FHWA GHG Analysis Toolkit

AASHTO Air Quality Peer Exchange

May 6-7, 2014

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## FHWA GHG Analysis Tools

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<tbody>
<tr>
<td></td>
<td>A Performance-Based Approach to Addressing Greenhouse Gas Emissions in Transportation Planning</td>
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<tr>
<td>Models</td>
<td>Energy and Emissions Reduction Policy Analysis Tool (EERPAT)</td>
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<tr>
<td></td>
<td>Construction and Maintenance GHG Calculator</td>
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To help state DOTs and MPOs of all sizes and capabilities understand possible approaches, data sources, and step-by-step procedures for analyzing GHG emissions in the planning process.

Designed to:

- Be user friendly and informative, particularly for State DOTs and MPOs that have limited experience with emissions analysis.
- Provide references to more detailed user manuals and technical resources.
Addresses selection of relevant GHG performance measure(s)

Techniques for evaluating the impact of strategies and plans

Use of performance information to support investment choices and decision-making
EERPAT is...

- An advanced sketch model
- Comprised of connected sub-models...
  - Regression and logit models, which draw on aspects of activity-based and 4-step modeling
  - Vehicle fleet and emissions models
  - designed to estimate the response of travel demand and GHGs to policy initiatives
- Built in the R statistical computer language

...intended to support rapid evaluation of policy scenarios

- Designed specifically to address GHG mitigation strategies, many of which are difficult to evaluate using traditional travel models
- Evaluate policy interactions
- Faster run time than regional travel demand models
- Integrated analysis of travel demand and emissions, reflecting MOVES emissions factors

Tool supported by FHWA, and available at: http://www.planning.dot.gov/FHWA_tool/
Policies Addressed by EERPAT

- Land Use / Smart Growth
- Transit / Nonmotorized
- Pricing (Parking, fuel tax, VMT tax)
- Operations and Eco-driving
- Vehicle Technology (EV and efficiency improvements)
Using EERPAT to Evaluate Policies and other Factors Affecting GHGs

1. Define Policies
   - Urban: Urban growth, mixed-use, transit
   - Pricing: Fuel tax, carbon tax, VMT tax
   - Fleet: Vehicle age, vehicle type, car-sharing
   - Technology: MPG, PHEVs, EVs, fuel type, power source
   - Marketing: Travel demand management
   - Roads: Capacity, incident management

2. Test Policy Combinations

Source: Portland Metro
Objectives of pilot testing
- Evaluate usefulness of EERPAT as a policy analysis tool for State DOTs
- Improve usability of tool – development of Graphical Usable Interface
- Create a community of users to provide feedback for enhancing model
- Promote ongoing use of tool for planning and climate mitigation analysis

Status of Pilot Projects
- WSDOT: Running final set of pilot scenarios
- MDOT: Running final set of pilot scenarios
- CDOT: Preliminary scenario testing
- VTrans: Pilot testing largely completed; May 29 presentation to management and Vermont Climate Cabinet
VTrans – Base Case Emissions and GHG Target

Base case
Includes increased CAFE standards through 2025

GHG Target
80 percent reduction from 1990 levels by 2050
Preliminary Results from VTrans

[Graph showing results for different scenarios over the years 2010 to 2050. Scenarios include:
- Base
- a_SmartGrowth
- b_parking+tdm
- c_transit+bikeped
- d_VMTcharge
- e_ElectricFleet
- g_CNG
- a+b
- a+b+c
- a+b+c+d
- a+b+c+d+e]
Vermont is a rural state; which likely limits the effectiveness of land use and demand management strategies.
Create a simple, user-friendly sketch tool to

- Provide estimates of energy and GHG emissions from transportation infrastructure (roads, parking, bike / ped, transit)
- Address construction and maintenance activities
- Estimate energy and emissions benefits of alternative construction and maintenance practices, including their incremental costs
- Use information available during long range planning / NEPA analysis (as opposed to detailed material quantity and construction activity estimates)
Scope of Emissions Addressed in the Model

- Traffic delay
- Pavement Roughness Effect
- Facility Use
- Decommissioning/Reconstruct
- Construction
- Maintenance
- Materials
- On-site equipment and transportation
- Pavement roughness
- Years
- Infrastructure condition
- Routine maintenance
- Preventive maintenance
Select energy/GHG reduction strategies using drop-down menus

Most strategies offer simple yes/no choice

Use of a strategy assumes that the agency will deploy that strategy to the maximum extent feasible

Calculator avoids double-counting by applying reductions to different sources (i.e., in-place recycling applies to resurfacing; recycled materials applies to new construction)
## Annualized energy use (mmBTUs), per year over 30 years

<table>
<thead>
<tr>
<th></th>
<th>Unmitigated</th>
<th>Mitigated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roadways</td>
<td>Bridges</td>
</tr>
<tr>
<td>Materials</td>
<td>1,490,980</td>
<td>-</td>
</tr>
<tr>
<td>Construction</td>
<td>647,910</td>
<td>-</td>
</tr>
<tr>
<td>Maintenance</td>
<td>112,540</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2,251,430</td>
<td>-</td>
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</tbody>
</table>

## Annual GHG emissions (MT CO2e), per year over 30 years

<table>
<thead>
<tr>
<th></th>
<th>Unmitigated</th>
<th>Mitigated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roadways</td>
<td>Bridges</td>
</tr>
<tr>
<td>Materials</td>
<td>85,810</td>
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<tr>
<td>Construction</td>
<td>47,250</td>
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<tr>
<td>Maintenance</td>
<td>8,210</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>141,270</td>
<td>-</td>
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Energy and Emissions Reduction Policy Analysis Tool (EERPAT)

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