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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.

Our primary funding partners, the Federal Highway Administration and Federal Transit Administration, have not issued formal direction or compiled best practices for addressing project-level GHG emissions. However, WSDOT guidance is consistent with draft guidance from the White House Council on Environmental Quality (CEQ) for analyzing project level GHG emissions and considering future climate change impacts.

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
   [http://www.wsdot.wa.gov/Environment/Air/Energy.htm](http://www.wsdot.wa.gov/Environment/Air/Energy.htm); and
2. Guidance for NEPA/SEPA Project-level Climate Change Evaluations
   [http://www.wsdot.wa.gov/SustainableTransportation/adapting.htm](http://www.wsdot.wa.gov/SustainableTransportation/adapting.htm)

All WSDOT projects subject to NEPA and SEPA are required to follow this guidance. The use of this guidance is recommended, but not mandatory, for federally funded local agency projects processed by the Highways and Local Programs Division of WSDOT. 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:

*Jim Laughlin*
Air Quality, Noise, Energy Technical Manager
(206) 440-4643 Laughlj@wsdot.wa.gov
Guidance

This guidance reflects recommendations 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 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 Procedures Manual (EPM).

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. This approach is consistent with WSDOT’s cumulative effects guidance, online at http://www.wsdot.wa.gov/Environment/Compliance/CumulativeEffects.htm.

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 the guidance apply?
All WSDOT projects subject to NEPA and SEPA are required to follow this guidance. The guidance is recommended, but not mandatory, for federally funded local agency projects processed by the Highways and Local Programs Division of WSDOT.

What is included in the guidance?
The 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 Procedures 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
- Construction – primarily from fuel used to build project
• Embodied—“Embodied” includes material extraction and transfer to project site
• Lifecycle—“Lifecycle” includes embodied and end of service demolition/disposal, (a.k.a. “cradle to grave”)

*Operational emissions* – GHG emissions from vehicles using project roadways. The quantity depends on assumptions about fuels, fuel efficiency, speeds, distances, and volumes. This is the largest category of GHG emissions released by the transportation sector. Approximately 72% of transportation emissions are from on-road transport, including both passenger and freight travel.¹

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

*Embodied emissions* – “cradle to site” GHG emissions from production of materials, including sourcing raw materials and converting them to a usable form.² For example, emissions released mining coal used to manufacture steel girders for a bridge.

*Lifecycle emissions* – “cradle to grave” GHG emissions released during a facility’s lifetime, from raw material sourcing to demolition. Unlike embodied emissions, lifecycle emissions account for the durability of a product.

**What level of analysis is recommended?**
WSDOT tailors the level of analysis to the level of environmental document (see Table 1).

**Table 1: GHG emission level of analysis based on NEPA or SEPA classification**

<table>
<thead>
<tr>
<th>Type of Emission</th>
<th>Exempt</th>
<th>DCE/Checklist/EA</th>
<th>EIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>No evaluation</td>
<td>Qualitative*</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Construction</td>
<td>No evaluation</td>
<td>Qualitative</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Embodied/Lifecycle</td>
<td>No evaluation</td>
<td>No evaluation</td>
<td>Qualitative</td>
</tr>
</tbody>
</table>

*Highly visible and/or controversial projects may consider a basic quantitative analysis of operational GHG emissions for NEPA EA documents when traffic and/or energy use information is available and a comparison to the No Action alternative is possible and useful.

NEPA CE - no recommended analysis of Operational and Construction Emissions for most NEPA CEs. Qualitative discussion for projects that receive related questions/comments from public or agencies is optional.

¹ AASHTO, Primer on Transportation and Climate Change, 2008. [http://downloads.transportation.org/ClimateChange.pdf](http://downloads.transportation.org/ClimateChange.pdf)
- 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 and Construction Emissions. Template language is included in Appendix A. Project teams can include the qualitative discussion in public materials. A qualitative project-level analysis of Operational or Construction GHG Emissions is optional for projects that receive GHG questions/comments from the public or agencies.

- Why? Most of these projects have a small potential for increased GHG emissions.

**NEPA EA** - WSDOT EA’s include language from this guidance required for the Cumulative Effects section of EA documents (see Appendix B). Some projects may also benefit from a basic based quantitative analysis of operational emissions when vehicle miles traveled (VMT) or energy use information is available and a comparison to the No Action alternative is possible and useful (see Appendix C). Construction emissions should be addressed qualitatively. No discussion of Embodied or Lifecycle Emissions is recommended.

- Why? EA-level projects normally do not have sufficient traffic data available for a more advanced Operational Emissions analysis. Also, EAs typically do not include an energy analysis, which provide the basis for analysis of Construction Emissions.

**NEPA / SEPA EIS** - WSDOT recommends quantitative analysis of Operational and Construction GHG Emissions for SEPA or NEPA EIS’s because the intensity and magnitude of these projects have the potential for substantial GHG emissions. The analysis should use the most current version of the EPA Motor Vehicle Emission Simulator (MOVES)\(^3\) model for operational emissions. The results of the Energy Discipline Report should be used for construction emissions. The quantitative analysis should be included in the Energy Discipline Report (see Appendix C). If detailed traffic data is not available for an advanced analysis, discuss with ANE program staff. A qualitative discussion of embodied and lifecycle emissions is suggested.

Within the body of the EIS, project teams should include two specific items:

1. Summary of results of the quantitative analysis (either in the Air/Energy section or the Cumulative Effects section).
2. Cumulative Effects Section should include WSDOT’s key messages about emission reduction efforts provided in Appendix B.

- Why? EIS-level projects typically have a high level of public interest and multiple alternatives with both detailed traffic data and an energy analysis available.

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\(^3\) [http://www.epa.gov/otaq/models/moves/index.htm](http://www.epa.gov/otaq/models/moves/index.htm)
Appendix A: Example Language for use in WSDOT documents

This appendix contains example text. It is organized from the earliest type of environmental documentation – our internal project summary database (ERS) to the larger and more complex publications prepared to satisfy NEPA and SEPA.

WSDOT Environmental Review Summary or “ERS”

Under the Air Tab
- SEPA CE and NEPA CE – “No GHG emissions analysis is recommended because the project is not expected add traffic or increase emissions beyond current levels”
- SEPA Checklist – “A brief statement addressing greenhouse gas emissions may be needed. Use the appropriate text from Appendix A of WSDOT’s Guidance to Project-Level Greenhouse Gas Evaluations.”
- NEPA EA – “The cumulative effects section will need to include a climate change discussion. Refer to the standard language provided in Appendix B of WSDOT’s Guidance to Project-Level Greenhouse Gas Evaluations. Please work with staff from the WSDOT Air, Noise, and Energy Program.”
- SEPA/ NEPA EIS – “A quantitative GHG emissions analysis is needed and should be included in the Energy Discipline Report. Standard language provided in Appendix B of WSDOT’s Guidance to Project-Level Greenhouse Gas Evaluations needs to be included in the EIS document along with results of the quantitative analysis. Contact WSDOT Air, Noise, and Energy Program.”

NEPA CE (ECS form), SEPA Checklist
Climate data should be factored into the design of the proposed project.

- SEPA CE/NEPA CE – “No GHG emissions analysis is recommended because the project is not expected to add traffic or increase emissions beyond current levels.”
- SEPA Checklist/NEPA DCE – Include in the Air Section of SEPA Checklist
  - 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 staff from the WSDOT, Air, Noise, and Energy Program for more information when a project is increasing traffic.

**NEPA Environmental Assessment (EA)**

Although emissions will not be quantified, a consistent approach should be followed to ensure that the relevant aspects of every project are adequately addressed. We recommend using the standard language developed for this purpose, see Appendix B.

For NEPA EA documents, a qualitative discussion should be included in the “Cumulative Effects” section.

**SEPA and NEPA Environmental Impact Statement (EIS)**

We recommend using the standard template language in Appendix B to ensure a consistent approach to the qualitative discussion on GHG emissions.

The Energy Discipline Report should include the quantitative GHG emissions analysis and the discussion of climate change should be in the Cumulative Effects section of the EIS. The EIS document should also include a summary of the quantitative analysis.

**WSDOT Recommended Standard Language for EA/EIS Discussion**

The standard qualitative language template below is recommended for the Cumulative Effects section of environmental documentation. 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 Air/Noise/Energy Program to tailor language prior to finalizing.
Appendix B: EA and EIS Template Language

Vehicles emit a variety of gases during their operation; some of these are greenhouse gases (GHGs). The GHGs associated with transportation are water vapor, carbon dioxide (CO\textsubscript{2}), methane (also known as “marsh gas”), and nitrous oxide (used in dentists’ offices as “laughing gas”). Any process that burns fossil fuel releases CO\textsubscript{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 almost 30 percent of total domestic CO\textsubscript{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 20%; and electricity consumption, also 20%. Figure 1 shows the gross GHG emissions by sector, nationally and Washington State.

Figure 1. GHG Emissions by Sector, Washington State (2008) and National (2005)

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

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 (pie chart)). WSDOT believes that transportation GHG emissions are better addressed at the region, state, or 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 direction from the Governor and WSDOT’s leaders 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.

All WSDOT projects subject to NEPA and SEPA are required to follow WSDOT’s guidance when evaluating GHG and climate change. When this is done, the following language should be used: Project Name followed the WSDOT Guidance for Project-Level Greenhouse Gas Evaluations and received technical support from the WSDOT Environmental Services Office.

**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 the reliability of transit and HOV travel times
- Increasing vegetation density over pre-project conditions to sequester carbon

**Note:** A quantitative analysis is recommended at the EIS-level of documentation where more detailed traffic data is typically available and where an Energy Analysis is prepared. Please contact Air, Noise, and Energy Program staff for more details about the methodology and appropriate language for preceding paragraph in 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.
How will this project minimize emissions while under construction?
Construction of the project is currently planned to last number of year years from 20xx to 20xx. 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.

Will the products used to construct the facility contribute to GHG emissions?
The production and disposal of materials used in the Project Name project will release greenhouse gases. However, at this time, there is no accurate and standardized methodology for calculating the embodied and lifecycle emissions for transportation projects.

Example Design Efficiency paragraph:
WSDOT has designed the project using materials with the longest available life. This includes replacing the existing pavement with Portland cement pavement rather than asphalt, and using bridges rather than highway fill at the stream crossings. These choices mean that the new highway would have a longer life before needing to be replaced, which would reduce overall emissions for highway reconstruction and replacing materials.
Appendix C: GHG Quantitative Methodologies

Basic Quantitative Approach to SEPA Checklist and NEPA EA Documents
WSDOT recommends that highly visible and/or controversial projects use the following procedure to perform a basic quantitative Operational GHG Emission’s analysis. The determination of a need for this type of analysis should be made in coordination with the WSDOT Air Quality, Noise, and Energy Program.

WSDOT currently describes the following as a basic quantitative GHG analysis:

1. Qualitative statements in Appendix A for SEPA Checklists, and relevant discussions from Appendix B for EA documents

2. Comparison of vehicle miles traveled (VMT) values and discussion of the differences
   Using an emissions factor based on average fuel economy to VMT

Methodology: Average fuel economy multiplied by VMT provides an estimate of Operational GHG Emissions. Percent changes in emissions/VMT between alternatives are then compared.

Advanced Quantitative Analysis for SEPA and NEPA EIS Documents
WSDOT recommends an advanced quantitative analysis of Operational and Construction GHG Emissions for EIS-level documents. The traffic data required for an advanced quantitative Operational GHG Emissions’ analysis is normally only generated for our largest projects. Energy Discipline Reports contain the information needed to analyze Construction GHG Emissions and these reports are only required on EIS-level documents. The determination of this need and the appropriate data to use should be determined in coordination with the WSDOT Air Quality, Noise, and Energy Program.


Operational GHG Emissions
WSDOT currently describes the following as an advanced quantitative Operational GHG Emissions’ analysis:

1. Relevant discussions from Appendix B for EA documents

2. 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.

Methodology: 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 the project itself and the project’s relationship to the surrounding transportation network.
Fuel economy varies with speed and vehicle type.

Periods of peak traffic volumes are evaluated and modeled to reflect the most congested periods when fuel-efficiency is lowest (e.g. “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.

Please contact Jim Laughlin (laughlj@wsdot.wa.gov) with the Air, Noise, and Energy Group for the most recent modeling inputs.

**Construction GHG Emissions**

WSDOT currently describes the following as an advanced quantitative Construction GHG Emissions’ analysis:

1. Convert construction energy results to GHG emissions based on project assumptions regarding fuel quantities and types

Methodology: CALTRANS has developed a standard methodology for converting project costs to fuel use. These values can be converted to GHG emission based on the fuel type(s)

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4 Caltrans, *Energy Requirements for Transportation Systems*, June 1980