

Guidance for Considering Climate Change-Related Effects in WSDOT Plans and Studies

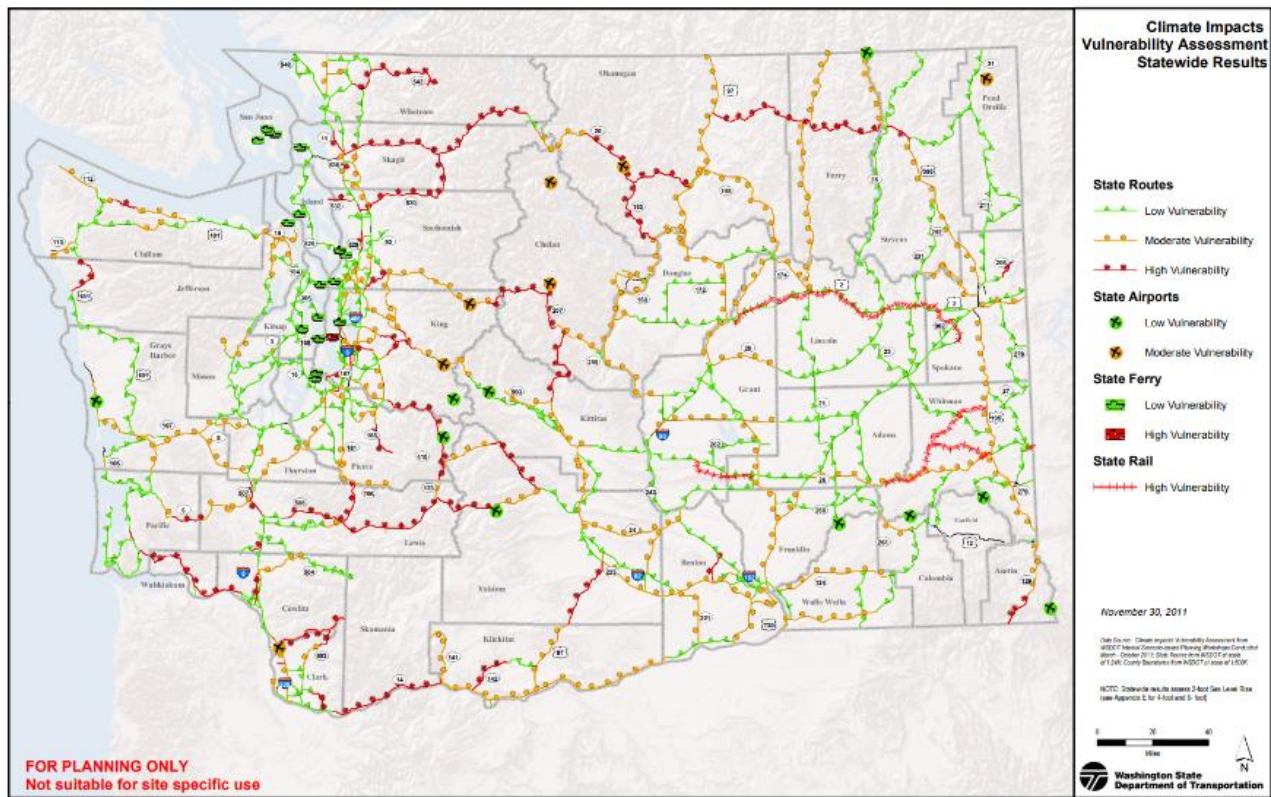


IMAGE: WSDOT's 2011 Climate Impacts Vulnerability Assessment (CIVA)

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Introduction

WSDOT's Environmental Services Office (ESO) developed the first version of this guidance in 2009 to answer the question: ***How should we address greenhouse gas (GHG) emissions and climate change in our transportation system planning process?*** Recent CEQ rulemaking has advanced to include considerations of climate change throughout government agency actions. This guidance is updated to align with recent rulemakings and incorporate considerations of climate change-related effects.

Our focus is on climate change-related effect evaluations when planning for sustainable multimodal transportation systems and incorporating these evaluations during the WSDOT planning process to develop practical long-term decision that result in more resilient outcomes.

There have been several iterations of this guidance over the years. To ensure you are working with the most current version of this document, locate "Guidance for Consideration Climate Change-Related Effects in WSDOT Plans and Studies," on the [Consideration of climate change webpage](#). For WSDOT's project-level guidance for climate change-related effects evaluations, see "Guidance for Project-Level Climate Change-Related Effects Evaluations" located on the [Consideration of climate change webpage](#). For WSDOT's project-level guidance on greenhouse gas evaluations, see "Guidance on Addressing Air Quality, Greenhouse Gas, and Energy for WSDOT Projects", on the [Air quality, energy & greenhouse gas emissions webpage](#).

Who is this guidance intended for?

This guidance is intended to be used by WSDOT modal and region planners for infrastructure owned and operated by WSDOT and multimodal transportation partners, as applicable. The work is intended to be accomplished by WSDOT staff using available data and tools. WSDOT's ESO is available to help planners and planning teams use this guidance and to answer questions about climate impacts.

What plans and studies is this guidance intended for?

This guidance should be used for plans and studies that are entirely controlled by WSDOT. For plans and studies that we partner or comment on, such as local plans or regional plans, we recommend WSDOT planners share this information on potential climate threats and ways to address climate resilience. This guidance is also intended for planning and environmental linkages (PEL) studies. PEL studies that need more robust climate analysis may find the "Guidance for Project-Level Climate Change-Related Effects Evaluations" useful. This is located on the [Consideration of climate change webpage](#). Please contact the [Climate Mitigation and Adaptation Branch](#) to determine which guidance is best for your PEL study.

What is the primary source for climate science that WSDOT uses?

WSDOT utilizes the best available climate science from University of Washington's Climate Impacts Group (UWCIG). WSDOT's ESO and HQ Hydraulics office staff maintain close ties with

University of Washington researchers to track actionable climate science and information on emerging resilient asset management techniques.

Analysis starts with WSDOT's Climate Impacts Vulnerability Assessment

WSDOT's Climate Impacts Vulnerability Assessment (CIVA) is a qualitative assessment of risks to the state's transportation infrastructure from climate change. In 2010 and 2011, WSDOT collected an inventory of department-owned and managed assets and climate change data using Geographic Information Systems. UW climate scientists provided us with climate data.

Key points about the CIVA:

- WSDOT leveraged its risk management experience to develop an appropriate risk assessment method for the climate change analysis.
- 14 workshops engaged experts across all regions, state ferries, rail, and aviation.
- Each workshop resulted in a qualitative assessment of the vulnerability agreed upon by workshop participants.

The CIVA maps, like the one on the cover, show climate vulnerability ratings for assets, and denote their severity by color.

- Red = a high likelihood of vulnerability.
- Yellow = could experience temporary operational failures at one or more locations.
- Green = could experience reduced capacity somewhere along the roadway segment, or asset.

Please note that the accuracy of the vulnerability ratings are *generally* suitable for planning purposes. Roadway segments shown as having a high climate change vulnerability rating (shown in red) may not be vulnerable the entire length of segment, rather one or two locations along the segment may be vulnerable to failure.

High vulnerability areas are typically located:

- In the mountains
- Either above or below steep slopes
- In low-lying areas subject to flooding
- Along rivers that are aggrading¹ due to glaciers melting
- In low-lying coastal areas subject to inundation from sea-level rise

Planners, asset managers and project teams should consider the climate vulnerability ratings in addition to examining both current and future conditions and other identified risks (such as unstable slopes, seismic, fires, and tsunamis).

¹ Aggrading refers to the raising of a stream or river bed due to sediment deposition. Glacial recession can cause aggradation below a glacier by exposing unstable sediments to erosion by rain or other factors. Sourced from: University of Washington Climate impacts Group, How will Climate Change Affect Infrastructure in Washington. 2020.

Where are the CIVA results located?

Internal to WSDOT:

- WSDOT GIS data layer is available on the GIS Workbench under the Environmental Business Area.
- For original CIVA data documents, contact Jonathan Olds, Climate Mitigation and Adaptation Branch Manager.

External:

- The final report containing methods and results is posted on WSDOT's "Climate resilience" website <https://wsdot.wa.gov/construction-planning/protecting-environment/climate-change-transportation/climate-resilience>.
- The GIS layer is available on the WSDOT's Community Planning Portal for external stakeholder use: <http://www.wsdot.wa.gov/planning/community/CommunityPlanningPortal.htm>.
- The GIS data are available for public download from the WSDOT Geospatial Open Data website. A search for "CIVA" should return CIVA datasets for State Highway, Rail, Ferry Terminal, Airport, and WSDOT Facility.

What other programs are considering climate or extreme weather risks?

WSDOT is committed to the consideration of climate change as part of the long-term management of state transportation assets. Climate and extreme weather preparedness are considered in all program areas, as illustrated in the table below.

Table 1: Consideration of Climate Change and Extreme Weather by Program Area

Program Area	How are climate change and extreme weather considered?
Planning	Major emphasis in WSDOT's strategic plan: Consider climate change and propose ways to improve resilience in planning documents. Project teams follow WSDOT's Environmental Guidance for Planning Studies website.
Design & Environmental Review	Evaluate potential climate change-related risks during the environmental and design phase, and design projects to accommodate anticipated future changes. Project teams follow WSDOT's Environmental Guidance .
Construction/ Implementation	Look at potential for new issues: Saltwater corrosion, heat or precipitation changes for long-term impacts on materials.
Maintenance & Operations	Multi-hazard risk reduction, awareness of maintenance activities that may be affected by climate change-related effects, such as heat or extreme weather events.

How should WSDOT’s plans consider future conditions related to climate change?

Planning teams are expected to examine the CIVA results for the study area as well as other readily available climate change data resources noted in the Resource section of this guidance. By doing so, planners can understand the potential risks and consider how to make proposed strategies more resilient to future climate impacts and severe storm events.

The following table was created with the assistance of the UW Climate Impacts Group to illustrate some potential impacts of particular concern to transportation infrastructure.

Table 2: Potential Climate Change Impacts in Washington

Projected Climate Change	Potential Impacts on Certain State-Owned Facilities (Highways, Rail, Airports, and Ferries)
<ul style="list-style-type: none"> • Increase in average winter precipitation and more extreme precipitation • Change in timing of precipitation (more rain, less snow) • Change in storm track with some extreme storms with higher than normal snow accumulation 	<ul style="list-style-type: none"> • More rock fall, mudslides, sink holes, road bed failure • Increased large-scale river flooding (bridge scour, roadway erosion, inundation) • More localized flooding due to poor drainage or higher groundwater table • Severe wind-related road closures • Blown-down trees, signs • Less snow removal, on average (some extreme snows)
<ul style="list-style-type: none"> • Sea-level rise, higher storm surge • More frequent and extensive inundation of low-lying areas (both temporary and permanent) 	<ul style="list-style-type: none"> • Coastal erosion and landslides weaken roadbed and bridge footings • Damage to stormwater drainage and tide gates • Saltwater corrosion of facilities • Detours around frequently flooded coastlines
<ul style="list-style-type: none"> • Higher average temperatures • Increase in extreme heat events (heat waves) • Drought and low stream and ground water flow 	<ul style="list-style-type: none"> • Wildfire or extreme fire risk • Adverse impacts on road and rail tracks (buckling) • Loss of roadside vegetation (leading to erosion and landslides) • Wetland site failure

It is very important that planners and technical experts understand that climate science changes how the environmental context is described. No longer can we look only at past climate and weather conditions – we must also examine the future climate forecast.

How is WSDOT incorporating climate into various stages of planning?

WSDOT is engaged in many different types of planning.

Some of the key plans and studies that should apply this guidance are:

- Region Planning Studies
- PEL Studies

- Statewide Policy Plans (such as Washington Transportation Plan)
- Asset Management Plans
- State-interest Modal Plans (Freight Mobility; Public Transportation; Aviation; Rail; Active Transportation)
- State-owned Modal Plans (Highway System; Ferry System)
- Other Highway Corridor or Network Plans (more detail below)

For all WSDOT plans and studies, teams are expected to ask and answer the question, “how will my plan be affected by climate change?”

Follow these steps for all plans and studies listed above:

1. Examine the results of WSDOT’s 2011 Climate Impacts Vulnerability Assessment (CIVA) for the project area. CIVA results are on the GIS workbench and Corridor Sketch database (see page 3 – where to find CIVA results). Continue to remaining steps if CIVA results do not apply.
2. Contact WSDOT’s ESO for guidance on how to tailor this information for a specific planning area or mode.
3. Consult the Concurrence Process memo at: Concurrence Memo (wa.gov). In addition to the memo see the steps outlined in Appendix B: Planning Study Flowchart at the end of the memo.
4. Consult the Planning study guidance | WSDOT (wa.gov) web page and refer to the “Environmental guidance for planning studies” link.
5. Collaborate with planning partners. Many local, state, federal, and tribal governments have their own climate vulnerability assessments and plans for improving resilience. Planners should look for ways to leverage existing strengths, such as emergency plans and natural hazard reduction plans (including flood protection efforts) with long term transportation strategies. Local comprehensive plans are being updated now with climate elements. Planners should determine whether there is regional or site-specific climate information that would be useful or applicable to their analysis.
6. Develop planning-level strategies that integrate resilience. Given the scope of the plan, and the information collected about any anticipated climate threats, document findings. Consider the following:
 - Whether or not climate change will adversely impact current or future multimodal transportation infrastructure;
 - Whether the planning partners have adequately considered transportation assets in the local or regional long-term natural hazard reduction plans; and
 - Whether or not climate change will impact transportation services to vulnerable or underserved populations.

7. Document the potential risks associated with extreme weather, and how the plan will promote climate resilience.

For Area, Network, and Corridor – Planning Studies and Related Efforts:

Follow the step-by-step guidance above. In addition, planning studies are expected to complete the following:

1. Create a short section containing a “Climate Change Assessment Summary.” This section should document CIVA data for the study extents. Summarize regional, Tribal, or local climate information if available.
2. Consider ways to address climate resilience in recommendations. Include discussion about resilience in study recommendations.
3. Coordinate with the M2 Team (multimodal, multidisciplinary) HQ subject matter experts for technical assistance; and for review and input on draft and final recommendations. Examine the results of WSDOT’s CIVA for the corridor. These are noted on Page 2 of the summary; however, the details are not listed. The details are available internally on GIS and intranet page (see page 3).
4. Identify ways to reduce long-term hazards from extreme weather and gradual changes in sea-rise, flood patters, etc. as you are developing strategies for performance gaps.
5. Review risks and resilience in a region’s multimodal, multi-discipline, multi-agency (M3) teams2, and document results.

Resources

Climate projections for the Pacific Northwest are available from the Climate Impacts Group (CIG) at the University of Washington (UW):

<http://cses.washington.edu/cig/fpt/ccscenarios.shtml>. When using models and visualization tools, you will need to pick a greenhouse gas scenario. WSDOT uses the “HIGH (RCP 8.5)” not the less likely “LOW (RCP 4.5). Sea level rise visualization tools are readily available. As of 2025, we recommend using [UW CIG’s Interactive Sea Level Rise Data Visualizations](#) web tool.

Additional links:

- Transportation Planning to the Extreme for Weather and Climate Change – <https://www.nationalacademies.org/trb/blog/extreme-weather>
- National Academies of Sciences, Engineering, and Medicine. 2024. Addressing Climate Resilience and Greenhouse Gases in the Transportation Planning Process. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27797>.
- [Climate Change Impacts and Adaptation in Washington State \(state of knowledge\)](#)

- [Georgetown Climate Center—Helping Communities Adapt to Climate Change](#)
- [National Fire Protection Association’s Firewise Communities](#)

For a list and description of tools and resources, see the Climate Change Related Effects Tools and Resources Matrix (Excel 42MB) on the [Consideration of Climate Change webpage](#). Contact the [Climate Mitigation and Adaptation Branch](#) for more information.

What state policy or directives support this guidance?

The vision of WSDOT’s Strategic Plan is to provide a safe, sustainable, and integrated multimodal transportation system. Sustainability is one of our agency’s core values. Climate consideration is part of our asset management approach as well as part of our implementation of practical solutions. The following strategic directives support our role in building a resilient transportation network for the future.

WSDOT’s Strategic Plan provides the vision, mission and values that guide the work of the agency. The important work of the agency is focused in three key areas: Diversity-Equity-Inclusion, Workforce Development, and Resilience.

Resilience means to: *Plan and/or invest resources to improve our ability to mitigate, prepare for, and respond to emergencies; combat climate change; and build a transportation system that provides equitable services, improves multimodal access, and supports Washington’s long-term resilience.*

There are two parts to WSDOT’s Resilience Goal.

Part 1: Improve resilience of the transportation system

Seismic Resilience – prioritize and strengthen the elements of the transportation system most critical to emergency response after a seismic event, such as an earthquake or tsunami.

Asset Management – build resilience and reduce vulnerabilities while proactively managing the preservation and maintenance of WSDOT’s assets necessary to achieve and sustain a state of good repair.

Climate and Natural Hazard Resilience – prioritize actions that reduce risk and build climate preparedness.

Operational Resilience – support and enhance security for all WSDOT staff and properties and improve WSDOT’s Emergency Preparedness for response and recovery from natural and manmade incidents (including cyber).

Part 2: Lead in the development of transportation that combats climate change and enhances healthy communities for all

WSDOT Agency Greenhouse Gas Emissions Reduction Strategy – Lead by example by reducing agency GHG emissions.

Transportation Sector Greenhouse Gas Emissions Reduction Strategy – Reduce transportation sector GHG emissions by promoting and investing in efficient, equitable and healthy transportation choices.

Washington’s Integrated Climate Response Strategy

WSDOT and other state agencies updated the state's [Climate Resilience Strategy](#) as directed by the Legislature under the [Integrated Climate Change Response Strategy \(Chapter 70A.05 RCW\)](#). The updated plan drives state action to lessen the impacts of climate change on the people of Washington — especially those most vulnerable and facing systemic inequities.