WSDOT Guidance - Project-Level Greenhouse Gas Evaluations under NEPA and SEPA

Washington State Department of Transportation

Environmental Services
February 2018

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Introduction

The guidance outlines a standard analytical process and template for addressing greenhouse gas (GHG) emissions in environmental documentation. The guidance has evolved over time, but was first introduced in 2009 by WSDOT's Environmental Services Office to answer the question: *How should we address greenhouse gas emissions and climate change in our environmental documents?* Related questions are typically asked during public involvement in the National and State Environmental Policy Acts (NEPA and SEPA). WSDOT is the SEPA lead agency for our proposed actions and the project proponent and/or joint NEPA lead with federal transportation agencies.

While the results of project-level analysis of GHG are often discussed alongside assessments of future climate impacts, these subjects have very different methods of analysis. WSDOT's guidance for NEPA/SEPA is separated into companion documents

1. This guidance for Project-level GHG Emissions
2. Guidance for NEPA/SEPA Project-level Climate Change Evaluations

Both are available on WSDOT's Addressing Climate Change webpage.

All WSDOT projects subject to NEPA and SEPA are required to follow this guidance. We recommend local agency projects processed by the Highways and Local Programs Division of WSDOT also be required to follow this guidance. Technical support is available to help determine the appropriate level of analysis and to prepare documentation at the project-level.

For help applying this guidance, contact WSDOT Environmental Services staff**:**

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Guidance

This guidance reflects the direction of WSDOT's Air, Noise, and Energy (ANE) Program. The ANE Program provides technical support to tailor the level of effort to decisions at the project-level. Users are encouraged to work with the agency's Air Quality and Energy Policy Specialist and ANE staff directly because direction may change with evolving tools, legislation, and scientific understanding. For example, WSDOT added EPA's MOVES model when that became available. This guidance is consistent with the technical and policy guidance contained in chapters 425 (air) and 440 (energy) of the WSDOT *Environmental Manual* (EM).

WSDOT guidance is based on the following:

- Project potential for substantial GHG emissions
- Data typically available at different levels of documentation
- Likelihood of generating information that will be useful in decision making

WSDOT believes GHG emissions are an issue of global concern and should be treated as cumulative effects. The tiered approach helps us focus evaluations on projects with the greatest potential GHG emissions. Our approach is to disclose information as a contribution to cumulative effects.

How was WSDOT's guidance developed?

WSDOT's guidance for project-level GHG analysis was developed through collaboration with internal and external experts (including USDOT, EPA, Departments of Ecology and Commerce, Puget Sound Regional Council, and clean air agencies), evaluation of other agency approaches, and assessment of the tools available for calculating GHG emissions. Tools were evaluated for ease of use, availability of required data, level of effort, and usefulness of results.

Where does WSDOT's guidance apply?

All WSDOT projects subject to NEPA and SEPA are required to follow this guidance.

What is included in WSDOT's guidance?

WSDOT's guidance outlines a standard analytical process and provides template language with key agency messages. It is consistent with technical and policy guidance in WSDOT's *Environmental Manual* chapters 412 (cumulative effects), 425 (air), and 440 (energy). WSDOT Environmental Services will help project teams use the guidance and answer questions about GHG emissions for analysis of our proposed actions under NEPA and SEPA.

What types of emissions are analyzed?

WSDOT evaluates the following types of GHG emissions:

- Operational – "tailpipe" emissions from vehicles using project roadways and "upstream" emissions from the "fuel cycle," i.e. emissions released through extraction, refining, and transportation of fuels used by vehicles traveling in the project area.
- Construction – primarily from fuel used to build project, but also emissions from traffic delays due to project construction and materials used.

- Maintenance – emissions from routine maintenance activities.

Operational emissions – GHG emissions from vehicles using project roadways and from the "fuel cycle." Approximately 72% of transportation emissions are from on-road transport, including both passenger and freight travel.[1] Vehicle emissions depend on assumptions about fuels, fuel efficiency, speeds, distances, and volumes. "Fuel cycle" emissions account for the emissions released during fuel extraction, refining, and transport.

Construction emissions – GHG emissions from fuel burned in the equipment used to build a project, such as bulldozers, pavers, and rollers. Construction emissions also come from increased traffic congestion caused by construction activities.

Routine Maintenance – GHG emissions from fuel combusted in maintenance equipment.

What analysis is required?

WSDOT tailors the level of analysis to the level of the environmental document (see Table 1).

Table 1: GHG emissions analysis based on NEPA or SEPA classification

Type of Emission	NEPA and SEPA CE	DCE/SEPA Checklist	EA	EIS
Operational	No evaluation	Qualitative	Quantitative*	Quantitative*
Construction	No evaluation	Qualitative	Quantitative*	Quantitative*
Maintenance	No evaluation	Qualitative	Quantitative*	Quantitative*

*If the project is included in a planning study that underwent a quantitative GHG emissions analysis, a qualitative analysis may be sufficient.

NEPA CE – Recommend no analysis of emissions for most NEPA CEs.

- Why? Most CE-level projects have little or no effect on GHG emissions. Many are maintenance operations that are captured in WSDOT's annual greenhouse gas emissions inventory.

NEPA Documented CE or SEPA Checklist – We recommend a brief (one or two sentence) qualitative analysis of operational, construction, and maintenance emissions. Template language is included in Appendix A. Project teams can include the qualitative discussion in public materials.

- Why? Most of these projects have a small potential to change GHG emissions.

[1] AASHTO, Primer on Transportation and Climate Change, 2008. http://downloads.transportation.org/ClimateChange.pdf

NEPA EA – WSDOT requires a quantitative analysis of operational, construction, and maintenance emissions for NEPA EA documents. The quantitative analysis may be conducted at the planning level and referenced in the NEPA documentation. If no planning-level analysis is available, the analysis must be conducted at the project-level. A project-level analysis should use the most current version of the EPA Motor Vehicle Emission Simulator (MOVES)[2] model for operational emissions. Fuel cycle emissions are calculated using the FHWA fuel cycle factor (0.27). Project-level construction and maintenance emissions should be calculated using FHWA's Infrastructure Carbon Estimator (ICE)[3] tool. The quantitative analysis must be included in the Air Quality Discipline Report. If detailed traffic data is not available, discuss other options with the Senior Policy Specialist for Air Quality and Energy or ANE program staff.

The Cumulative Effects section of the body of the EA should include two specific items:

1. Summary of results of the quantitative analysis.
2. Standard text provided in Appendix B.

- Why? EA-level projects usually have sufficient traffic data available for an operational emissions analysis. FHWA's ICE tool provides a simple method for estimating construction and maintenance emissions.

NEPA and SEPA EIS – WSDOT requires a quantitative analysis of operational, construction, and maintenance GHG emissions for SEPA and NEPA EIS documents. The quantitative analysis may be conducted at the planning level and referenced in the EIS or the analysis may be conducted at the project-level. An analysis should use the most current version of the EPA Motor Vehicle Emission Simulator (MOVES)[4] model for operational emissions. Fuel cycle emissions are calculated using the FHWA fuel cycle factor (0.27). Project-level construction and maintenance emissions and energy should be calculated using FHWA's Infrastructure Carbon Estimator (ICE)[5] tool. The quantitative analysis needs to be included in the Energy Discipline Report. If detailed traffic data is not available, discuss other options with the Senior Policy Specialist for Air Quality and Energy or ANE program staff.

The Cumulative Effects section of the body of the EIS should include two specific items:

1. Summary of results of the quantitative analysis.
2. Standard text provided in Appendix B.

- Why? EIS-level projects typically have a high level of public interest and multiple alternatives with detailed traffic data available. FHWA's ICE tool provides a simple method for estimating construction and maintenance emissions.

[2] http://www.epa.gov/otaq/models/moves/index.htm
[3] https://www.fhwa.dot.gov/environment/climate_change/mitigation/tools/carbon_estimator/index.cfm
[4] http://www.epa.gov/otaq/models/moves/index.htm
[5] https://www.fhwa.dot.gov/environment/climate_change/mitigation/tools/carbon_estimator/index.cfm

Appendix A: Example Language for use in WSDOT documents

This appendix contains example text. It is organized from the earliest type of environmental documentation from a SEPA Checklist and NEPA DCE to the larger and more complex publications prepared to satisfy NEPA and SEPA.

SEPA Checklist, NEPA DCE

- No change in traffic –

  "Because the project will not change traffic, operational greenhouse gas emissions are not expected to change. Construction greenhouse gas emissions will result primarily from fuel used in construction equipment."

- Expected to improve traffic flow/reduce congestion –

  "The project is expected to improve traffic flow, which should reduce operational greenhouse gas emissions. Construction greenhouse gas emissions will result primarily from fuel used in construction equipment."

- Expected to add traffic to roadway –

  "The project is expected increase traffic flow [describe in one sentence how; for example, adding lane]. This may result in a small increase in operational greenhouse gas emissions. However, the data needed to quantitatively evaluate greenhouse gas emissions for this project are not available. Construction greenhouse gas emissions will result primarily from fuel used in construction equipment."

  Please consult the Senior Policy Specialist for Air Quality and Energy or the staff from the WSDOT, Air, Noise, and Energy Program for more information when a project is increasing traffic.

WSDOT Recommended Standard Language for EA/EIS Discussion

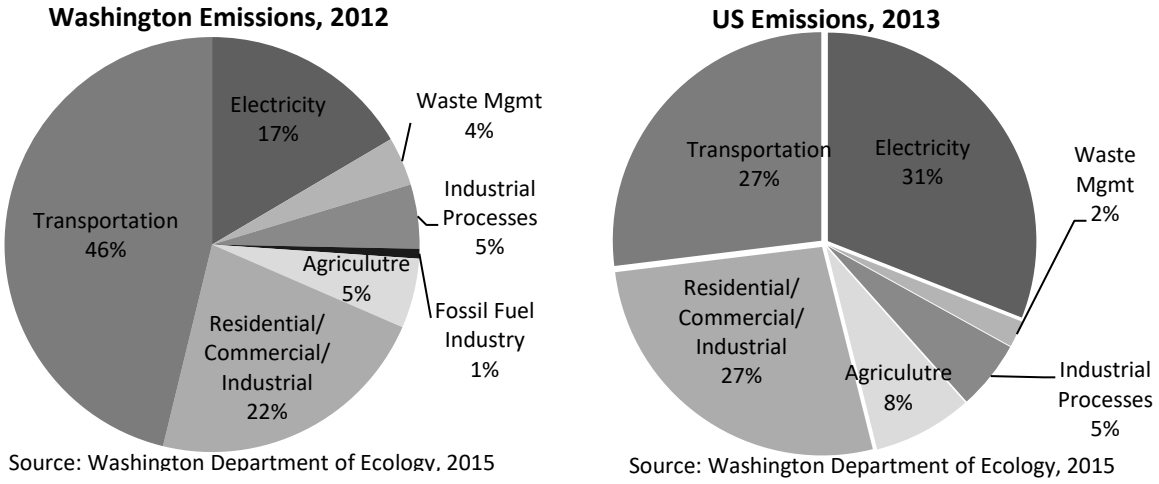
The standard qualitative language in Appendix B is required for the Cumulative Effects section of EA and EIS documents. This text can be pared down and should be tailored to your specific project. However, it is very important that project teams work with the Senior Policy Specialist for Air Quality and Energy or staff from the WSDOT, Air, Noise, and Energy Program to tailor language prior to finalizing.

In addition to the standard language, if a project-level analysis was conducted, the results need to be presented in the EA or EIS document.

Vehicles emit a variety of gases during their operation; some of these are greenhouse gases (GHGs). The GHGs associated with transportation are carbon dioxide (CO_2), methane, and nitrous oxide. Any process that burns fossil fuel releases CO_2 into the air. Carbon dioxide makes up the bulk of the emissions from transportation.

Vehicles are a significant source of greenhouse gas emissions and contribute to global warming primarily through the burning of gasoline and diesel fuels. National estimates show that the transportation sector (including on-road vehicles, construction activities, airplanes, and boats) accounts for about 27 percent of total domestic CO_2 emissions. However, in Washington State, transportation accounts for nearly half of GHG emissions because the state relies heavily on hydropower for electricity generation, unlike other states that rely on fossil fuels such as coal, petroleum, and natural gas to generate electricity. The next largest contributors to total GHG emissions in Washington are fossil fuel combustion in the residential, commercial, and industrial sectors at 22 percent and electricity consumption at 17 percent. Figure 1 shows the gross GHG emissions by sector, for Washington State and nationally.

Figure 1. GHG Emissions by Sector, Washington State (2012) and National (2013)[6]



Source: Washington Department of Ecology, 2015

Source: Washington Department of Ecology, 2015

What efforts are underway to reduce greenhouse gas emissions in Washington State?

Project teams should refer to the WSDOT Sustainable Transportation website for up-to-date information about state efforts and WSDOT-specific initiatives.
http://www.wsdot.wa.gov/SustainableTransportation

[6] Please contact the WSDOT Senior Policy Specialist – Air Quality and Energy or the Air, Noise, Energy staff for editable versions of these graphs.

What is WSDOT's Approach to Climate Change at the Project-Level?

In our work to date, we have found that the GHG emissions from a single project action are usually very small, (and often less than without the project). However, overall, users of the transportation system contribute close to half of the state's GHG emissions (see Figure 1). WSDOT believes that transportation GHG emissions are better addressed at the region, state, and transportation systems level where multiple projects can be analyzed in aggregate. We recognize that most current plans at these broader levels do not yet provide the emissions analysis that would put our proposed transportation improvements in a larger context. We also recognize the public's interest in these issues and the need to disclose GHG emissions at the project level for major public projects. Essentially, project-specific analysis can be done now, and WSDOT will reference planning level information when it becomes available.

How will transportation improvements from the project have on GHG emissions?

The state and federal investments in transportation projects are made to improve current conditions of the multi-modal transportation network. The proposed type: ferry, highway, rail, transit, multi-modal project contains several features that will improve – *or not increase* – GHG. In general, project-level actions that can help reduce greenhouse gas emissions include:

- Reducing stop and go conditions
- Improving roadway speeds to a moderate level
- Improving intersection traffic flow to reduce idling
- Creating more safe and efficient freight movement
- Expanding transit and non-motorized options for travelers
- Increasing vegetation density over pre-project conditions to sequester carbon

Note: a quantitative analysis is required at the EA- and EIS-levels of documentation. Please contact Air, Noise, and Energy Program staff for more details about the methodology and appropriate language for preceding paragraph in EA- and EIS-level documents.

Example Project Description paragraph:

Traffic improvements proposed by this project will create smoother driving conditions. More specifically, widening and intersection improvements proposed on the project will minimize stop and go conditions thereby conserving fuel. It will also promote more efficient energy consumption by moderating speeds. This proposed project will enable better movement of vehicles in (insert air quality horizon year) for project area intersections and on the mainline, thereby reducing traffic congestion and collisions. Decreased vehicle delay at off and on ramps further reduces collisions and promotes more efficient driving. (Include quantitative results)

Will the project construction contribute to GHG emissions?

Construction of the project is currently planned to last number of year years from 20xx to 20xx. Project construction and production of materials used in the Project Name project will release greenhouse gases. These emissions are estimated to be about Emissions Quantity metric tons.

Likewise, maintenance activities and materials over the life of the project will produce GHG emissions. These emissions are estimated to be about Emissions Quantity metric tons.

How will this project minimize emissions while under construction?

The project traffic plan includes detours and strategic construction timing (like night work) to continue moving traffic through the area and reduce backups to the traveling public to the extent possible. WSDOT will seek to set up active construction areas, staging areas, and material transfer sites in a way that reduces standing wait times for equipment. WSDOT will work with our partners to promote ridesharing and other commute trip reduction efforts for employees working on the project.

Appendix C: GHG Quantitative Methods

Quantitative Analysis for EA and EIS Documents

WSDOT requires a quantitative analysis of operational, construction, and maintenance GHG Emissions for EA- and EIS-level documents. Projects at these levels typically have the detailed traffic data required for quantitative operational GHG emissions analysis with MOVES. Fuel cycle emissions are easily calculated using the FHWA-provided factor (0.27). FHWA's new Infrastructure Carbon Estimator (ICE) tool has greatly simplified calculations of construction and maintenance emissions. All EA and EIS projects should have sufficient information available to complete these analyses.

Example project: SR 520, I-5 to Medina Bridge Replacement and HOV Supplemental Draft Environmental Impact Statement (SDEIS) June 2010. (Note: this project was analyzed prior to the availability of the ICE tool.)

Operational GHG Emissions

Operational GHG emissions from highway projects depend on several factors: primarily, distance traveled (VMT) and fuel economy. Total VMT in a project area is determined by both the project and the project's relationship to the surrounding transportation network. Fuel economy varies with speed and vehicle type.

Periods of peak traffic volumes should be identified and modeled to reflect the most congested periods when fuel-efficiency is lowest (i.e., "worst-case" scenario). Modeling is done with the EPA MOVES model to develop emission rates based on the vehicle type and modeled speed. Emission rates are then applied to the traffic volumes to calculate the total GHG emissions produced during average weekday peak periods.

Quantify GHG emissions from vehicle operations on the facility and, depending on the project, on nearby facilities that are directly affected by the project using the most current version of the EPA MOVES model.

Please contact the Senior Policy Specialist for Air Quality and Energy ESO Policy Branch for information about the most recent modeling inputs.

Fuel Cycle Emissions

All WSDOT projects need to include a calculation of fuel cycle emissions, which are the emissions from fuel extraction, refining, and transportation to end user. These emissions are reported as a component of operational emissions because they are directly proportional to the amount of fuel used. FHWA has determined that emissions from the fuel cycle are about 27 percent of the emissions from combusting the fuel.

Calculate fuel cycle emissions by multiplying the operational emissions by the fuel cycle factor of 0.27.

Construction and Maintenance GHG Emissions

Construction emissions come from the fuel used on-site to power construction equipment as well as the emissions released in the production of materials. Traffic delays occurring due to construction are another source of construction emissions. Maintenance emissions come from similar sources, but occur over the project's lifespan.

FHWA's new Infrastructure Carbon Estimator (ICE) [7] spreadsheet tool incorporates project features and construction traffic delays to calculate emissions from construction equipment, materials, and routine maintenance. This tool should be used to quantify construction and maintenance emissions for all projects at the EA and EIS level. The tool can be used at both the planning and project levels.

Planning Level Analysis

A planning level analysis is the preferred level of operational emissions analysis for transportation projects because analyses at this 'higher' level account for the interconnections between projects and the existing road network.

WSDOT makes the following recommendations for project-level analyses:

- Compare emissions from the Build and No Build networks.
    - The Build network should include all projects and programs in the plan.
    - The No Build network should include only those projects and programs that will be completed if the plan is not implemented. For example, projects currently under construction that will be completed by the plan's design year.
- Include both direct tailpipe emissions and fuel-cycle emissions (which are directly related to tailpipe emissions) using EPA's MOVES model and the FHWA fuel cycle factor (0.27).
- Calculate construction emission for new project and reconstruction projects using FHWA's ICE tool.
- Calculate maintenance emissions for both new and existing infrastructure, also using FHWA's ICE tool.

WSDOT looks forward to working with our partners to evaluate GHG emissions at the plan level. Please contact the Senior Policy Specialist for Air Quality and Energy for more information.

[7] https://www.fhwa.dot.gov/environment/climate_change/mitigation/tools/carbon_estimator/index.cfm