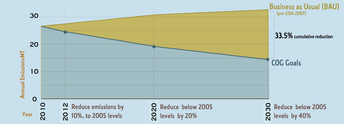
Meeting Transportation Greenhouse Gas Reduction Goals in the National Capital Region:

A "What Would it Take?" Scenario

Purpose: To demonstrate what it would it take to meet aggressive greenhouse gas reduction goals *at the regional level* within the transportation sector.

CONTEXT

THE GOAL:

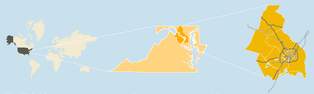


These goals are voluntary targets adopted by the Metropolitan Washington Council of Governments in November 2008, are based on international goals, and are not sector-specific.

WHAT IS THE TPB?

The Transportation Planning Board (TPB) is the Metropolitan Planning Organization (MPO) for the National Capital Region. It is housed within the Metropolitan Washington Council of Governments (MWCOG). TPB is charged with long-range transportation planning and regional coordination for its planning area, which has approximately 5 million people and 3 thousand square miles.

STUDY AREA:



The TPB Planning Area consists of suburban northern Virginia, suburban Maryland, and the District of Columbia. Although climate change is a global problem, many strategies are local or regional.

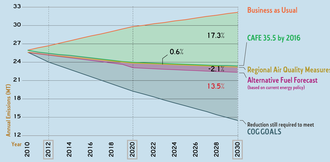
Currently, only Maryland has climate change legislation including mandatory reduction targets in force.

GENERAL ASSUMPTIONS:

* CO_2 only GHG studied
* Emissions were studied cumulatively over the 20-year study period
* National-level strategies were examined because of their effects on regional emissions rates
* Strategies included were thought to be technically and politically feasible to some degree

ANALYSIS

STEP 1: BASELINE INVENTORY



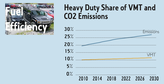
Baseline Inputs:

1. 2009 Constrained Long Range Transportation Plan
2. MWCOG Cooperative Forecast Round 7.2 (detailed employment and population forecasts)
3. Emissions rates
4. Implemented air quality measures

Tools Used:

1. Mobile6.2 and CO_2 post-processor
2. Regional 4-Step Travel Demand Model (TDM)
3. Off-model spreadsheet to estimate reductions from recent CAFE standards
4. Vehicle Identification Number (VIN) decoded local fleet information
5. U.S. DOE Annual Energy Outlook (used for alternative fuel forecast, not part of official baseline inventory because of incompatible methodology)

STEPS 2 & 3: REDUCTION SOURCES & STRATEGIES



Strategies:

1. CAFE 55 mpg by 2030
2. Heavy duty CAFE, doubling current fuel economy by 2020
3. Local tax incentives for fuel efficient vehicle purchase

Strategies:

1. Current renewable fuel standard
2. US DOE Annual Energy Outlook "High Price Case", assuming $7 per gallon gasoline

Strategies:

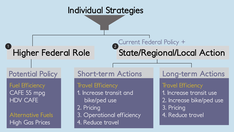
1. Increase transit and bike/ped use (13 measures improving bus service, Metrorail extension, park and ride lots, bikestations, bikesharing, ped paths to rail, regional bike-ped plan)
2. Pricing (parking impact fees, pay-as-you-drive insurance, regionwide value pricing)
3. Improve operational efficiency (traffic signal optimization, eco-driving, idling reduction, incident management)
4. Reduce travel (telecommuting, carpooling, carsharing, regional smart growth strategy)

STEPS 4 & 5: STRATEGY ANALYSIS & GROUPINGS

Each strategy was analyzed individually over a 20-year period (2010-2030) for their cumulative reduction impacts and for cost-effectiveness.

TOOLS:

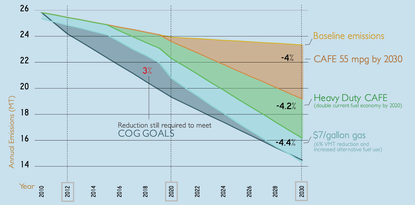
- Regional survey data
- MWCOG, consultant, and national studies
- Components of MWCOG's four-step modeling process (trip generation, trip distribution, mode choice, and trip assignment) or the COMSIS TDM model.
- TPB cost-effectiveness procedure for air quality measures, using dollars of program (or project) cost per ton of CO_2 abated.



All groups combine additive strategies to the full extent currently possible.

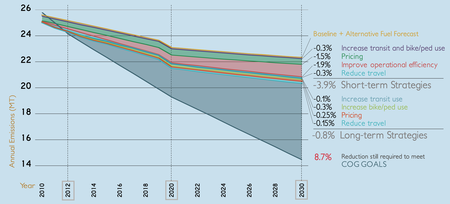
RESULTS

GROUP 1: HIGH FEDERAL ROLE



Group 1 strategies reduce CO_2 emissions to almost meet the overall GHG reduction goal. Together the actions achieve reductions in excess of the 2030 target; however, they do not ramp up fast enough to meet the 2012 or 2020 targets. Cumulatively, by 2030 the actions in Group 1 reduce CO_2 emissions by 12.6%, still 3% short of the regional reduction goal.

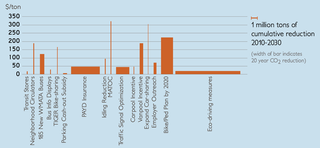
GROUP 2: REGIONAL STRATEGIES



While the strategies in Group 2 do not achieve the overall cumulative goal, they help the region in meeting the earliest target putting the region on the right track toward meeting the later targets.

Short-term strategies reduce emissions by 3.9% and long-term strategies reduce emissions by 0.8% below BAU levels by 2030. A short study period and fewer long-term than short-term strategies contributed to this difference in effectiveness.

COST-EFFECTIVENESS



Most measures demonstrated modest CO_2 reduction potential and thus show high cost-per-ton values compared to 2030 "social cost of carbon" estimates at $33 per ton. However, some cost-effective measures include the pay-as-you-drive insurance, parking cash-out subsidies, and purchase of new CNG transit buses. The accelerated completion of the TPB Bicycle and Pedestrian Plan also stands out as an effective strategy in the middle of the cost-effectiveness range.

DISCUSSION

LESSONS LEARNED

1. Since this study focused on strategies deemed politically feasible, meeting aggressive climate change targets would require more than what the federal government and many state and local governments are currently prepared to consider.
2. A DIVERSE PORTFOLIO of strategies across all levels of government and across the three categories of fuel efficiency, alternative fuels and travel efficiency will be necessary to meet the region's goals for CO_2 reduction.
3. Strategies that can affect the whole LIGHT DUTY FLEET, which represents around 90% of VMT in the region, were shown to be more effective than those that target small portions of the whole fleet. (EXAMPLE: eco-driving assumed a 10% improvement in fuel efficiency for 50% of light duty drivers and was thus not surprisingly among the most effective strategies)
4. Small-scale applications of a measure that targets the HIGHEST POLLUTING VEHICLES, such as buses, were highly effective due to the growing proportion of emissions from heavy duty vehicles.
5. Providing wide-spread NON-POLLUTING TRANSPORTATION OPTIONS were highly effective if implemented on a large enough scale, such as the accelerated completion of the 2030 TPB Bicycle and Pedestrian Plan.
6. Expanding COMMUTER OPTIONS aimed at lowering the SOV rate and reducing VMT, such as increased teleworking and carpool rewards, was effective at reducing emissions from commute trips, which are roughly 20% of all trips are work trips.
7. The cost-effectiveness methodology used was not the appropriate tool for evaluating CO_2 reduction effectiveness. Almost all transportation strategies have multiple benefits beyond CO_2 reduction worth exploring using COMPREHENSIVE BENEFIT COST ANALYSIS.

NEXT STEPS

1. Use MOVES (Motor Vehicle Emissions Simulator) to update CO_2 emissions inventories and strategy analysis.
2. Coordinate with local governments on potential strategy implementation.
3. Analyze additional strategies.
   (EXAMPLES: bus rapid transit and light rail, broader exploration of pricing of existing lanes and cordon pricing, and major freight improvements)
4. Begin analyzing strategies in bundles.
   (Bundling strategies could be used to determine potential effects, both positive and negative, of combining multiple strategies)
5. Consider unintended impacts and second order demand effects for all strategies.
6. Analyze reduction strategies within a comprehensive cost-benefit framework in order to account for multiple benefits.
7. Estimate lifecycle emissions for the CO_2 emissions inventory and strategy analysis.

ACKNOWLEDGEMENTS

Supporting COG Staff: Daivamani Sivasailam, Anant Choudhary, Yu Gao, Eulalie Gower-Lucas, Jinchul (JC) Park, Daniel Son, Michael Clifford, and Ronald Kirby.

QUESTIONS?

Contact Monica Bansal (mbansal@mwcog.org) or Erin Morrow (emorrow@mwcog.org)

Full study materials: http://www.mwcog.org/clrp/elements/scenarios