Real Solutions: Integrating Climate Change Considerations into the Transportation Planning Process

September 25, 2008

Jeffrey Ang-Olson, Principal
jangolson@icfi.com
Introduction

• Transportation and climate change are inextricably linked
• Transportation plans are increasingly incorporating climate change considerations
• Transportation plans can
  – acknowledge climate change concerns
  – establish proactive strategies to address climate change
  – measure the impacts of strategies
Greenhouse Gases (GHGs) and Transportation

- After industry, transportation is leading source of U.S. GHG emissions
- Transportation sector accounts for 28% of GHGs nationally – much more in some states
- Transportation is among the fastest growing sources of GHG emissions
U.S. Transportation GHG Emissions by Source, 2006

Light-duty Vehicles 63%
Light-Duty Trucks 28%
Medium- and Heavy-Duty Trucks 20%
Commercial Aircraft 7%
Buses
Ships and Boats
Pipelines
Lubricants
Rail
Other Aircraft
Other Non-Road 7%
Aircraft 9%
Heavy-duty Vehicles 21%
Passenger Cars 34%

Climate Change Potentially Impacts Transportation Infrastructure

Charts do not include periodic hurricane storm surge, e.g., Isabel 10+ feet.
Importance of State and Local Efforts

- Can have large impacts – 34 of 75 largest GHG sources in the world are U.S. states
- States are testing grounds for emerging policy

Estimated Transportation Share of Total GHG Emissions by State, 2010
State Climate Actions Plans

- Plans propose specific policies and programs for consideration by the state legislature or implementation by state agency.
- Stakeholder groups convened to develop policies aimed at meeting state emission goals.

39 states have developed or are developing a climate plan.

Source: Pew Center on Global Climate Change, online.
Key State Policy Affecting Transportation Planning

• Washington State
  – **SB 6001** – requirement to reduce GHG emissions to 1990 levels by 2020, with additional targets thereafter
  – **HB 2815** – requirement to reduce light duty vehicle per capita VMT 18% by 2020, 30% by 2035, and 50% by 2050.

• California
  – **AB 32** – mandates that California reduce GHG emissions to 1990 levels by 2020. It further directs the California Air Resources Board (CARB) to monitor and regulate GHG emissions in coordination with relevant state agencies.
  – **SB 375** (awaiting Governor’s signature) – requires CARB to allocate reductions to large urban areas. If enacted, this legislation would directly affect the long-range planning functions of MPOs in the state.
  – Legal action under CEQA
Key State Policy Affecting Transportation Planning, cont.

• Oregon
  – HB 3543 – requirement to reduce GHG emissions to 10% below 1990 levels by 2020, with additional targets thereafter

• New York
  – New York State Energy Plan (2002) – recommends that MPOs, in conjunction with the State, assess the energy use and greenhouse gas emissions expected to result from implementation of transportation plans and programs.
Research

• Funded by FHWA
• Review of federal transportation planning legislation
• Review of DOT and MPO Long Range Transportation Plans (LRTPs)
• Interviews with DOTs and MPOs
Relationship of Federal Planning Statutes and Regulations

Linkage Opportunities

1. Requirements to address energy and environmental concerns
   (23 CFR 450 Subparts 200, 206, 214, and 306)

2. Requirements to ensure an integrated transportation system, preserve the projected and existing system, and ensure the safety and security of the system for users is preserved
   (23 CFR 450 Subparts 206, 214, and 306; 49 CFR 613 Subparts 100 and 200)

3. Transportation demand management and transportation system management strategies
   (23 CFR 450 Subparts 200 and 320)

4. Consultation requirements
   (23 CFR Subpart 208 and 214)
Climate Change in LRTPs: Components

• Trends and Challenges
  – Recognize the interrelation of transportation and climate change
  – E.g., “Connecticut’s greenhouse gas (GHG) emissions from non-renewable fuel consumption are contributing to global climate change.”

• Vision and Goals
  – Establish intent to address climate change
  – E.g., Managing Global Warming (MTC)

• Policies and Strategies:
  – Propose mechanisms to address climate change
  – E.g., Increasing use of public transportation, freight rail, bicycling, and walking

• Performance Measures
  – Establish metrics to monitor progress
  – E.g., GHG emissions
Climate Change in LRTPs

Processes

- Coordinate
- Stakeholder Outreach

Step 1: Stakeholder Identification and Initial Outreach
Step 2: Establish Vision, Goals, and Objectives
Step 3: Define Performance Criteria and Data Needs
Step 4: Evaluate Deficiencies
Step 5: Develop Alternative Plan Scenarios
Step 6: Evaluate Alternatives & Select Preferred Alternative

Components

- Vision, Goals, and Trends
- Performance Measures
- Trends and Challenges
- Strategies and Improvement Projects
- Performance Measures

Feedback

Link funding
Integrate land use
## Integrating Climate Change in Statewide Transportation Plans

<table>
<thead>
<tr>
<th>DOT</th>
<th>Status of LRTP</th>
<th>Climate Change Mitigation in:</th>
<th>Energy Conservation or Alternative Fuels in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>adopted 2007</td>
<td>Trends and Challenges ✔</td>
<td>Vision and Goals ✔</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Policies and Strategies ✔</td>
<td>Performance Measures ✔</td>
</tr>
<tr>
<td>New Mexico</td>
<td>adopted 2005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>adopted 2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado</td>
<td>adopted 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>adopted 2004</td>
<td>Trends and Challenges ✔</td>
<td>Vision and Goals ✔</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Policies and Strategies ✔</td>
<td>Performance Measures ✔</td>
</tr>
<tr>
<td></td>
<td>adopted 2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maryland</td>
<td>draft goals 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregon</td>
<td>adopted 2006</td>
<td>Trends and Challenges ✔</td>
<td>Vision and Goals ✔</td>
</tr>
<tr>
<td>California</td>
<td>adopted 2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida</td>
<td>adopted 2005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td>adopted 2006</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


- Includes adaptation
## Integrating Climate Change in Metropolitan Transportation Plans

<table>
<thead>
<tr>
<th>MPO Region</th>
<th>Status of LRTP</th>
<th>Climate Change Mitigation in:</th>
<th>Energy Conservation or Alternative Fuels In:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eugene, OR</td>
<td>final draft Sep 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missoula, MT</td>
<td>adopted May 2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Fe, NM</td>
<td>draft due 2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albany, NY</td>
<td>draft August 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Rapids, MI</td>
<td>adopted April 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portland, OR</td>
<td>final draft Jan 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt Lake City</td>
<td>adopted May 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baltimore</td>
<td>adopted Nov 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>updated June 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denver</td>
<td>adopted Dec 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houston-Galveston</td>
<td>updated Oct 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philadelphia</td>
<td>adopted 2005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacramento</td>
<td>draft Nov 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Diego</td>
<td>adopted Nov 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Francisco</td>
<td>draft goals 2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seattle</td>
<td>adopted Spring 2008**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern California</td>
<td>draft Dec 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington, DC</td>
<td>adopted Oct 2006</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


** Refers to Vision 2040, a regional growth, transportation, and economic strategy.

** Includes adaptation
Example: Maine DOT

- *Connecting Maine*, adopted December 2007
- Section: Greenhouse Gases and Global Warming
  - Overview of Maine GHG emissions inventory
  - Need for long-term strategies including:
    - Low-GHG fuels
    - Tailpipe emissions standards
    - Slowing VMT growth
    - Increasing the availability of low-GHG travel modes
    - Shift freight movement from highways to rail and marine modes
- Estimate of emissions impact of the plan:
  - Reduce GHG emissions by 26,000-32,000 metric tons by 2020
  - Reduce GHG emissions by 40,000-48,000 metric tons by 2030
Quantifying GHG Effects of Transportation Plans

• New York State MPOs
  – In response to New York State Energy Plan, New York State requires MPOs to quantify GHG emissions from transportation plans and transportation improvement programs (TIPs).
  – Guidance for:
    • Roadway projects – direct vehicle energy
    • Roadway projects – construction and maintenance
    • Rail projects

• Several other MPOs are estimating GHG emissions effects of their transportation plans
  – Completed: Sacramento, San Diego, Southern California (SCAG)
  – Forthcoming: Chicago region, Portland OR, Missoula, San Francisco Bay Area, Philadelphia region, Puget Sound

• Additional states considering quantification requirements
  – California, Oregon, Washington
Example: Sacramento Area Council of Governments (SACOG)

- Environmental Impact Report for *Metropolitan Transportation Plan for 2035*

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2035 No Project</th>
<th>2035 Draft MTP</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Road Non-Transit VMT/Yr (000)</td>
<td>17,685,380</td>
<td>28,887,188</td>
<td>27,220,285</td>
<td>-1,666,903</td>
</tr>
<tr>
<td>Gasoline (billion BTUs)</td>
<td>114,140</td>
<td>186,612</td>
<td>175,843</td>
<td>-10,769</td>
</tr>
<tr>
<td>Diesel (billion BTUs)</td>
<td>9,359</td>
<td>13,766</td>
<td>12,971</td>
<td>-794</td>
</tr>
<tr>
<td>Total Gas + Diesel (billion BTUs)</td>
<td>123,499</td>
<td>200,378</td>
<td>188,815</td>
<td>-11,563</td>
</tr>
<tr>
<td>Transit Electricity Revenue Miles/Yr</td>
<td>1,777,915</td>
<td>3,189,005</td>
<td>5,216,945</td>
<td>2,027,940</td>
</tr>
<tr>
<td>Transit Diesel Revenue Miles/Yr</td>
<td>20,016,600</td>
<td>42,705,365</td>
<td>58,586,880</td>
<td>15,881,515</td>
</tr>
<tr>
<td>Transit Electricity (billion BTUs)</td>
<td>169</td>
<td>303</td>
<td>496</td>
<td>193</td>
</tr>
<tr>
<td>Transit Diesel (billion BTUs)</td>
<td>722</td>
<td>1,540</td>
<td>2,112</td>
<td>573</td>
</tr>
<tr>
<td>Transit Total (elect + diesel, billion BTUs)</td>
<td>891</td>
<td>1,843</td>
<td>2,608</td>
<td>765</td>
</tr>
<tr>
<td>Totals (billion BTUs)</td>
<td>124,389</td>
<td>202,220</td>
<td>191,423</td>
<td>-10,798</td>
</tr>
<tr>
<td>CO2 Emissions (ton)/Yr</td>
<td>16,064,000</td>
<td>17,689,600</td>
<td>-1,625,600</td>
<td></td>
</tr>
</tbody>
</table>
Example: Metropolitan Transportation Commission (MTC), San Francisco Bay Area

- Developing *Transportation 2035 Plan*
- Including specific measurable objectives (targets) for each of its key principles – one relates to climate change

<table>
<thead>
<tr>
<th>Economy</th>
<th>Target 1 – Reduce per-capita delay by 20 percent below today’s levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Target 2 – Reduce daily per-capita vehicle miles traveled (VMT) by 10 percent</td>
</tr>
<tr>
<td></td>
<td><strong>Target 3 – Reduce CO₂ emissions by 40 percent below 1990 levels by 2035</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Target 4 – Reduce emissions of finer particulates (PM2.5) by 10 percent and coarser particulates (PM10) by 45 percent</strong></td>
</tr>
<tr>
<td>Equity</td>
<td><strong>Target 5 – Decrease by 10 percent from today the combined share of household income consumed by transportation and housing costs by low and low-middle income households.</strong></td>
</tr>
</tbody>
</table>

Source: MTC Memorandum to Planning Committee, January 2008.
Example: Metropolitan Transportation Commission (MTC), cont.

- Analyzing scenarios to assess which options meet the target
- Pricing and land use measures are essential to meet the goal
- Next step: analyzing individual projects

Plan Alternatives: 2035 CO2 Emissions (Thousands Tons per Day)

<table>
<thead>
<tr>
<th>Infrastructure Packages</th>
<th>No New Investments</th>
<th>Freeway Performance</th>
<th>HOT &amp; Local/Express Bus</th>
<th>Regional Rail &amp; Ferry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Emissions (No Policy Changes)</td>
<td>101.4</td>
<td>92.4</td>
<td>97.0</td>
<td>99.1</td>
</tr>
<tr>
<td>Reductions from Policy Packages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pricing Sensitivity</td>
<td>-8%</td>
<td>-6%</td>
<td>-8%</td>
<td>-8%</td>
</tr>
<tr>
<td>Land Use Sensitivity</td>
<td>-8%</td>
<td>-6%</td>
<td>-7%</td>
<td>-7%</td>
</tr>
<tr>
<td>Combined Pricing &amp; Land Use</td>
<td>-14%</td>
<td>-11%</td>
<td>-13%</td>
<td>-14%</td>
</tr>
<tr>
<td>Combined Pricing, Land Use, and Telecommuting</td>
<td>n/a</td>
<td>-14%</td>
<td>-17%</td>
<td>n/a</td>
</tr>
<tr>
<td>Combined Pricing, Land Use, Telecommuting and Fuel Efficiency</td>
<td>n/a</td>
<td>n/a</td>
<td>-46%</td>
<td>n/a</td>
</tr>
</tbody>
</table>
GHG Inventories

• Most states now have GHG inventories
• A few regions are developing their own GHG inventories
  – E.g., Philadelphia region (DVRPC), Washington D.C.
• Challenges
  – Top-down approach based on aggregate fuel sales data vs. bottoms-up approach based on VMT
  – Disaggregation by mode, vehicle type, and geography is difficult
• EPA’s MOVES model should improve local inventories
  – Incorporates local driving conditions
  – Pilot project with Puget Sound Regional Council
GHG Inventories, cont.

Top-down fuel-based approach

- Motor fuel purchased in-state (gal)
- In-state activity by vehicle type (VMT)
- Fuel efficiency by vehicle type (miles/gallon)
  - LDV fuel consumption (gallons)
  - HDV fuel consumption (gallons)
- Emission factors
  - LDV GHG emissions (grams)
  - HDV GHG emissions (grams)

Bottoms-up VMT-based approach

- In-state activity by vehicle type (VMT)
- National activity rates by vehicle and fuel type (% of VMT)
  - In-state activity by vehicle and fuel type (VMT)
  - Fuel efficiency by vehicle and fuel type (miles/gallon)
  - LDV fuel consumption (gallons)
  - HDV fuel consumption (gallons)
- Emission factors
  - LDV GHG emissions (grams)
  - HDV GHG emissions (grams)
Adaptation to Climate Change

- Impact of climate change on transportation systems
- Less well understood than GHG emissions
- Climate models cannot yet predict local impacts with any certainty
- Most agencies focusing on awareness and research
  - Examples: MTC, ODOT, ConnDOT, PSRC
Summary

• Many DOTs and MPOs are beginning to incorporate climate change issues into their transportation planning processes
• Current practice for incorporation varies widely by agency
• A number of agencies are waiting on decisions or recommendations from state agencies or committees
• Quantification of GHG emissions bringing new challenges
• GHG reduction strategies
  – Lots of on-going analysis
  – Concern that effective strategies outside DOT and MPO control
• Adaptation – more uncertainty, less urgency
Thank you!

For more information:
Jeffrey Ang-Olson
ICF International
916-231-7674
jangolson@icfi.com