Climate Change: Impact on Transportation
(And Transportation Impact on Climate Change)

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Metropolitan Washington Council of Governments
National Capital Region Transportation Planning Board
I. Introduction/Background

Climate change initiative
Formation of Steering Committee (CCSC) in April 2007

Led to TPB’s involvement
Similar to SIP responsibilities:
• Inventory construction for mobile source GHG emissions
• Analysis of emissions reduction measures and strategies

CCSC completed its charge
Draft report now out for agency and public comment through Sept. 30
II. Planning Context

**Inputs**
- Geography: 8-hour ozone non-attainment area
- Analysis years: 1990-2030

**Technical Process**
- Travel demand forecasting
- Mobile 6 emissions factors
- CO$_2$ yearly totals (tons/yr), CO$_2$e

**Initial Results**
- By source
- Mobile emissions through time
8-Hour Ozone Non-Attainment Area
Estimated Washington Region CO$_2$ Emissions, 2005-2030 (BAU)
Annual Mobile CO₂ Emissions (Tons) for 8-Hour Ozone Non-Attainment Area

Note: Years 2000, 2005 and 2020 were interpolated using 2002, 2010 and 2030 emissions estimates from the October 18, 2006 conformity determination.
## 2002-2030 Changes in Employment, Households, VMT, NOx, VOC and CO₂ for the 8-Hour Ozone Non-Attainment Area

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2030</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment (M)</td>
<td>2.89</td>
<td>4.16</td>
<td>44%</td>
</tr>
<tr>
<td>Households (M)</td>
<td>1.74</td>
<td>2.46</td>
<td>41%</td>
</tr>
<tr>
<td>Annual VMT (M)</td>
<td>39,212</td>
<td>53,726</td>
<td>37%</td>
</tr>
<tr>
<td>NOx (tons/day)</td>
<td>259</td>
<td>35</td>
<td>-87%</td>
</tr>
<tr>
<td>VOC (tons/day)</td>
<td>101</td>
<td>39</td>
<td>-61%</td>
</tr>
<tr>
<td>CO₂ (M tons/year)</td>
<td>23.27</td>
<td>34.45</td>
<td>48%</td>
</tr>
</tbody>
</table>
III. Planning for Emissions Reductions

**Targets** *(from CCSC)*
- By 2012: reduce to 2005 levels
- By 2020: reduce to 20% below 2005 levels
- By 2050: reduce to 80% below 2005 levels

**Processes**
- CCSC draft report represents research effort
- TPB Scenario Study Task Force: “What Would it Take?”
III. Planning for Emissions Reductions, cont’d

**Transportation Measures**
- Committed (CAFE, TERMS)
- Analyze strategies (fuel efficiency, carbon intensity, vehicle travel reductions including land use, travel behavior/system performance and travel pricing)

**Development of Reductions Strategy**
- Cost-effectiveness approach
  - McKinsey Report
  - May 2, 2008 memo to TPB Technical Committee
- Scale of benefits
# Mobile CO₂ Projections

**CO₂ Emissions from Cars, Trucks, and Buses**
All figures are Annual Tons of CO₂ Emissions (in Millions) in the 8-hour Ozone Non-Attainment Area

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Emissions (prior to 2007 CAFE)</strong></td>
<td>24.89</td>
<td>31.02</td>
<td>34.45</td>
</tr>
<tr>
<td>% Change from 2005 levels</td>
<td>----</td>
<td>24.6%</td>
<td>38.4%</td>
</tr>
<tr>
<td><strong>Emissions With 2007 CAFE (35 mpg by 2020)</strong></td>
<td>24.89</td>
<td>26.83</td>
<td>26.91</td>
</tr>
<tr>
<td>% Change from 2005 levels</td>
<td>----</td>
<td>7.8%</td>
<td>8.1%</td>
</tr>
<tr>
<td><strong>CCSC Proposed Regional Goal</strong></td>
<td>24.89</td>
<td>19.91</td>
<td>15.75</td>
</tr>
<tr>
<td>% Change from 2005 levels</td>
<td>----</td>
<td>-20.0%</td>
<td>-36.7%</td>
</tr>
<tr>
<td><strong>Emissions with Enhanced CAFE (55 mpg by 2020)</strong></td>
<td>24.89</td>
<td>23.63</td>
<td>20.86</td>
</tr>
<tr>
<td>% Change from 2005 levels</td>
<td>----</td>
<td>-5.1%</td>
<td>-16.2%</td>
</tr>
</tbody>
</table>
### Building the “What Would it Take?” Scenario

Three categories of strategies to reduce mobile CO$_2$ emissions

<table>
<thead>
<tr>
<th>Fuel Efficiency</th>
<th>Fuel Carbon Intensity</th>
<th>Travel Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beyond CAFE standards [currently 35 mpg by 2020]</td>
<td>Alternative fuels (biofuels, hydrogen, electricity)</td>
<td>Reduce VMT through changes in land use, travel behavior, prices</td>
</tr>
<tr>
<td>Vehicle technology (hybrid engine technology)</td>
<td></td>
<td>Reduce congestion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improve operational efficiency</td>
</tr>
</tbody>
</table>
What Would it Take with Fuel Efficiency?

Fuel Efficiency

Beyond CAFE standards [currently 35 mpg by 2020]
What Would it Take with Alternative Fuels?

Fuel Carbon Intensity

Alternative fuels (biofuels, hydrogen, electricity)

Vehicle technology (hybrid engine technology)

How would this look with lifecycle emissions for the region?

-46% reduction in fuel carbon intensity

Based on national averages of lifecycle emissions, EPA, 2007

Based on use of coal as electricity source, EPRI, 2008
What Would it Take with VMT?

Travel Efficiency

Reduce VMT through changes in land use, travel behavior, prices

Reduce congestion

Improve operational efficiency
What Can We Do by Reducing Congestion?

Travel Efficiency

- Reduce VMT through changes in land use, travel behavior, prices
- Reduce congestion
- Improve operational efficiency

CO₂ Emissions Rates by Speed

Source: University of California, Riverside
## Analyzing Cost-Effectiveness

Initial analysis of cost-effectiveness of Transportation Emissions Reduction Measures ($ per ton of CO₂ reduced)

<table>
<thead>
<tr>
<th>Number</th>
<th>Category Description</th>
<th>CO₂ Cost Effectiveness Range *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Access Improvements to Transit/ HOV</td>
<td>$100 to $400</td>
</tr>
<tr>
<td>2</td>
<td>Bicycle / Pedestrian projects</td>
<td>$50 to $100</td>
</tr>
<tr>
<td>3</td>
<td>Transit Service improvements</td>
<td>$100 to $800</td>
</tr>
<tr>
<td>4</td>
<td>Rideshare Assistance Programs</td>
<td>$30 to $300</td>
</tr>
<tr>
<td>5</td>
<td>Park &amp; Ride Lots (Transit and HOV)</td>
<td>$100 to $500</td>
</tr>
<tr>
<td>6</td>
<td>Telecommute Programs</td>
<td>$10 to $40</td>
</tr>
<tr>
<td>7</td>
<td>Signal Optimization</td>
<td>$30 to $50</td>
</tr>
<tr>
<td>8</td>
<td>Bus Replacement Programs</td>
<td>$525 to $775</td>
</tr>
</tbody>
</table>

* Several locations / applications studied

| TIP Projects

* CO₂ Cost-Effectiveness of TERMs

* Several locations / applications studied
IV. Next Steps

**EPA’s Proposed Rulemaking**
Comment upon Federal direction

**CCSC report**
Continuing research effort once report is finalized

**TPB Scenario Study**
Ongoing study effort of mobile sources through June 30, 2009
Reference/Contact Information

CCSC Report
http://www.mwcog.org/environment/climate/about.asp

TPB Scenario Study
http://www.mwcog.org/transportation/committee/committee/default.asp?COMMITTEE_ID=230

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