AERIS: The Policy Context for Air Pollutants and Greenhouse Gases

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What are the Emissions of Concern?

Criteria Pollutants
- Ozone (NOx & VOCs), Particulate Matter, Carbon Monoxide (CO)

Air Toxics
- Diesel Particulate Matter, Benzene, Acetaldehyde, Butadiene, Formaldehyde, Acrolein, Naphthalene, Polycyclic Organic Matter

Greenhouse Gases
Criteria Pollutants are Declining

CO Air Quality, 1980 - 2008
(Based on Annual 2nd Maximum 8-hour Average)
National Trend based on 124 Sites
-79%

PM2.5 Air Quality, 2000 - 2008
(Based on Seasonally-Weighted Annual Average)
National Trend based on 728 Sites
-19%

Ozone Air Quality, 1980 - 2008
(Based on Annual 4th Maximum 8-Hour Average)
National Trend based on 258 Sites
-25%

1980 to 2008: 79% decrease in National Average
1980 to 2008: 25% decrease in National Average
Characteristics of Criteria Pollutants

Geographic scale
- Microscale ("hotspots")
- Regional ("metropolitan")

Time Frame
- Duration of events – hours to days
- 20-Year Planning horizon
Climate Impacts are Significant

Average global temperature to rise 2 to 11.5 degrees Fahrenheit by 2100

Sea-level to rise 3-4 feet by 2100

Impacts in US:
- Increase in severity of storms, draughts, floods, heat waves

Widespread climate impacts are occurring now and expected to increase
CO2 is the Predominant Greenhouse Gas (GHG)

All U.S. Sources

- CO2: 84%
- CH4: 7.4%
- N2O: 6.5%
- HFCs, PFCs & SF6: 2%

Transportation

- CO2: 95%
- N2O: 1.5%
- CH4: 0.1%
- HFCs: 3.3%

Not Included in Official Inventories:
- Tropospheric Ozone
- Black Carbon

On Road Sources are the Largest Share

- Electric Power Industry, 34%
- Transport, 29%
- Industry, 19%
- Residential, 5%
- Commercial, 6%
- Agriculture, 8%

- Light Duty Vehicles, 58%
- Aircraft, 12%
- Freight Trucks, 19%
- Marine, 5%
- Rail, 3%
- Pipelines, 1%
- Lubricants, 1%
- Buses, 0.6%
- Motorcycles, 0.1%


Note: Above figures include international bunker fuels purchased in the U.S.
GHG Emissions Trends: 1990-2006

Light duty emissions have increased by 24%

But emissions from freight trucks have increased 77%

Source: Bureau of Transportation Statistics. National Transportation Statistics.
Characteristics of GHGs

Geographic Scale
- Global, but national “targets”

Time Frame
- Cumulative process, CO2 stays in the atmosphere ~ 100 years
- Major climate change effects realized over 50 – 100 year period
- But “short” (e.g. 10-15 year) term reductions needed
What do we know? Typical emissions benefits (VOC) under CMAQ are small.
### Results from *Moving Cooler*

<table>
<thead>
<tr>
<th></th>
<th>2030 GHG Reduction</th>
<th>Key Assumptions</th>
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</thead>
<tbody>
<tr>
<td>Traffic management</td>
<td>&lt;0.1-0.5%</td>
<td>Signal coordination, faster clearance of incidents, ramp metering</td>
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<tr>
<td>Real-time traveler information</td>
<td>&lt;0.1%</td>
<td>Electronic message boards, 511, web</td>
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<tr>
<td>Cumulative TSM strategies</td>
<td>0.6%</td>
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Optimize design, construction, operation, and use of transportation networks

Benefits:
- Reduced congestion
- Reduced travel time
- Reduced travel costs
- Economic benefits
## System Efficiency | Combined 3-6% GHG ↓

<table>
<thead>
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<tr>
<td>Improve top 100-200 bottlenecks by 2030</td>
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<td>55mph national speed limit</td>
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<td>26-100% of sleeper cabs with one board idle reduction tech</td>
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<td>Reduce rail chokepoints, shore-side power for ships, reduce VMT in intermodal terminal, limited modal diversion</td>
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<td>Airport efficiency, direct routing, reduced separation, continuous descents</td>
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<td>Recycled material in cement, low temp asphalt</td>
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<tr>
<td>Truck size and weight, freight urban consolidation centers, transportation agency energy efficient buildings, alt fuel fleet and construction vehicles</td>
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<tr>
<td>Includes strategies not shown</td>
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<td>Travel Activity</td>
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<tr>
<td><strong>Pay as you drive insurance</strong></td>
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<td><strong>Congestion pricing</strong></td>
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<td><strong>Public transportation</strong></td>
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<td><strong>Non-motorized travel</strong></td>
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<td><strong>Land use</strong></td>
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<td><strong>Parking management</strong></td>
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<td><strong>Commuter / worksite trip reduction</strong></td>
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<td><strong>Telework / compressed work week</strong></td>
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<td><strong>Individualized marketing</strong></td>
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<td><strong>Eco-driving</strong></td>
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<td><strong>Combined Strategies</strong></td>
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<td><strong>VMT fee (not included above)</strong></td>
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What Does it All Mean?

Greenhouse gases are **NOT** the same as criteria pollutants
- Difference in geographic scales
- Different time frames

Baseline development will be crucial

*Critical for strategy development & evaluation*

Limited effectiveness at the project level

*Need for transformational strategies*
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