and procedures.

Section of the CAP	Process Metric	DOT Status
3C – Climate Training and Capacity Building for a Climate Informed Workforce	Step 1: By December 2024 100% of agency leadership have been briefed on current agency climate adaptation efforts and actions outlined in their 2024 CAP. Step 2: Does the agency have a Climate 101 training for your workforce? If yes, what percent of staff have completed the training? Step 3: By July 2025, 100 % of employees have completed climate 101 training.	Step 1: Yes, Modal leadership briefing on CAP and Climate Adaptation and Resilience Review in Spring 2024. Step 2: Yes. DOT has a Climate 101 training course available on the DOT training platform. Over 10% of DOT staff have completed the training live or online. Step 3: Training is not required for all employees.

4B. Adaptation in Action

DOT has embraced this generational opportunity to address climate change risks to the safety, effectiveness, equity, and sustainability of our transportation infrastructure and the communities it serves. The 2021 CAP identified five priority strategies to bolster adaptive capacity and resilience of the national transportation system, building on decades of DOT leadership. The Department has completed many priority actions and is continuing to make significant progress towards climate action goals, highlighted at the United Nation 28th Conference of the Parties.

Incorporating resilience into grant and loan programs: DOT includes climate resilience as a consideration in many discretionary grants to increase funding for projects that use the best-available climate data and tools to assess climate-related vulnerabilities and risks and develop resilience solutions to address those risks. In addition, the BIL included PROTECT, the first DOT-administered program dedicated to resilience. PROTECT includes funding for evacuation routes, coastal resilience, making existing infrastructure more resilient, or efforts to move infrastructure to nearby locations not continuously impacted by extreme weather and natural disasters. The BIL prioritizes natural infrastructure as a resilience solution, provides a definition of natural infrastructure, and expands opportunities to utilize funding for natural infrastructure within the PROTECT program. This includes projects like tidal wetlands that not only protect our infrastructure from flooding, but often also help reduce carbon emissions through sequestration.

Enhancing resilience throughout the project planning and development process: The new U.S. DOT Project Delivery Center of Excellence (Center) enables the successful implementation of the BIL by accelerating completion of local transportation infrastructure investments. The Center's Project Delivery Toolbox provides resources and best practices for public engagement, environmental impact, civil rights, equity, and other topics critical for successful project planning. The toolbox includes information on DOT Climate and Sustainability priorities. For DOT operations, OAs are incorporating priority adaptation and mitigation strategies into their Capital Asset Plans, new building design standards, and facility operation and maintenance schedules. The Department incorporates natural hazard and climate risk information into federal property management decisions and is making continued investments in climate-smart transportation infrastructure.

DOT is committed to ensuring that programs, policies, guidance, and operations consider climate impacts and incorporate resilience solutions to protect infrastructure from extreme weather. Resilience solutions must also incorporate equity priorities and decarbonization goals. As part of the Biden-Harris Administration's Justice40 Initiative, which establishes the goal that 40 percent of the overall benefits of certain federal investments flow to disadvantaged communities, DOT has committed to advance environmental justice and ensure no one is left behind in the transition to a decarbonized and resilient transportation system. DOT has identified 39 programs that are covered by the Justice40 Initiative.

Ensuring resiliency of DOT facilities and operational assets: DOT developed a climate resilience assessment tool that uses critical system vulnerability data, historical exposure data, and projected exposure to heat and precipitation data from downscaled global climate models to calculate site-specific climate risk scores for Departmental facilities and operational assets. In addition, DOT also developed a vulnerability assessment framework and partnered with more

than 50 pilot project teams across the U.S. to conduct climate change vulnerability assessments and analyze options for improving resilience.

Improving climate education and research on resilience: DOT collaborated with NOAA to develop a "Climate Change and Transportation 101" training, available to all employees as a webinar on Earth Day, 2023. The training is maintained as an opportunity on the DOT Learns platform and the department intranet. The initial content developed with NOAA has served as a template for climate training courses for other agencies. In addition, FHWA's NHI offers many resilience-related courses, including "Addressing Climate Resilience in Highway Project Development and Preliminary Design" for engineering, design, and project development/NEPA staff from state DOTs, local governments, Tribal governments, Federal State agencies, and consultants. The BIL authorizes the creation of new DOT Resilience and Adaptation Centers of Excellence. These Centers will advance research to help make surface transportation infrastructure more resilient to natural disasters and extreme weather.

DOT is also working to improve access to climate research as it relates to transportation. DOT is ensuring continued research in transportation resilience to fill gaps in climate knowledge and use of new technologies. The DOT Climate Change Center and the BTS National Transportation Library maintain the Transportation and Climate Change Clearinghouse, a curated collection of information on transportation and climate change issues that also provides monthly bibliographies of the latest research.[16]

Addressing climate change with our foreign partners: DOT launched a global engagement program, *MOMENTUM*, in which DOT works with foreign partners to share knowledge and best practices focused on seven key areas, including climate change. This program offers toolkits and workshops to our international partners to reduce GHG emissions, mitigate climate change impacts, and build a more resilient transportation system.

This 2024-2027 Climate Adaptation Plan builds on the previous DOT CAPs prepared in 2012, 2014, and the *Climate Action Plan: Revitalizing Efforts to Bolster Adaptation and Increase Resilience* published in 2021. Looking forward, the Department will support continued investments in climate-smart transportation infrastructure and incorporate natural hazard and climate risk information into federal property management decisions, policies, guidance, and operations, prioritizing investments that achieve the quadruple benefit of advancing resilience, supporting adaptation, addressing environmental justice, and strengthening climate mitigation. The CAP will guide the Department to ensure climate adaptation and resilience will be incorporated in grant and loan programs, project planning and development, education and workforce training, research, and additional activities that will help address the climate crisis.

[16] Transportation and Climate Change Clearinghouse

APPENDIX A: RISK ASSESSMENT DATA

The Federal Mapping App uses the following data:

Buildings
Buildings data comes from the publicly available Federal Real Property Profile (FRPP). GSA maintains FRPP data and federal agencies are responsible for submitting detailed asset-level data to GSA on an annual basis. Although FRPP data is limited—for example, not all agencies submit complete asset-level data to GSA, building locations are denoted by a single point and do not represent the entirety of a structure or could represent multiple structures, and properties may be excluded on the basis of national security determinations— it is the best available public dataset for federal real property. Despite these limitations, this data is sufficient for screening-level exposure assessments to provide a sense of potential exposure of federal buildings to climate hazards.

Personnel
Personnel data comes from the Office of Personnel Management's (OPM) non-public dataset of all personnel employed by the federal government that was provided in 2023. The data contains a number of adjustments, including exclusion of military or intelligence agency personnel, aggregation of personnel data to the county level, and suppression of personnel data for duty stations of less than five personnel. Despite these adjustments, this data is still useful for screening-level exposure assessments to provide a sense of key areas of climate hazard exposure for agency personnel.

Climate Hazards
The climate data used in the risk assessment comes from the data in Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool. When agency climate adaptation plans were initiated in 2023, CMRA data included climate data prepared for the Fourth National Climate Assessment. Additional details on this data can be found on the CMRA Assessment Tool Data Sources page. Due to limited data availability, exposure analyses using the Federal Mapping App are largely limited to the contiguous United States (CONUS). Additional information regarding Alaska, Hawai'i, U.S. Territories, and marine environments has been included as available.

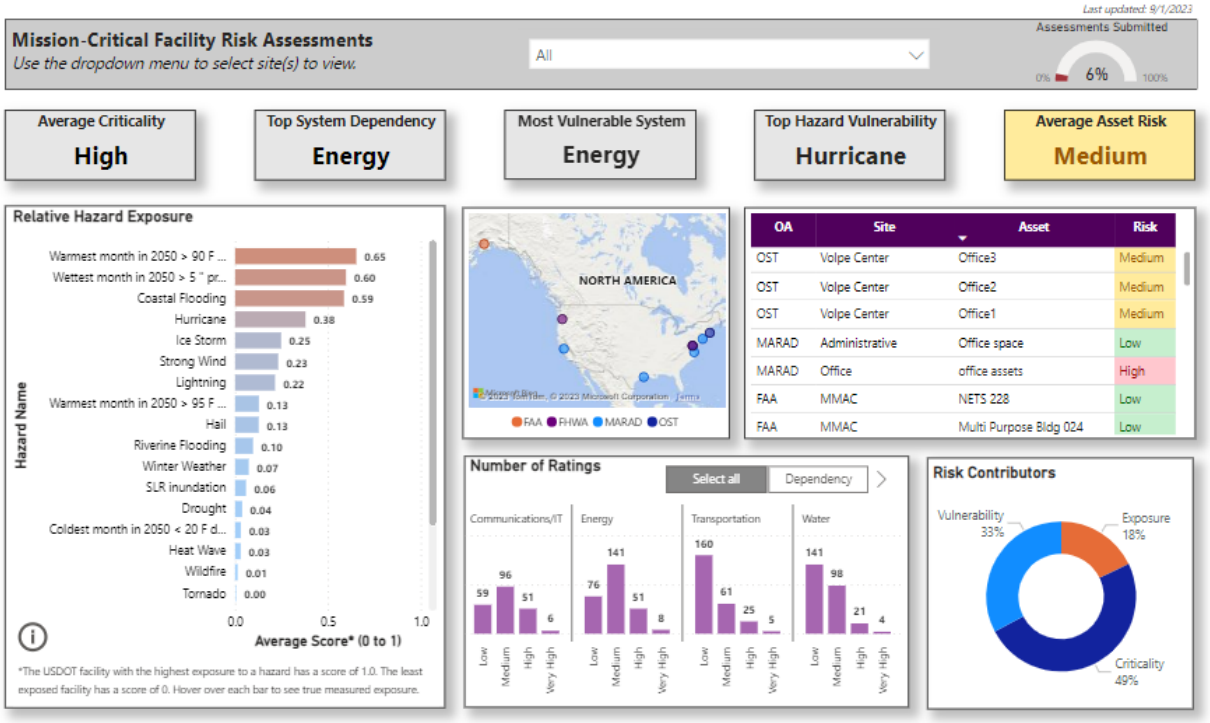
In addition to these data, DOT included climate and natural hazard information from the CHER Tool, which provides location-specific exposure data for climate hazards at mission-critical facilities. The CHER tool sourced historical climate hazard information from the FEMA National Risk Index (NRI)[17] and includes annualized occurrence frequencies of fourteen climate-related hazards: Coastal Flooding, Cold Wave, Drought, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Wildfire, and Winter Weather. An additional eight climate hazards derive from data in the World Climate Research Programme's (WCRP) phase 5 Coupled Model Intercomparison Project (CMIP).[18] The CHER tool uses climate projection data centered on the year 2050[19] and considers temperatures in the

[17] FEMA National Risk Index for Natural Hazards
[18] WCRP (2021). WCRP Coupled Model Intercomparison Project (CMIP). https://www.wcrpclimate.org/wgcm-cmip
[19] https://www.worldclim.org/data/v1.4/cmip5.html

hottest and coldest months, and precipitation in the wettest and driest months. Finally, the tool includes estimates of inundation due to SLR on top of mean higher high water (MHHW) from NOAA.[20]

Snapshot of the Dashboard Demonstrating Results of Vulnerability and Risk Assessments Completed Using the CHER Tool

Summary of U.S. DOT risk assessments submitted by Sep. 1, 2023.



[20] NOAA Method: Mapping Sea Level Rise Inundation