

National Capital Region Transportation Planning Board

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MEMORANDUM

May 2, 2008

To: TPB Technical Committee

From: Mike Clifford *MC*

Subject: Cost-Effectiveness of Transportation Emissions Reduction Measures (TERMs) in Reducing CO₂ Emissions in the Washington Region

I. INTRODUCTION

Within the last year carbon dioxide (CO₂), as the primary component of greenhouse gases, has taken the center position regionally and nationally in air quality / global warming analyses. The problem is still being defined in terms of contribution to present emissions inventories, forecasts of future emissions, and impacts. However, it is generally clear that mitigation strategies must be brought to bear to control these emissions.

This memo describes some of the work being performed by TPB staff to assist in this effort. As with past air quality analyses, a key to addressing this issue will be to examine control strategies on a cost-effectiveness basis across all sources of CO₂ emissions.

CO₂ Emissions Picture in the Washington Region

COG's Climate Change Steering Committee (CCSC) was created a year ago to analyze this issue at the Washington regional level. Working with this committee and COG/DEP, TPB staff prepared mobile source emissions inventories to enable a consistent time frame with point and area source emission sources. See Exhibit 1 for CO₂ emissions inventories through time for all sectors. Mobile emissions, as well as the other sources, are seen to steadily rise through time. Unlike all previous air quality studies (carbon monoxide, ozone, fine particulates), for which significant decreases are occurring through time due to cleaner vehicles and fuels, CO₂ emissions rise directly as fuel consumption rises.

Reduction Targets

The CCSC has had several discussions involving the setting of appropriate reduction targets to control CO₂ emissions. Their current proposals involve: by 2012, a 10%

reduction from current 2012 forecast estimates (to get back to 2005 levels); by 2020, a 20% reduction below 2005 levels; and by 2050, an 80% reduction below 2005 levels. Exhibit 2 shows these reduction targets applied to CLRP analysis year baseline emissions (along with some results obtained by varying corporate average fuel economy (CAFE) standards. These proposed dramatic reductions in emissions further emphasize the need to carefully analyze all potential reduction strategies. Assessment of the means to achieve these reductions needs to be done for the Washington area to develop specific, effective control strategies.

II. COST-EFFECTIVENESS ANALYSIS

Since the enactment of the 1990 Clean Air Act Amendments, TPB staff has been extensively involved in development of state air quality implementation plans (SIPs) and subsequent air quality conformity analyses. In developing recommendations regarding control strategies to implement in order to meet these air quality requirements, staff has relied upon the use of cost-effectiveness analysis. This approach has been employed in TPB's annual CLRP and TIP conformity analysis, from listing in the *Call For Projects* document through application of methods in the TERMS assessment of implemented and proposed measures. (See the TERMS Tracking Sheet in the TPB's conformity report.)

This analysis provides a consistent documentation of costs and emissions reductions associated with transportation emission reduction measures (TERMs) in order to compare the relative benefits of different measures. While most of this previous work was performed on a daily basis (for an ozone season day), CO₂ costs and benefits typically are analyzed on an annual basis.

The fundamental expression for this, developed for each measure, is:

$$\text{Cost-Effectiveness} = \frac{\text{Annual Costs (\$ per year)}}{\text{Annual Benefits (tons of CO}_2 \text{ reduced per year)}}$$

Documentation for the calculations includes:

$$\text{Annual Costs} = \frac{\text{(Capital Cost)}}{\text{(Project Life Span)}} + \text{Operating and Maintenance Cost per year}$$

The expected life span for the various projects referenced above has been estimated and is available in the documentation accompanying the *Call For Projects* and TERMS reports.

III. ANALYSIS OF TERMS

TERM Tracking Sheet

In recent months TPB staff was asked to evaluate with respect to CO₂ reduction the cost-effectiveness of the Commuter Connections program. This study yielded a cost-effectiveness value of \$17 per ton of CO₂ abated. In light of that request and anticipated future requests, as discussed at the April 15th meeting of the Travel Management Subcommittee staff proceeded with the CO₂ analysis of measures on the TERMS Tracking Sheet, i.e., measures used in past air quality conformity analyses. That work is in progress, and, given that many of the measures are programmed in several different locations, categories of measures have been developed to organize and report the work. Preliminary results providing cost-effectiveness ranges are included in Table 3. These results will be instrumental in comparing the benefits of various point, area and mobile sector reduction strategies to begin to address the need for appropriate control strategies in the Washington area.

Additional Prospective Measures

In addition to the TERMS being analyzed, staff is planning to similarly analyze measures for CO₂ cost-effectiveness to achieve the "What Would It Take ?" scenario being developed by the TPB Scenario Task Force. Staff is also receiving new proposals from the CCSC (for example, see proposed measures in their April 23, 2008 draft report outline – excerpts attached as Appendix A), the Travel Management Subcommittee and the TPB Technical Committee.

IV. Next Steps

Following the completion of this cost-effectiveness work, staff will forward the draft results to TPB technical and policy committees, for subsequent transmittal and discussion at the CCSC and MWAQC committees.

Following: Exhibits 1 -3

Exhibit 1
 Estimated Washington Region CO2 Emissions, 2005-2030 (Business As Usual)

Draft CO2e Emissions Projections for the Washington, DC-MD-VA Region

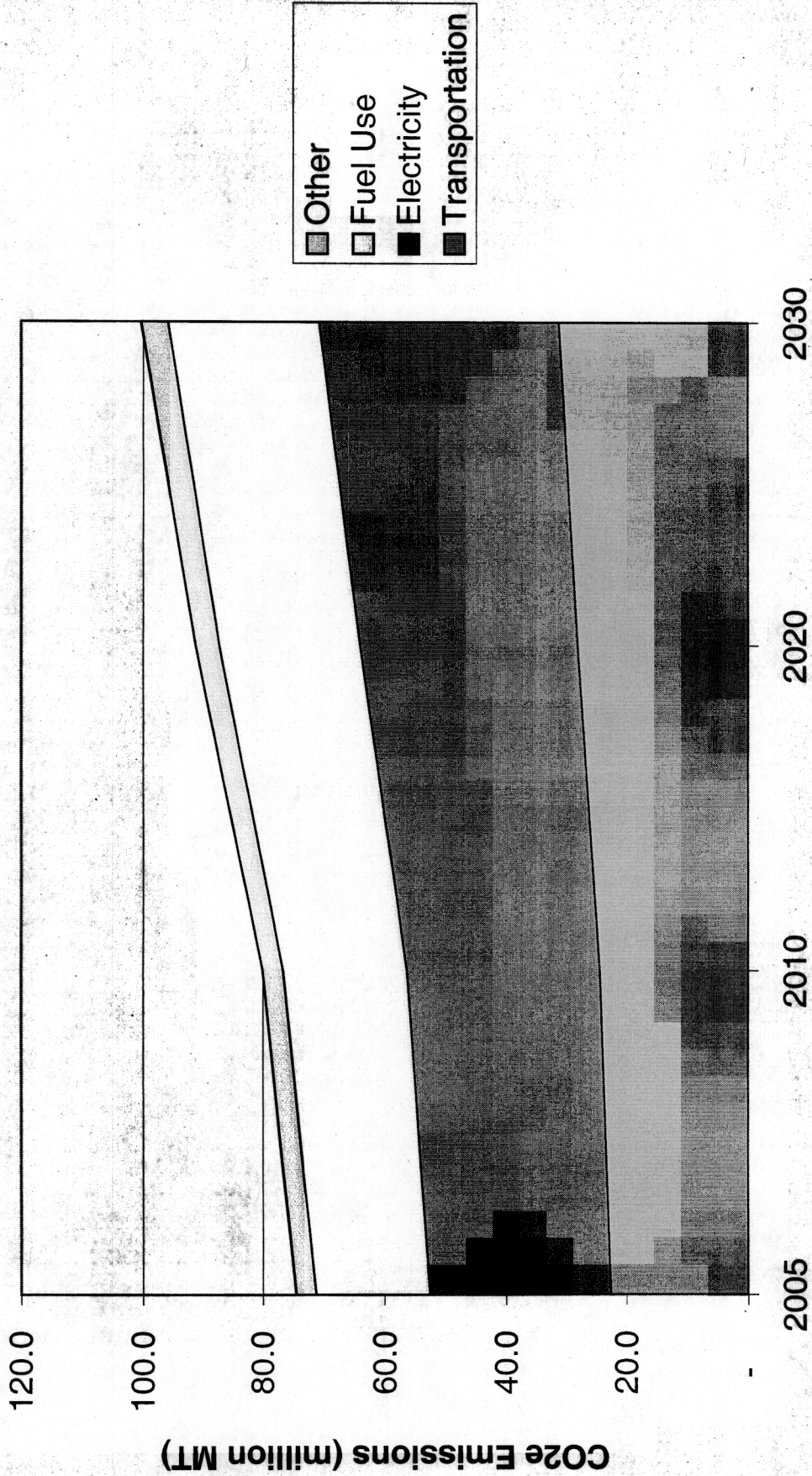


EXHIBIT 2

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

	2005	2020	2030
Baseline Emissions (prior to 2007 CAFE)	24.89	31.02	34.45
% Change from 2005 levels	---	24.6%	38.4%
Emissions With 2007 CAFE (35 mpg by 2020)	24.89	26.83	26.91
% Change from 2005 levels	---	7.8%	8.1%
CCSC Proposed Regional Goal	24.89	19.91	15.75
% Change from 2005 levels	---	-20.0%	-36.7%
Emissions with Enhanced CAFE (55 mpg by 2020)	24.89	23.63	20.86
% Change from 2005 levels	---	-5.1%	-16.2%

EXHIBIT 3
CO₂ Cost-Effectiveness of TERMS

Number	Category Description	CO ₂ Cost Effectiveness Range *
1	Access Improvements to Transit/ HOV	\$100 to \$400
2	Bicycle / Pedesrian projects	\$50 to \$100
3	Transit Service improvements	\$100 to \$800
4	Rideshare Assistance Programs	\$30 to \$300
5	Park & Ride Lots (Transit and HOV)	\$100 to \$500
6	Telecommute Programs	\$10 to \$40
7	Traffic Improvements/TSM	In Progress
8	Engine Technology/Alternative Fuel Programs	In Progress

* Several locations / applications studied

APPENDIX A

excerpts from

**Metropolitan Washington Council of Governments
Climate Change Steering Committee
Final Report Recommendations**

Committee Discussion Draft for April 23, 2008

Committee Discussion DRAFT for 4-23-2008

Regional Climate Change Policies and Program Recommendations	
Sector/Target	Policy/Program Recommendation
VII. Transportation	<p>b) Columbia and Virginia. Collaborate with RGGI to support implementation of energy conservation and renewable energy projects in the Washington region.</p> <p>1) <u>Transportation Planning Options for Meeting Regional Greenhouse Gas Emission Reduction Goals:</u> In collaboration with Transportation Planning Board and its "Scenarios Workgroup":</p> <ul style="list-style-type: none"> a) Evaluate "What would it take?" alternatives for meeting regional greenhouse gas emission reduction goals in transportation sector. b) Based upon "What would it take?" analysis, develop regional policies and plans to meet regional greenhouse gas emission reduction goals for the transportation sector. <p>CCSC proposes that the following types of measures to reduce emissions of greenhouse gases be considered. CCSC seeks an analysis of the relative impact and cost effectiveness of measures including:</p> <ul style="list-style-type: none"> • Smart Growth/Transit Oriented Development • Alternative Modes of Transportation (e.g., exclusive transit ROW, commuter buses, commuter rail, ferries) • VMT Reduction Strategies (e.g., telecommuting, rideshare) • Value Pricing (e.g., entry fees, HOT lanes) • Clean Vehicles and Fuels • Bicycle/Pedestrian

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Regional Climate Change Policies and Program Recommendations

Sector / Target	Policy / Program Recommendation
	<ul style="list-style-type: none"> • Idling Reduction • Congestion Management • Traffic Engineering Improvements and Roadway Management • Incentives • No Regrets Options (e.g., options for which useful benefits exist warranting implementation of the measure, regardless of whether significant greenhouse gas emission reductions are achieved) <p>2) <u>"Conformity" Process for Greenhouse Gas Emissions:</u> Collaborate with the Transportation Planning Board to develop a process similar to the one currently used to demonstrate conformity for ozone and particulate matter for greenhouse gas emissions.</p> <p>3) <u>Smart Growth/Transit Oriented Development:</u> Evaluate the benefits from achieving a range of possible goals (up to 95%) for directing new residential and commercial growth to regional activity centers, including growth around transit as well mixed use higher density development. Provide incentives for mixed-use development, including workforce housing, at transit centers to reduce sprawl and VMT.</p> <p>4) <u>Traffic Engineering Improvements and Roadway Management:</u> a) Identify and promote best practices for traffic engineering improvements and roadway management to reduce VMT, congestion, and emissions of greenhouse gases. Identify</p>

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Regional Climate Change Policies and Program Recommendations	
Sector/Target	Policy/Program Recommendation
	<p>locations of significant recurrent congestion and prioritize investments to reduce congestion. Implement the Metropolitan Area Transportation Operations Coordination Program (MATOC).</p> <p>b) Promote transit-supportive street designs.</p> <p><u>Promote Clean Vehicles and Fuels:</u></p> <p>a) Promote adoption of CAL LEV II standards for all jurisdictions in the region.</p> <p>b) Promote/accelerate adoption of efficient clean fuel vehicles, including hybrids (cars, trucks, buses). Target public and private fleets, transit, taxicabs, rental cars, refuse haulers. Evaluate benefits of specific "green fleet" conversion percentages. Provide incentives for purchase of clean fuel vehicles. Assess benefits from a "Cash-for-Clunkers" Program and rebates or tax incentives for purchase of hybrid vehicles.</p> <p><u>Alternative Modes:</u></p> <p>a) Evaluate greenhouse gas reduction benefits of specific incremental expansion of regional transit capacity, peak commuter rail service. Evaluate funding requirements for purchasing additional transit vehicles, railcars, commuter buses. Evaluate funding requirements for transit incentives and expanded metrocheck program.</p> <p>b) Examine options to promote increased use of existing transit capacity. Consider developing specific targets for shifting modes.</p> <p>c) Expand existing and fund new programs to enhance access to transit and alternative modes, commuter connections,</p>
5)	
6)	

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Regional Climate Change Policies and Program Recommendations

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	<p>guaranteed ride home, telework programs, bike/ped access, park/ride lots.</p> <p>d) Evaluate greenhouse gas reduction benefits of expand existing and establishment of new exclusive transit routes, lanes, on-ramps, corridors.</p> <p>e) Promote equalization of transit and parking benefits.</p> <p><u>VMT Reduction:</u></p> <p>a) Collaborate with TPB to develop regional goals to reduce VMT by 2012 and 2020.</p> <p>b) Identify the percentage of auto trips under 3, 2, 1, ½ mile and develop strategy to shift half of these trips to bike or pedestrian modes.</p> <p>c) Evaluate the potential greenhouse gas emission reduction benefits and costs of financial incentives to reduce VMT.</p> <p>d) Promote car-sharing.</p> <p>e) Examine parking policies and relation to VMT. Implement new parking policies to reduce VMT.</p> <p><u>Bicycle/Pedestrian:</u></p> <p>a) Fully fund construction of bicycle/pedestrian paths in the region as outlined in the regional bicycle/pedestrian plan. Provide incentives to developments that speed improvements to bicycle/pedestrian access. This includes speed improvements to sidewalks, curb ramps, crosswalks, lighting, etc.</p> <p>b) Design regional program to promote bike sharing.</p> <p><u>Idling:</u></p> <p>a) Control Vehicle Idling. No Idling Rule – Restriction. Limits idling to 5 minutes for all non-commercial, consumer</p>
7)	
8)	
9)	

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Regional Climate Change Policies and Program Recommendations	
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	<p>operated vehicles within the Washington NAA. Establish exemptions where required.</p> <p>b) Enhanced Enforcement: Idling. Step-up enforcement of existing regulations to prevent extended vehicle idling.</p>
VIII. Land Use	<p>1) <u>Tree canopy preservation:</u> Establish goal and develop program and plan to achieve a "no net loss" in the region's tree canopy. Consider associated issues related to density and height requirements for buildings.</p> <p>2) <u>Location and Design of New Development:</u> a) Research and develop specific regional goals (up to 95%) to significantly increase percentage of new development located in regional activity centers. b) Promote regional policies that support walkable communities and affordable housing near transit.</p> <p>3) <u>Comprehensive Planning:</u> Identify best practices for local governments to include greenhouse gas reduction and energy as an element in their local comprehensive planning. Such efforts should include practices that address climate change risk reduction to guide local zoning, building codes, site planning and review.</p>
IX. Financing	<p>1) <u>Evaluate Financing Mechanisms:</u> a) Evaluate potential options for financing of greenhouse gas reduction and renewable energy projects in the region: carbon offset fund; redirecting savings from energy efficiency; establishing an energy fee/carbon tax; performance contracting; clean energy fund or utility; participation in cap-and-trade program revenues.</p>