National Capital Region

Climate Change Report

Prepared by the Climate Change Steering Committee for the Metropolitan Washington Council of Governments Board of Directors

July 9, 2008 Review Draft

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NATIONAL CAPITAL REGION

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1. Preface

The coming decades will likely be a time of rapid change and uncertainty with dramatic changes in cost of energy and in the environment. The Metropolitan Washington region's historical growth trends in housing, land use and energy have been disrupted by recent events such as the price of oil and the uncertainty of mortgage lending. Energy, climate and environmental concerns are having profound effects on the region by reshaping development preferences and goals for the types of uses and transit options that are desired by communities. Future economic growth will likely depend on finding reliable low-carbon alternatives to build a sustainable future.

The Metropolitan Washington region has unique advantages that enable it to respond rapidly to increasing energy prices and vagaries of economic cycles. In facing the challenges of energy and climate, the region's advantages include one of the best transit systems in the country, thoughtful and progressive governments that are able to coordinate strategic responses to rapidly changing conditions, a diversified economy, excellent airport and high speed rail hubs, and many viable communities and "activity centers" around the area that provide transit options for future growth.

The region faces serious challenges in the near term dealing with the economy, environment and energy prices. In the longer term, responding to the potentially dramatic impact of global climate change will present an enormous challenge. Early action is needed to avert the worst predicted impacts from climate change. The region needs to transition to a low-carbon future starting today. This report provides the regional framework to do so.

Looking Back and to the Future

On April 11, 2007, the Metropolitan Washington Council of Governments (COG) celebrated its 50th anniversary. As part of its 50th anniversary year, the COG Board of Directors examined the extraordinary changes that took place during the first half century of its existence and how COG grew up along with the region and helped shape its growing and vibrant communities.

The Board then set its sights on the next 50 years. It recognized that one profound force fundamental to defining the decades ahead is global climate change. The Board resolved that the region would become a leader in the growing national and international effort to combat this major challenge to the region's quality of life.

Thus on April 11, 2007, the Board adopted Resolution R31-07 (see Appendix A), creating a regional climate change initiative. In its resolution, the Board stated: "The failure to reduce greenhouse gases can undermine the quality of life in our region and its economic and environmental sustainability." The Board action called for creating a regional climate change program that would include developing a greenhouse gas inventory, setting regional goals and identifying best practices for reducing emissions, advocating policies at the federal and state levels, making recommendations on regional climate change policy, and recommending a governance structure to guide COG's efforts in the future.

By adopting R31-07, the metropolitan Washington region joined more than 28 states and 200 local governments that are taking actions to mitigate and prepare for climate change. The COG initiative was among a handful of regional climate action programs. With its focus on the National Capital Region, COG placed itself front and center on the national landscape of those taking leadership action on climate change.

Resolution R31-07 established a Climate Change Steering Committee to guide the initiative. The committee's initial work, which began in May 2007, focused on examining climate initiatives in Maryland, Virginia, and the District of Columbia, as well as among its twenty-one member local jurisdictions. Between May, 2007 and May, 2008 this work included:

- Reviewing the work of the Intergovernmental Panel on Climate Change, as well as local assessments of potential impacts in the mid-Atlantic region;
- Preparing a report cataloguing best practices and greenhouse gas reduction activities already underway in the region;
- Developing an inventory of greenhouse gas emissions, and forecasting the future level of emissions out to 2050 under a "business as usual" scenario;
- Evaluating a wide range of potential regional greenhouse gas reduction goals, and reaching consensus on an aggressive sequence of reduction targets starting in 2012;
- Examining state and federal legislation;
- Preparing advocacy positions primarily focused on enhancements to local and regional roles and resources to support local and regional initiatives;
- Endorsing the Cool Capital Challenge, a grassroots effort to jumpstart emission reductions in the region;
- Reviewing a wide range of measures to reduce greenhouse gas emissions;
- Framing a regional Climate Action Plan; and
- Recommending a governance structure to guide COG's efforts in the coming years.

This report reflects the work of the COG Climate Change Steering Committee during the past year. It presents recommendations for regional action by proposing broad goals, identifying actions that will begin to reduce regional greenhouse gas emissions, and it setting in place a process to implement the regional framework crafted in this document.

An overarching tenet of this report is the Climate Change Steering Committee's acceptance of the overwhelming evidence presented by the Intergovernmental Panel on Climate Change, U.S. National Academies of Science, National Center for Atmospheric Research, and others that the Earth is gradually warming and this warming trend is due in large part to human activities. The Committee also acknowledged the need for taking action now in an effort to avoid the potentially catastrophic consequences of climate change forecast for the middle and latter parts of this century. The committee was motivated not only by the need for action to address global climate change, but also by the growing body of evidence that adverse consequences are already taking place in our region.

While climate change concerns provided the foundation for the action plan recommended in this report, the committee also notes that many, if not virtually all, of the recommended actions will provide very significant benefits and will enhance the future of the region's quality of life, irrespective of whether the anticipated climate changes materialize as predicted, or whether the collective intervention of those in this region, across the United States, and elsewhere in the world ultimately produce the desired greenhouse gas mitigation benefits.

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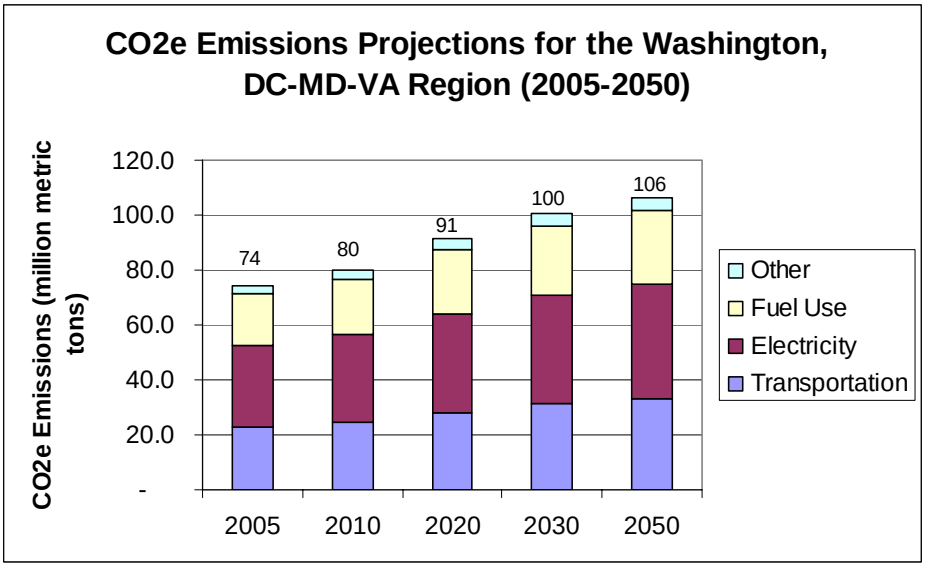
2. Executive Summary

Facing the Facts

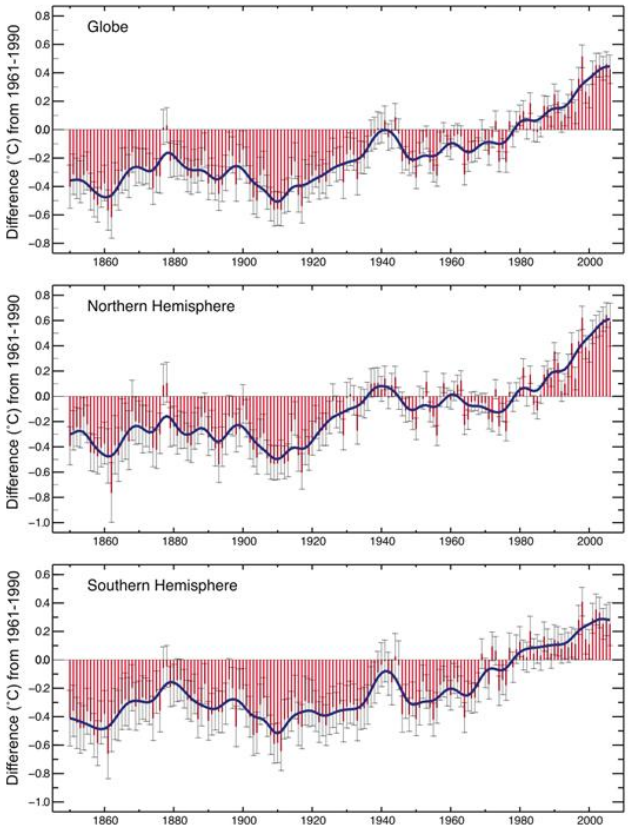
The Washington metropolitan region is growing. The Metropolitan Washington Council of Governments (COG) forecasts that between 2005 and 2030, the region will gain 1.6 million new residents and 1.2 million new jobs. The forecasts are based on historical growth patterns or "business as usual." The region's growth has been fueled by relatively inexpensive gasoline prices, encouraging development in outer suburbs and bringing more cars and traffic congestion to the region's roads. Population in the outer suburbs is predicted to experience the fastest growth, a 47 percent increase by 2030, compared to 18-20 percent in the regional core and inner suburbs (MWCOG 2007a). Based on current business-as-usual projections of growth in population, housing, employment, and energy use, total greenhouse gas emissions in the region will increase by 33 percent by 2030 and 43 percent by 2050. (see Figure ES-1)

Figure ES-1. Projected Growth in Regional Greenhouse Gas Emissions Under a Business As Usual Scenario



An enormous amount of energy is needed to fuel the region and the nation's economy and lifestyle. Industrial development and the spread of the automobile have created a strong, growing economy but the consequences are emissions that cause global warming. Global-warming is happening and leading to climate change that is accelerating faster than scientists anticipated as recently as three years ago (see Figure ES-2). The Intergovernmental Panel on Climate Change (IPCC) concludes "most of the observed increase in globally averaged temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations." Scientists predict that irreversible changes in temperature and weather will occur by mid-century if current energy use, fuels and life-styles do not change. There is an urgent need to address the causes of global warming, as the costs of inaction are greater than the costs of mitigation and adaptation.

Figure ES-2. Global Temperature Trends



Observed Global Warming

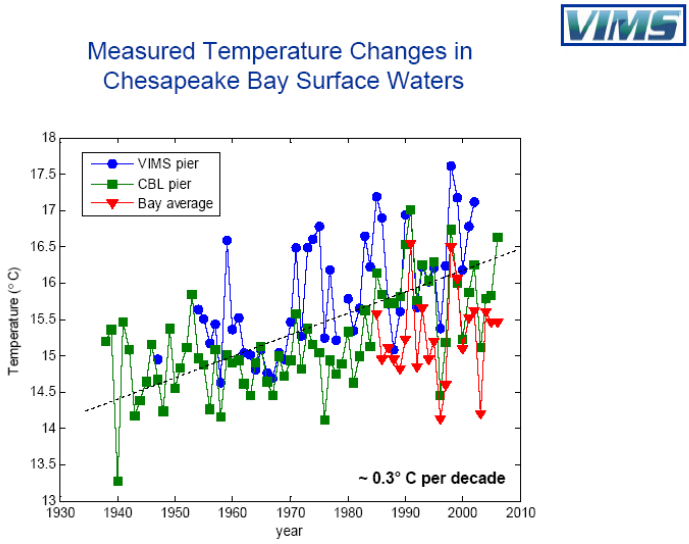
Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level

Global average warming in the past century is 0.74°C (1.3°F)

U.S. temperatures warmed during the 20th and into the 21st century; temperatures are now approximately 0.56°C (1.0°F) warmer than at the start of the 20th century, with an increased rate of warming over the past 30 years

The Metropolitan Washington Region is experiencing the effects of climate change with rising sea levels and a **warmer Chesapeake Bay;** more than 2°C (3.6°F) in the past 70 years (see Figure ES-3). With the warming, the Bay's ecosystems like submerged aquatic vegetation and oyster farming are adversely impacted. Changes in the climate will have significant effects on the region's natural environment, built environment, all sectors of the economy, and on residents of the region, their families, communities and workplaces.

Figure ES-3.



Taking Stock: Regional Inventory
Developing a greenhouse gas inventory is an important first step in reducing the region's contribution to global CO_2 levels. The inventory provides a basis for developing an action plan and setting goals and targets for future reductions, helps to identify the largest sources of greenhouse gases, enables tracking of trends over time, and documents the impacts of actions taken to reduce emissions.

In the base year, 2005, greenhouse gas emissions in the metropolitan Washington region totaled 74 million metric tons (MMt). As shown in Figure ES-1, the inventory includes emissions from electricity generation; on-road motor vehicle transportation; residential/commercial/industrial and commercial aviation fuel use; and other sources, including hydrofluorocarbons used as refrigerants and solvents, and methane from wastewater and landfills. In 2005 two sectors, transportation and electricity use, contributed more than 70 percent of regional CO_2 emissions.

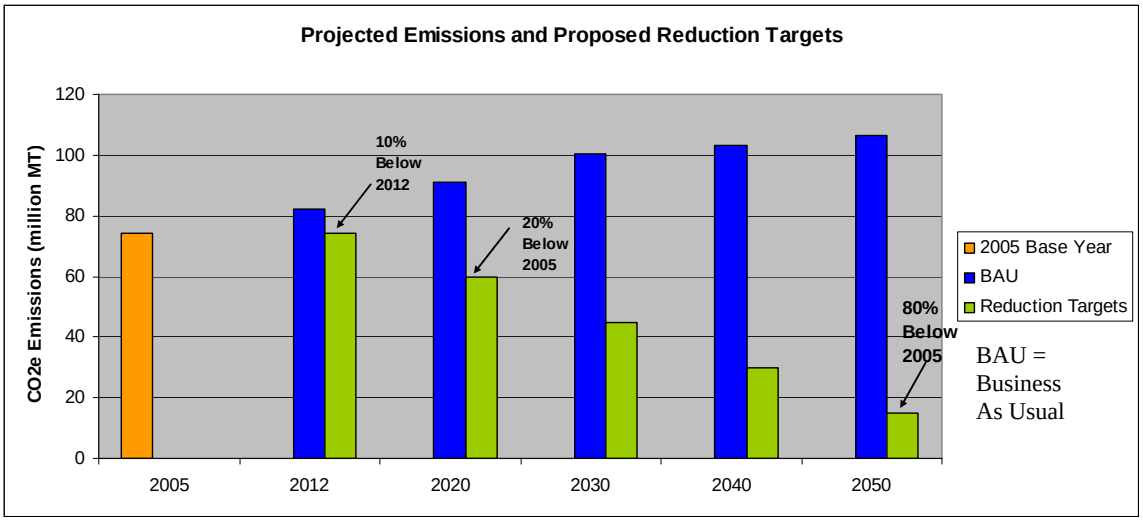
Projected Growth
Based on current business-as-usual (BAU) projections of growth in population, housing, employment, and energy use, ***total emissions from energy consumption (electricity and fuel use) in the region will increase by 35 percent by 2030 and 43 percent by 2050 and*** total emissions from ***transportation in the region will increase by 38 percent by 2030 and 47 percent by 2050 (see Figure ES-1).*** Energy consumption is 66 percent of the total inventory; transportation contributes 30 percent of the region's greenhouse gas emissions inventory.

The inventory projections do not account for the recently adopted federal CAFE and energy efficiency standards. The inventory also does not account for the 4.1 MMt of CO_2 emissions that are absorbed (or "sequestered") by the metropolitan area's 1.3 million acres of undeveloped forests and grassland. As development increases, these areas are expected to decline, reducing the region's overall capacity to absorb and temporarily store greenhouse gas emissions. Further research is needed to better project the anticipated loss of forest and grassland in the region.

Regional Targets
COG's Climate Change Steering Committee recommends establishing regional greenhouse gas reduction goals for three target years: 2012 to force early action, a medium-range goal (2020) to encourage expansion of recommended policies and programs, and a long-range goal (2050) to stimulate support for research into technologies and clean fuels needed to stabilize greenhouse gas emissions.

The goals are based on scientific evidence from the Intergovernmental Panel on Climate Change and are equivalent to similar goals adopted by jurisdictions in the Washington region. The recommended goals are to reduce greenhouse gas emissions 10% below business as usual by 2012; reduce 20% below 2005 levels by 2020; and reduce 80% below 2005 levels by 2050.

Figure ES-4. Comparison of Projected Regional Greenhouse Gas Emissions Under Business As Usual (BAU) and Proposed Emission Reduction Scenarios: 2005–2050



2012 Target: Reduce Business As Usual Emissions (BAU) by 10 Percent
Between 2005 and 2012, regional energy consumption and greenhouse gas emissions are expected to grow by about 10 percent under a Business As Ususal scenario. The goal is to stop projected growth in regional greenhouse gas emissions by achieving a 10 percent reduction in regional emissions between 2008 and 2012.

Strategy to Modify Energy-Consuming Behaviors
Changing the energy-consuming behavior of individuals, households and businesses offers a potentially significant gold mine for greenhouse gas reductions. Individuals and businesses can take simple measures to reduce energy consumed daily by driving, heating and cooling in the home and workplace, and disposing of trash. Opportunities for education and outreach efforts include persuading consumers to purchase more energy-efficient cars, appliances, and heating and air conditioning units, and to consider alternatives for commuting to work other than by driving alone, and increasing recycling. Many of the measures are relatively easy to achieve through incentives from utilities and local governments working together.

2020 Target: Reduce BAU Emissions by 20 Percent Below 2005 Levels
The Climate Change Steering Committee recommends an interim goal of 2020 to reduce emissions to 20 percent below 2005 levels. Some of the reduction will be achieved by a combination of federal, state, and local policies, such as the Energy Efficiency Act of 2007, the new federal CAFE standards, and regional cap-and-trade program for utilities, such as the Regional Greenhouse Gas Initiative (RGGI). To assess what would be involved in meeting the 2020 goal, the Climate Change Steering Committee prepared a preliminary analysis of current and potential future greenhouse gas reduction measures with an estimated reduction benefit by 2020. That reduction works out to be 55-57 percent of the quantity of reductions needed to reach the 2020 goal. The Committee believes that a plan for achieving the full reduction can be developed in the next 1-2 years.

2050 Target: Reduce BAU Emissions by 80 Percent Below 2005 Levels
An ambitious long-term goal of reducing emissions to 80 percent below 2005 levels by 2050 would present a challenge to the region and would place the region among national leaders calling for aggressive action to address climate change. Strategies to achieve the goal include energy efficiency and conservation; fuel switching and carbon capture and storage; renewable fuels and electricity/forest and soil storage, low-carbon vehicle technology; changes in development patterns in new and existing developments; and nuclear energy. All require a coordinated effort involving actions on the part of individuals, businesses, federal and state policy and regulations, academic research and development, and new technologies.

Cost of Meeting the Targets
McKinsey & Company and the Corporation Board (2007) studied the cost of measures to reach a 2030 goal. The most cost-effective options are improving the energy efficiency of buildings (e.g., lighting and heating, ventilation, and air conditioning systems) and appliances, and increasing the fuel efficiency of vehicles. Such investment in energy efficient technology can actually save consumers money. The most expensive options—but still less than $50 per metric ton of avoided emissions—involve shifting to less carbon-intensive energy sources, such as wind, solar, and nuclear power. The study concluded that the savings of these measures outweigh the costs, and the measures can significantly abate greenhouse gas emissions. A more intensive financial analysis of the specific measures identified in the report is recommended in the coming year.

Taking Action
Mitigating Emissions from Energy Consumption
The region has many advantages to help address the challenge of a changing climate. It has a good transit system, local governments have a history of working together to develop strategic response to changing conditions, the region has a diversified economy and serves as a hub for rail and air traffic. Reduced energy use provides significant regional benefits, such as enhanced quality of life, reduced energy expenses and less pollution in addition to reduced greenhouse gases. Rising to the challenge of transforming to a low-carbon economy will produce economic benefits for the region as well as helping to minimize the adverse impacts of changing climate.

COG's Climate Change Steering Committee recommends a number of measures to reduce regional carbon dioxide emissions, listed in Table ES-1. The Committee recommends reducing emissions from the energy sector, 66 percent of emissions in the region, by **improving energy efficiency**, **reducing demand for energy**, and **developing clean (alternative) energy sources**.

Mitigating Emissions from Transportation and Land Use
The Climate Change Steering Committee (CCSC) recommends reducing emissions from transportation (30%) by **reducing Vehicle Miles Traveled (VMT)**, **increasing fuel efficiency**, and **reducing the carbon content of fuel**. Changes to land use planning are recommended to reduce greenhouse gas emissions from future development. A list of recommendations for transportation and land use are given in Table ES-1.

Regional Economic Development
In the Washington region employment is projected to grow 39 percent by 2030. What types of jobs will be created in the next 20-25 years? Are we adequately training our workforce to assume these positions? The CCSC views environmental protection, greenhouse gas reduction, and green energy development as an opportunity to create new green jobs. The passage and expansion of renewable portfolio standards and increased purchases of renewable energy, plays an important role in stimulating the green economy and in creating new green jobs.

Preparing for the Impacts of Climate Change
The full scope of the impacts of climate change on the Washington region is yet to be analyzed. Risks and costs are critical to any set of decisions that will require an investment of substantial resources. That said, it's not too early for the region to begin a systematic investigation of high-priority program areas and initiate early planning. The state of Maryland has been actively addressing adaptation priorities and opportunities, but so far has focused mainly on coastal areas, which are particularly vulnerable. Virginia has also begun to assess the potential damage climate change could have on its coastal areas, agriculture and recreational resources.

Local governments and waste and wastewater utilities in the region are taking actions to adapt to the potential risks of climate change. CCSC recommends the region analyze changes and risks to the region's transportation infrastructure, buildings and population living in low-lying areas. Regional adaptation policies need to be developed for regional emergency response planning.

Financing Mechanisms
Local greenhouse gas reduction actions can help the region stabilize energy demand, diversify energy supply, lower utility bills, improve air quality, create more walkable community designs, and provide the region the chance to develop our impressive transit system, green collar workforce, and green building and technology base.

There are several ways area governments can cover the costs associated with climate change activities, such as paying for energy efficiency improvements through the use of energy performance contracting and using economies of scale through cooperative purchasing. Proceeds from federal energy block grants and proposed cap and trade legislation are also going to be essential for assisting the region to meet its greenhouse gas reduction goals.

Outreach and Education
The Climate Change Steering Committee (CCSC) believes that education and outreach is critical to meeting the region's target reduction goals. Developing a regional public education campaign to promote individual and institutional efforts to reduce greenhouse gases in the region is essential. Individual and institutional actions to achieve regional reduction goals include improved energy efficiency in buildings and residences, purchase of energy efficient appliances, driving less (public transit, bike, walk), recycling, and using less water. CCSC recommends developing partnerships with the private sector and other organizations such as ICLEI, Cool Counties, Cool Cities, and Climate Communities to achieve outreach goals.

Next Steps: COG Climate Change Initiative

Proposed Governance Structure for Ongoing COG Climate Change Initiative

The committee concludes that creation of a permanent COG Climate Change initiative is essential given the long-term nature of this challenge. To provide oversight and direction for the initiative, a COG Board **Climate and Energy Policy Committee** should be established with a broad membership from COG elected officials. State and federal agencies, and business and other key stakeholders should be requested to participate in this new committee.

Next Steps

The recommendations contained in this report fall broadly into several categories. Certain recommendations, such as the regional greenhouse gas emission reduction goals, are quantitative and time-specific. A significant number of the recommendations set the direction for regional policy, but require further analysis to support a definitive and quantifiable proposal, for example, setting a regional green power purchase goal, or a regional vehicle miles of travel (VMT) reduction goal. Other recommendations reflect policy principles to guide the region and COG's members as the climate change program moves forward.

To help define the work program in the coming year and beyond, the committee has developed the following matrix (Table ES-1) that contains, classifies, and analyzes all of the recommendations included in this report. The matrix provides a sense of timing, with many of the initiatives listed as having an immediate time frame. The initiatives identified as immediate necessarily will be the focus in the next year.

Partnership with regional stakeholders will be essential to carrying out most of the recommendations. In the next year CCSC recommends that COG develop detailed plans to achieve the reduction goals as well as to track progress toward the goals.

Table ES-1. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
I. Regl GHG Reduction Goals					
1. 2012: Reduce 10% by 2012	Medium	Immediate	Low	Medium-High	COG Members, Fleet, Energy, and Building Managers, General Public, Board of Trade, Procurement Officers
2. 2020: Reduce 20% below 2005	High	Midrange-Long Term	Low-Medium	Medium-High	COG Members, Federal Government, Board of Trade, WMATA, MWAA, Procurement Officers
3. 2050: Reduce 80% below 2005	High	Midrange-Long Term	Medium-High	Medium-High	All
II. Energy					
1. Regional green building policy	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
2. Energy performance goals for public buildings	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers
3. Incentives/outreach to improve private building efficiency	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
4. Identify best practices for private buildings, improve efficiency	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
5. Green affordable housing policies/programs	Medium-High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, Housing Directors, MDPC, Planning Directors, GSA, USGBC
6. Energy conservation and efficiency goals, plan	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Energy Advisory Committee, State Energy Offices, Utilities, Universities, Businesses, General Public, ACEEE
7. Home weatherization program, energy audits, retrofits	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Utilities, State Energy Offices
8. Best practices to reduce methane, use biosolids	Medium-High	Midrange-Long Term	Medium-High	Medium-High	COG Members, Wastewater Treatment Facilities, Landfills, EPA
9. Identify best practices for local govt, reduce 15%	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Energy Advisory Committee, State Energy Offices, Utilities, Universities, Businesses, General Public, ACEEE
10. Energy Use: Energy Star goals for new buildings	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, EPA, Energy Advisory Committee, Board of Trade, AIA, Trade Asscns
11. Green Power: utilization goals	Medium-High	Immediate-Midrange	Medium-High	Medium	COG Members, EPA Green Power Partnership, Energy Managers, Utilities, Procument Officers
12. Green Power: regional cooperative purchase	Low-Medium	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Advisory Committee, Energy Managers, Utilities, Procument Officers
13. Regional street lighting analysis	Low-Medium	Immediate	Medium-High	Medium	COG Members, Energy Managers, Utilities, Board of Trade, Private Sector
14. Regional energy performance contracting	Low-Medium	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Managers, State Energy Offices, Utilities, Private Sector
15. Long term goal: carbon neutrality for public buildings	High	Long-Term	Varies	Medium	COG Members, IGBG, Facilities Managers, USGBC, AIA
16. Recycling programs	Low-Medium	Immediate-Midrange	Varies	High	COG Members, Recycling Committee
17. Partnership programs	Medium-High	Immediate-Midrange	Low-Medium	Medium-High	COG Members, EPA Energy Star, USGBC, Board of Trade, Utilities
18. Promote 20% RPS, including imports	High	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Advisory Committee, Energy Managers, Utilities, State Energy Offices
19. RGGI - Expand to DC & VA	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	Virginia, DC, Maryland, RGGI States
20. RGGI funds for efficiency and renewables	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Maryland, RGGI States

Table ES-1. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
III. Transportation and Land Use					
1. Promote adoption of clean vehicles, including CAL LEV II	High	Immediate-Midrange	Medium-High	High	COG Members, State Legislature, Fleet Managers, Auto Manufacturers
2. Provide incentives for early vehicle retirement	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Local and State Govt, Auto Dealers
3. Green fleet policy	Medium-High	Immediate-Midrange	Medium-High	Medium-High	COG Members,
4. Traffic engineering and roadway improvements	Low-Medium	Midrange-Long Term	Varies	High	COG Members, DOTs, TPB
5. Anti-idling initiatives: rules and enforcement	Low-Medium	Immediate	Low-Medium	Low-Medium	COG Members, Local Govt, Police
6. VMT Reduction: goals	Medium-High	Midrange-Long Term	Medium-High	Low-Medium	COG Members, TPB, DOTs, Local Govt, Transit Authorities
7. VMT Reduction: shift short trips	Low-Medium	Immediate-Midrange	Low	Medium-High	COG Members, Local Govt, Transit Authorities, Commuter Connections
8. VMT Reduction: financial incentives	Low-Medium	Immediate-Midrange	Medium-High	Low	COG Members, State and Local Govt
9. VMT Reduction: car sharing	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Local Govt, Zipcar, Flexcar
10. VMT Reduction: parking policies	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, State and Local Govt
11. VMT Reduction: financial and other incentives	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, State and Local Govt, Private Sector
12. Develop conformity process for GHGs	Medium-High	Midrange-Long Term	Medium-High	Low	COG Members, TPB, DOTs
13. Stated goal of GHG reduction in transportation planning	Medium-High	Midrange-Long Term	Medium-High	Low	COG Members, TPB, MDPC, DOTs, WMATA
14. Direct development to activity centers	Low-Medium	Midrange-Long Term	Varies	High	COG Members, Planning Directors, MDPC, TPB, Board of Trade, DOTs, WMATA
15. Expand transit infrastructure and use	Medium-High	Midrange-Long Term	Medium-High	Medium-High	COG Members, Transit Authorities, TPB, DOT
16. Alternative Modes: exclusive transit routes	Low-Medium	Midrange-Long Term	Medium-High	Medium-High	COG Members, TPB, DOTs, State and Federal Govt, Transit Authorities
17. Alternative Modes: promote increase transit use	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, Commuter Connections, TPB, DOTs, Local Govt, Transit Authorities
18. Targets for shifting modes	Low-Medium	Midrange-Long Term	Medium-High	Medium-High	COG Members, Private Sector
19. Alternative Modes: enhance access	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, TPB, DOTs, Local Govt, Transit Authorities
20. Travel management plan for new developments	Medium	Midrange-Long Term	Low-Medium	Low-Medium	COG Members, Private Sector, Planning Directors, MDPC
21. Equalize transit and parking benefits	Low	Immediate-Midrange	Low	Low	COG Members, State and Local Govt
22. Bicycle/pedestrian programs	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, TPB, DOTs, Local Govt, WMATA
23. Land Use Planning: Tree canopy preservation	Low-Medium	Midrange-Long Term	Low-Medium	High	COG Members, State and Local Forestry Agencies, U.S. Forest Service, Casey Trees, Center for Chesapeake Communities
24. Land Use Planning: Promote location & design of new development around regional activity centers	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Local Planning Agencies, Local Developers, Greater Washington 2050
25. Land Use Planning: Promote walkable communities and affordable housing near transit	Medium-High	Midrange-Long Term	Medium	High	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers, WMATA
26. Evaluate LEED-ND Standards	Medium-High	Immediate-Midrange	Medium	Varies	COG Members, Planning Directors, MDPC, TPB, Board of Trade, DOTs, WMATA
27. Comprehensive Planning: best practices	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers
28. Comprehensive Planning: environmental review	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers

Table ES-1. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
IV. Economic Development					
1. Promote green business & green jobs	Low	Immediate-Midrange	Medium-High	Medium-High	COG Members, Board of Trade, Universities, Sustainable Business Alliance
2. Promote eco-business or green business zones	Low	Immediate-Midrange	Medium-High	Medium-High	COG Members, Board of Trade, Universities
3. Promote cooperative green purchasing	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, Procurement Officers, Board of Trade
4. Promote local food production options	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, State and Local Govt, Farmer's Cooperatives, Regional Agricultural Workgroup, Community Supported Agriculture, Freshfarm Markets
5. Promote local vendors and suppliers	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, State and Local Govt, Farmer's Cooperatives, Economic Development Authorities
6. Regional green jobs analysis	Low	Immediate	Low-Medium	Medium-High	COG Members, Board of Trade, Universities, Sustainable Business Alliance
V. Adaptation					
1. Partner w/ university to develop 2050 Impacts Report	Low	Immediate-Midrange	Medium	Medium	COG Members, University of Maryland, NOAA
2. Develop adaptation policies based on report	Low	Midrange-Long Term	Medium	Medium	COG Members, Utilities, Private Sector, State and Federal Govt.
3. Conduct regional adaptation workshops	Low-Medium	Midrange-Long Term	Medium	Medium	COG Members, University of Maryland, NOAA
VI. Financing					
1. Evaluate financing mechanisms for GHG reduction & Energy Efficiency Projects	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Chicago Climate Exchange, MD Strategic Energy Fund, Block Grants, Energy Efficiency Partnership of Greater Washington
2. Regional offset fund for tree canopy enhancement	Medium	Immediate-Midrange	Medium	Medium	COG Members, State and Local Forestry Agencies, U.S. Forest Service, Casey Trees, Center for Chesapeake Communities
3. Identify funding for transit	Medium-High	Immediate-Midrange	High	High	COG Members, State and Federal Govt, WMATA
4. Identify funding for building retrofits	Medium-High	Immediate-Midrange	High	High	COG Members, State and Federal Govt, ESCOs
VII. Outreach & Education					
1. Citizen Outreach Campaign	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Clean Air Partners, Commuter Connections, Wise Water, Recycling Committee, IGBG
2. Develop partnerships w/private sector & others	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Board of Trade, Federal Government, WMATA, MWAA, Cool Capitol Challenge
3. COG member outreach (assistance)	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, Cool Capitol Challenge, EPA, ICLEI, Sierra Club
4. Recognition program	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, EPA, ICLEI, US Conference of Mayors
5. COG Climate Change website	Low-Medium	Immediate	Low-Medium	Low-Medium	COG Members, ICLEI, EPA

Table ES-1. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
VIII. COG Climate Change Program					
1. Establish the COG Climate and Energy Policy Committee	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
2. Identify work program priorities, products and timetables	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
3. Design outreach and education program	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
4. Develop advocacy positions for federal and state legislation	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
5. Evaluate recommended greenhouse gas reduction measures for cost effectiveness	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
6. Identify regional goals for recommended greenhouse gas reduction measures	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
7. Prepare plan to reach 2012 goal	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
8. Develop system for tracking progress toward greenhouse gas reduction goals	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
9. Seek additional resources such as in-kind contributions from stakeholders, partners, consultants	-	Immediate-Midrange	Low-Medium	-	COG Members, Greater Washington Board of Trade, EPA, DOE
9. Seek additional funding from foundations, grants to support selected work program elements	-	Immediate-Midrange	Low-Medium	-	COG Members, Foundations

Key:

Timing:
Immediate - Now to June 2009.
Midrange - 1-3 years.
Longterm -More than 3 years.

Emission Impact:
Low - Minimal emission reduction expected.
Medium - Some emission reduction anticipated.
High - Significant emission reduction anticipated.

Cost:
Low - Relatively low cost.
Medium - Moderate financial costs.
High - Expensive option to implement.

Economic Co-Benefits:
Low - Action will have limited impact on other areas of the economy.
Medium - Some economic synergies are anticipated.
High - Significant enhancement to the economy or sector are possible.

I: Facing Facts, Taking Stock and Taking Aim

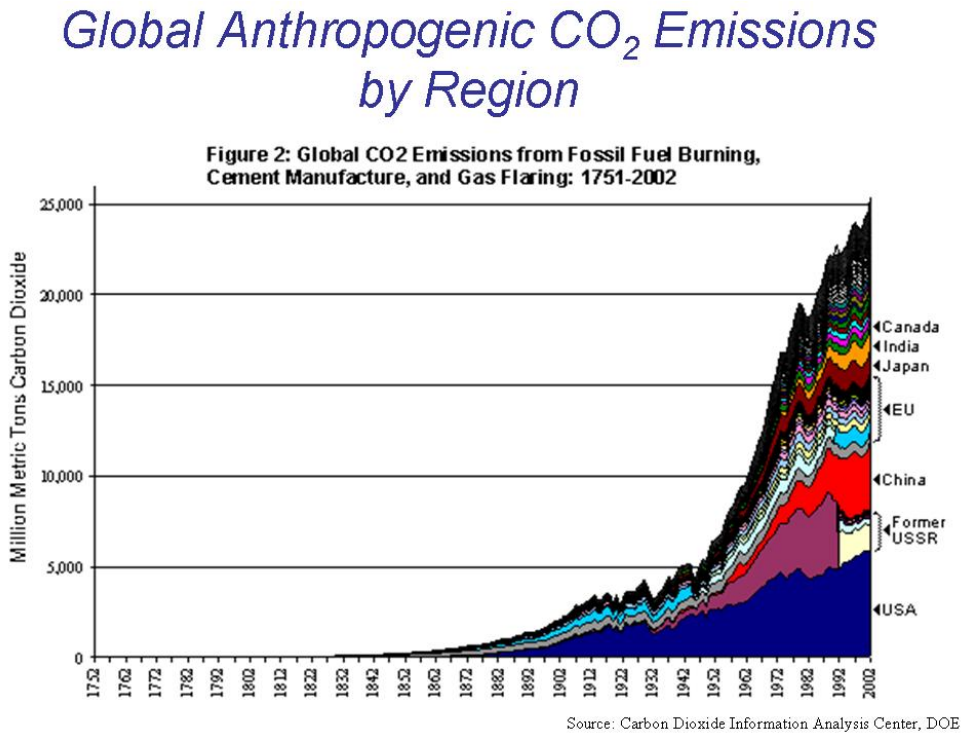
3. Facing the Facts: Our Climate Is Changing

An overwhelming body of scientific evidence indicates that climate is indeed changing and has changed rapidly starting at the beginning of the twentieth century.[1] The greenhouse effect is a natural warming process. Carbon dioxide (CO_2) and other gases, primarily methane and nitrous oxide, are always present in the atmosphere. They create an effect similar to the warming inside a greenhouse, where energy from the sun passes through the gases, is reflected back by the earth's surface, and much of this radiation is trapped by the various greenhouse gases. Natural factors that affect the balance between the sun's energy warming the Earth and loss of energy into the atmosphere include clouds, water vapor, and greenhouse gases.

Starting in the mid-20th century, the greenhouse effect and associated global warming has been accelerated by the dramatic increase in man-made greenhouse gases, according to the scientific consensus of the Intergovernmental Panel on Climate Change, the National Academy of Sciences and other scientific organizations.

Figure 1 shows the dramatic rise in global CO_2 emissions since the mid-1750s, and the relative contributions from various large industrial countries.

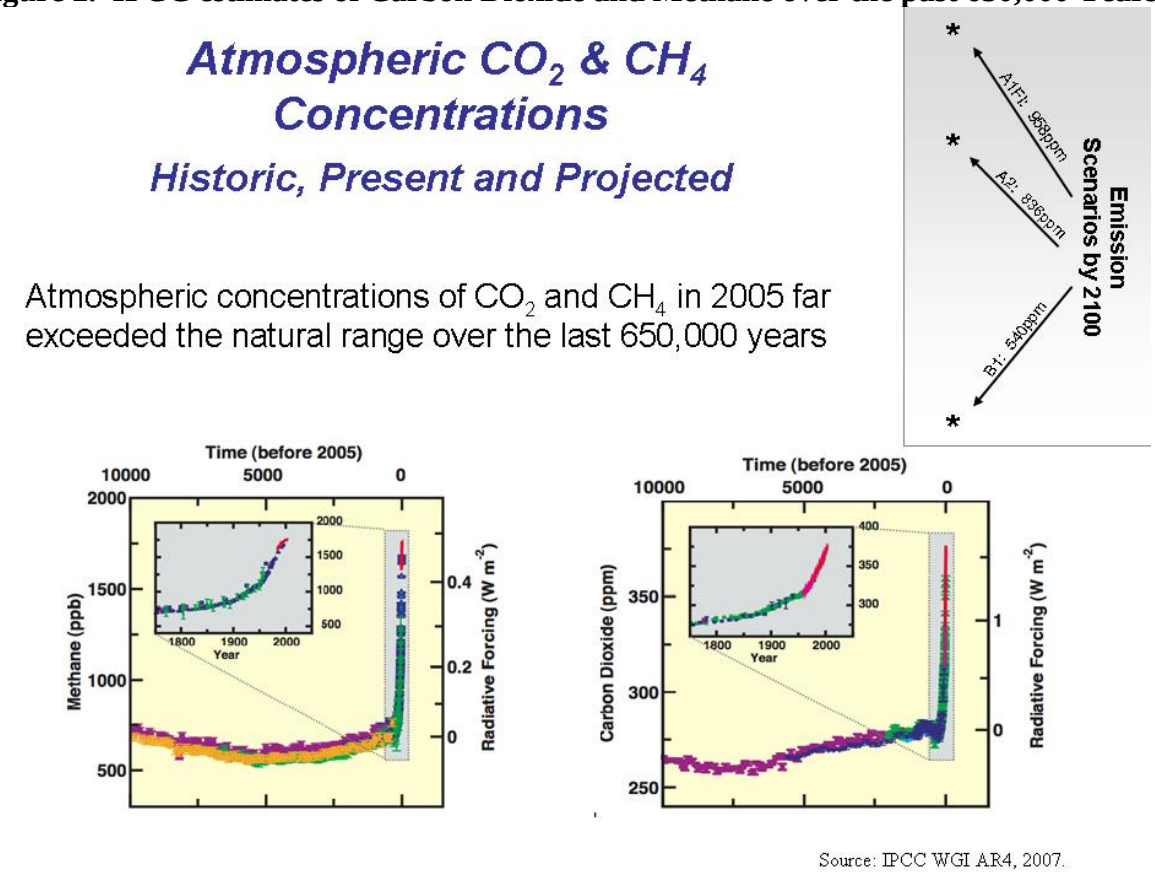
Figure 1. Global Anthropogenic CO_2 Emissions by Region



[1] See Glick et al. 2008, NSCT 2008, USCCSP 2008.

Figure 2 shows the dramatic increase in concentrations of CO_2 and methane (CH_4) in the atmosphere and the projected concentrations absent any mitigation of man-induced emissions. Concentration levels are projected out to 2100 showing the possibility of unprecedented levels of CO_2 and methane are possible.

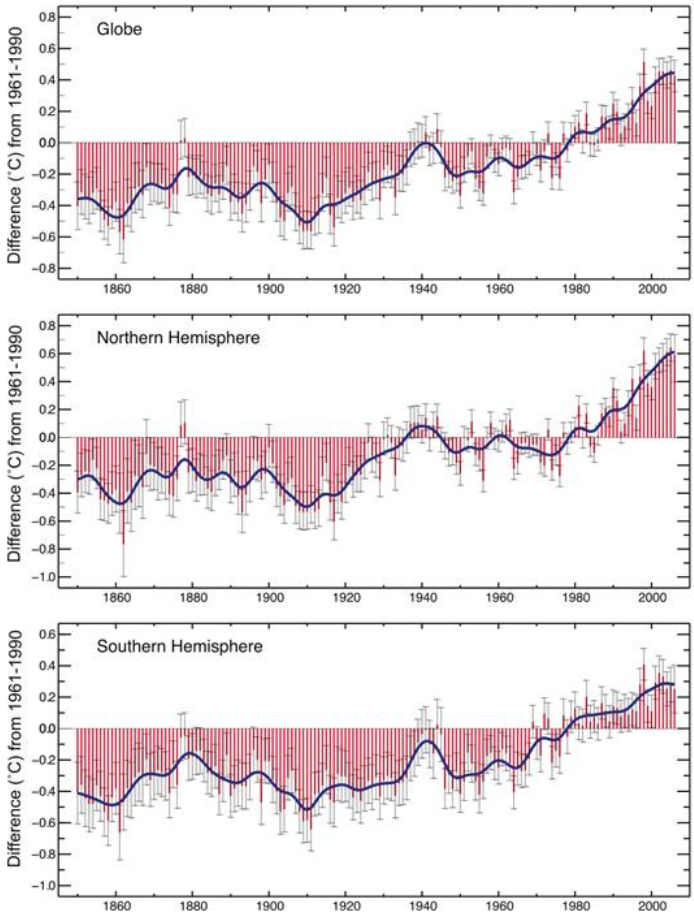
Figure 2. IPCC estimates of Carbon Dioxide and Methane over the past 650,000 Years



Source: IPCC WGI AR4, 2007.

Figure 3 shows the evidence for increased temperatures across the globe. While there may be some degree of natural variability in temperature cycles, the conclusion of the IPCC is that *warming of the climate is unequivocal*. Over the last century, the accumulation of greenhouse gases (GHGs) in the atmosphere is estimated to have raised average global temperatures by more than 0.74°C (or 1.3°F). Before industrialization, the amount of carbon dioxide released to the atmosphere by natural causes was in balance with the amount absorbed by plants, oceans, and other "sinks." More rapid warming in higher latitudes in the Northern Hemisphere could have potentially devastating implications for coastal areas of the U.S. and around the world due to sea level rise associated with melting polar sea and land ice (see USCCSP 2008, Glick et al. 2008, Fahrenthold 2008).

Figure 3. Observed Global Warming



Observed Global Warming

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level

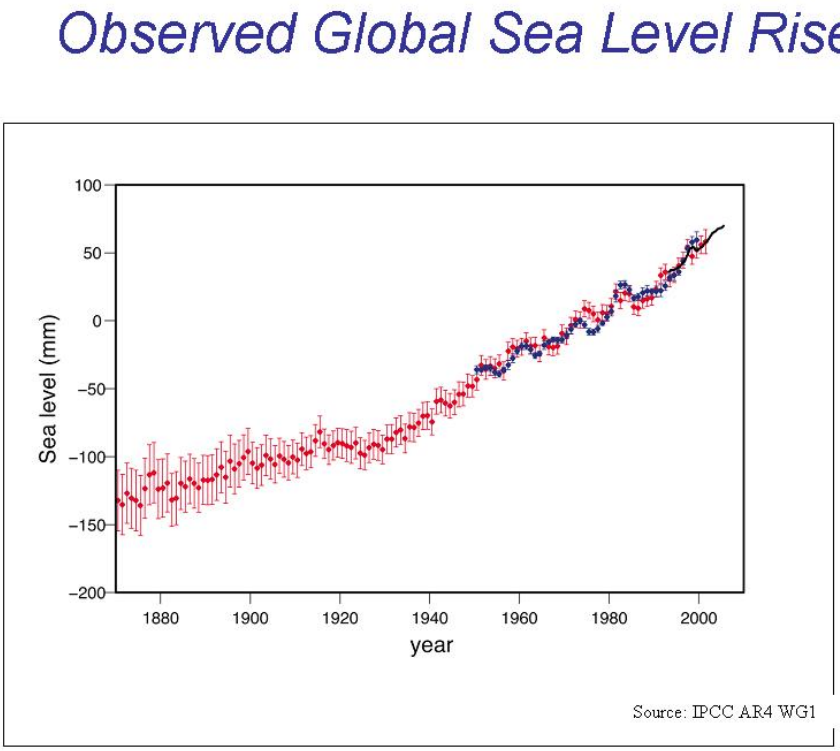
Global average warming in the past century is 0.74°C (1.3°F)

U.S. temperatures warmed during the 20th and into the 21st century; temperatures are now approximately 0.56°C (1.0°F) warmer than at the start of the 20th century, with an increased rate of warming over the past 30 years

Scientists are observing and tracking the evidence of global warming. Over the second half of the 20th century, the global mean sea surface height increased at a rate of about 1.8 millimeters (mm) per year, and there is evidence that this rate is increasing (see Figure 4). Other effects include changes in terrestrial ecology leading to the extermination of animal and plant species, increased melting of polar ice sheets, higher sea levels, extreme heat waves and drought, increased severity of hurricanes and other storms, increased precipitation, ocean acidification, and flooding. Scientists warn that an additional 2°C (3.6°F)rise in average global temperature will result in dramatic and irreversible changes to the environment.[2]

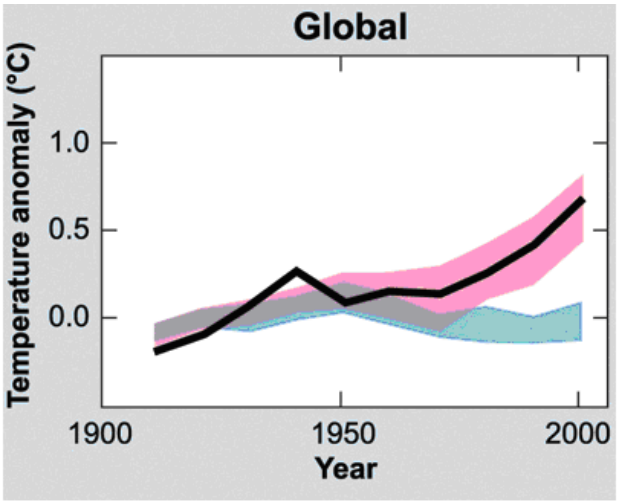
[2] Parry, Martin, et al., eds. 2007. *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the IPCC. Cambridge University Press.

Figure 4. Observed Global Sea Level Rise



Much of this change in climate is attributable to human activities. The Intergovernmental Panel on Climate Change (IPCC) concludes "most of the observed increase in globally averaged temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations." (IPCC Fourth Assessment Report 2007). Figure 5 shows summaries of the analyses provided by the IPCC illustrating the relationship between man-made emissions and climate change, as well as forecasts of potential increases through 2100 for various emissions and modeling scenarios.

Figure 5. Relationship Between Human Activities and Global Warming



Source: IPCC Report, Fourth Assessment Report, Nov. 2007

Temperature predictions by climate change models match well with observations during 1920 through 2000 proving the models are quite accurate now. These models predict that the temperature does not change much due to natural causes (shown in green). However when anthropogenic factors (shown in red) are added to it, global temperature rises at a fast rate as seen in the graph since 1960s.

Source: *IPCC Report, Fourth Assessment Report, the Physical Science Basis, November 2007*

Carbon dioxide (CO_2) from combustion of fossil fuels from power plants and vehicles, loss of carbon "sinks" due to deforestation, and methane emissions from landfills are the major human activities contributing to climate change. Mitigating, or controlling, greenhouse gas emissions to reduce the risks of global warming to the economy and environment will require action at the national, state, and local levels, such as developing and applying alternative energy sources and technologies. In some circumstances, preparing for and adapting to the consequences of climate change will be necessary.

The greenhouse gas emission reduction goals in proposed federal legislation and adopted by states and localities are based on what scientists say is needed to stabilize greenhouse gas emissions to below 2.5-3°C (4.5-5.4°F) by 2050. Under different international growth scenarios, greenhouse gas emissions will grow to 50-75 GtCO2e/year globally by 2030, an approximate 25 to 90 percent increase from 2000 levels. ***To stabilize greenhouse gas concentrations, carbon emissions will have to be reduced by at least 50% and as much as 85% by 2050 below 1990 levels***, according to the 2007 Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC).

4. Recognizing the Risks: Potential Impacts of Climate Change on the Metropolitan Washington Region

Substantial effort has been devoted to assessing the potential impacts of climate change in the United States and Mid-Atlantic region.[3] The real challenge is assessing the risks of these impacts occurring and to what degree.[4]

The basic drivers of any impacts are changes in CO_2, sea level, temperature, precipitation, and runoff. Accordingly, any risk assessment begins with projections of future conditions associated with each of these. Table 1 presents the projected range of change from various studies for five key parameters that may adversely affect the region's future, along with the levels of confidence in the projections—critical to any credible risk assessment. In addition, consideration must also be given to changes in CO_2, sea level, temperature, precipitation, and runoff that have already been documented over the last century.

There is a very high degree of confidence in the likelihood of substantial increases in CO_2 concentrations in the coming decades. In the Mid-Atlantic region, this is expected to result in rising sea levels, higher air and water temperatures, and changes in precipitation patterns. It is also possible that storm intensity and associated wind damage will increase, including an increase in the frequency of tornadoes. These changes also are generally interconnected and hence generally have synergistic impacts on water and environmental quality. The Mid-Atlantic Regional Assessment (MARA) estimates are consistent with more recent estimates of the Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) in 2007.

Table 1. Key Mid-Atlantic Projections for 2030 and 2095 Above 1990 Baseline Levels

Parameter	2030	2095	Confidence in Projection
CO_2 change *(%)*	+20 to +30	+50 to +120	Very High
Sea level change *(inches)*	+4 to +12	+15 to +40	High
Temperature change *(°F)*	+1.8 to +2.7	+4.9 to +9.5	High
Precipitation change *(%)*	–1 to +8	+6 to +24	Medium
Runoff change *(%)*	–2 to +6	–4 to +27	Low

Source: Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change - Mid-Atlantic Foundations (January 2001).

Higher Sea Levels → *Increased Flooding and Shoreline Loss, Degraded Water Quality*

The shorelines of the Chesapeake Bay and its tributaries such as the Potomac River are among the region's most threatened resources, subject to the combined impacts of climate and land-use change. Wetlands such as coastal marshes and shoreline ecosystems provide important

[3] See: Glick et al. 2008, NSCT 2008, USCCSP 2008, Eilperin 2008a, Eilperin 2008b, Fahrenthold 2008.

[4] See: Preparing for a Changing Climate: The Potential Consequences of Climate Variability and Change - Mid-Atlantic Foundations (January 2001), which is a part of the Mid-Atlantic Regional Assessment (MARA); and (2) Climate Change Impacts in the Mid-Atlantic Region – A Workshop Report, compiled by Ann Fisher et al.

ecological functions, serving as nurseries and critical habitat, sources of dissolved organic carbon, modifiers of local water quality, and stabilizers of global levels of available nitrogen, atmospheric sulfur, CO_2, and methane. The loss or submerging of wetlands would eliminate those important ecological functions and hence to further degrade water quality and hence adversely impact the living resources of the Bay and its tributaries. Submerged aquatic vegetation (SAV), which is critical elements of the Bay's shoreline ecosystems, would also be adversely impacted by increased water depth due to higher sea levels.[5] In addition, wetlands serve to mitigate the impacts of storm surges, and their loss would increase the likelihood of flooding in many low-lying areas.

The confidence level for sea level rise is high, with the 2095 projection ranging from a low of 38 centimeters (cm) to a high of 102 cm. The Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) report projects a "Chesapeake Bay local" sea level increase of approximately 70–160 cm by 2100, including natural subsidence, the "enhanced" rate of sea level rise in the bay (beyond that attributable to global sea level rise).

The impacts of rising sea levels on the Chesapeake Bay and its rivers include: a) heightened risk and vulnerability of inundation of wetlands and other low-lying lands by storm surges and coastal flooding; b) saltwater contamination of fresh water used for drinking water and irrigation for some smaller communities utilizing water from the Potomac estuary; and c) degraded water quality in the Bay and its tributaries, potentially increasing the risk of harmful algal blooms that thrive from runoff, harming fish and crab populations (see Glick et al. 2008). The Chesapeake Bay crab population is an important part of the local culture and economy. These ecosystems exist in a naturally changing environment, but the current and forecast rates of change are likely to overwhelm their inherent resilience.

Higher Air Temperatures → *Increased Pollution and Health Risks, Changing Plant and Animal Species, More Frequent Forest Fires*

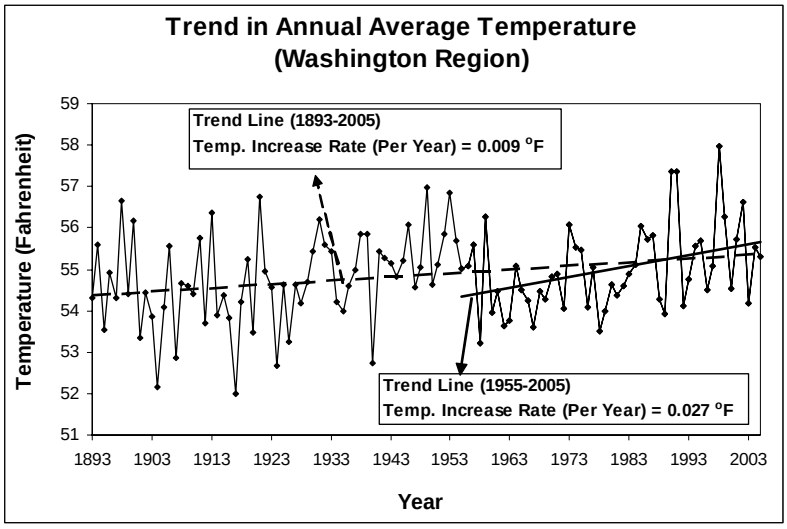
Temperature in the Washington region increased at a much faster rate in the last fifty years compared to the last hundred years. Figure 6 shows a comparison of trends in the annual average temperature during these two periods. It is clear that the rate of annual temperature increase of 0.027°F in the last fifty years (1955-2005) is thrice than the annual rate of increase of 0.009°F during the period 1893-2005. According to the IPCC, temperature in the Washington region is projected to increase in future years (Fig. SPM.6, Page 9, IPCC Fourth Assessment Report (AR4), Summary for Policy Makers, 2007). Five of the last 10 years have ranked as the top 10 warmest in the United States, since record keeping began in the late 19th century.

A warmer climate could result in increased cases of vector-borne diseases such as West Nile Virus and stronger, more frequent heat waves. Also, locally, there is a correlation between heat waves and the occurrence of high ozone days. Generally, the hotter the temperature, the more favorable

[5] Comments by Dr. Christopher R. Pyke, Director of Virginia Institute of Marine Science's Climate Change Services and Chesapeake Bay Program STAC member; U.S. Senate Committee on Environment and Public Works Hearing on 'The Impact of Global Warming on the Chesapeake Bay' (September 26, 2007).

the conditions are for ozone-producing chemical reactions in the air, which can lead to an increase in asthma cases and exacerbation of chronic respiratory diseases.

Figure 6. Average Annual Temperature in the Washington, DC, Metropolitan Area[6]



Source: William et al. (2007).

Longer growing seasons are expected in the region. Rising CO_2 will also affect crop yields, both detrimentally and beneficially. According to the Intergovernmental Panel on Climate Change (IPCC), in the middle latitudes (including the Mid-Atlantic region), climate change most likely will affect crops differently from region to region. Agricultural production may benefit from increased CO_2 concentrations on crop growth and a resulting increase in water use efficiency.

As temperatures rise, plants and animals currently in the southeastern United States may migrate north into the Mid-Atlantic. Today, more than half of the Mid-Atlantic region is covered by a maple-beech-birch deciduous forest. Over time, the southern pine and mixed oak-pine forests in the Southeast may become more dominant as they migrate north. Overall forest productivity may increase, but a shift in dominant forest types may detrimentally foster invasive species and reduce biodiversity. More frequent and severe forest fires are expected, threatening ecosystems and human settlements.

Higher Water Temperatures → *Decrease in some Living Resources, Increase in Harmful Algal Blooms, Degraded Water Quality*

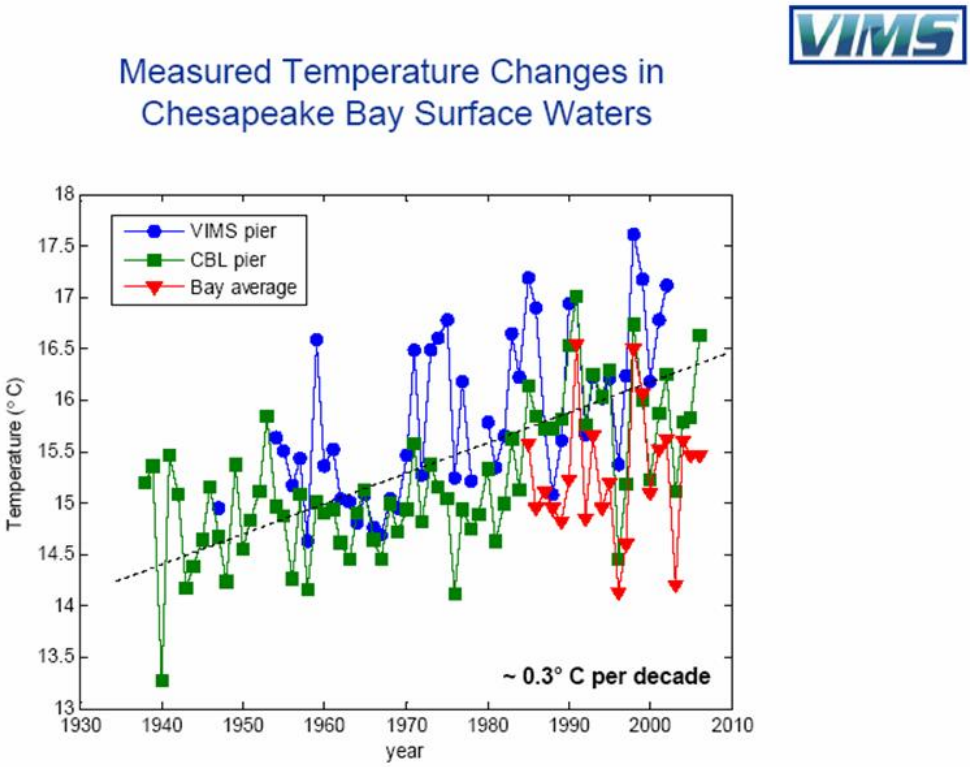
Long-term temperature records indicate that Chesapeake Bay waters are warming. The close coupling of air and water temperatures in the bay and is likely to be a signal of climate change. Submerged aquatic vegetation (SAV), which is a critical element of the Bay's shoreline

[6] The Washington region data are based on the average annual temperatures of the following stations: College Park, Laurel, Glenn dale, Fredericksburg, and Owings Ferry Landing. Original observed data at these stations were corrected for time of observation differences, instrument changes, instrument moves, station relocations, and urbanization effects that these stations experienced since they first started.

ecosystems, would be adversely impacted by higher water temperatures.[7] In the case of oysters, which historically had been a major factor in serving to filter Bay waters - with resultant improvements in water quality; the additional stress of higher water temperatures could offset any potential benefits seen due to the increase in amount of saline waters where they can grow because higher water temperatures can make them more even more vulnerable to diseases.

Also, higher water temperatures, if coupled with both increased pollutant runoff in the spring (as a result of changes in precipitation patters) and higher air temperatures during summer months - will likely lead to increased frequency and duration of algal blooms. Some of those blooms may be deemed potentially harmful to human health (e.g., Pfiesteria -- a one-celled toxic microorganism), and definitely would lead to degraded water quality (e.g., decreased dissolved oxygen levels).

Figure 7.



Source: *Predicted Impacts of Climate Change on Coastal Virginia and the Chesapeake Bay: Physical, Geological, and Biogeological Processes.* Presentation to Virginia Climate Commission, April 22, 2008

[7] Comments by Dr. Christopher R. Pyke, Director of Virginia Institute of Marine Science's Climate Change Services and Chesapeake Bay Program STAC member; U.S. Senate Committee on Environment and Public Works Hearing on 'The Impact of Global Warming on the Chesapeake Bay' (September 26, 2007).

Changes in Precipitation Patterns → *Heavier Rainfall, Flooding, Erosion, Prolonged Droughts, Increased Pollutant Runoff, Degraded Water Quality*

As the global climate grows warmer, evaporation will increase due to warmer oceans. Because the world is a closed system, this will cause heavier rainfall[8], with more beach and land erosion as well as coastal flooding. By the second half of the 21st century, precipitation in the Mid-Atlantic region is expected to increase overall.

The National Center for Atmospheric Research Report notes that climate changes consistent with the impacts of global warming are occurring now, such as significant changes in the seasonal timing of runoff in many mountainous areas. According to a report prepared for the Association of Metropolitan Water Agencies (AMWA Report)[9], the "humid East and Midwest" can expect more rainfall in the winter and late spring, and potentially less rainfall in late summer and fall, with more extreme droughts.

Such changes in precipitation patterns have both water quality and water supply implications. Some implications of these changes would be lower base flows in surface waters and reservoir levels in the summer and fall. These impacts will also adversely impact groundwater levels - which does account for some of the region's drinking water needs. In addition, decreases in precipitation during summer months may lead to increased demands for non-drinking water within the region. This could also result in an increase in the demand for irrigation water in the upper Potomac – which has at least the potential to impact the availability of downstream water supplies, and will at least increase the difficulty in meeting all of those increased demands in light of increased population growth in the region.

Increased storm intensity would also increase the flow of sediment and pollutants to the Bay and its tributaries. This would especially be true due to stormwater runoff in those areas that are not currently under stormwater management control. However, if precipitation patterns change significantly enough, then the suite of stormwater management controls that are currently in place throughout the region may also be operating at the maximum or exceeding their design capabilities (i.e., resulting in reduced performance and removal efficiencies).[10] The combination of these two factors would lead to degraded water quality both within local streams as well as to the Bay and its tributaries, as increased sediment and nutrient runoff degrades water quality (i.e., excess nutrients lead to anoxic conditions/reduces levels of dissolved oxygen in water, and excess sediments smoothers submerged aquatic vegetation growing in shallow waters).

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[8] USCCSP 2008. *Weather and Climate Extremes in a Changing Climate; Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands.* U.S. Climate Change Science Program Synthesis and Assessment Product 3.3. June 2008.

[9] Cromwell et al 2007. Implications of Climate Change for Urban Water Utilities; Association of Metropolitan Water Agencies.

[10] Comments by Dr. Christopher R. Pyke, Director of Virginia Institute of Marine Science's Climate Change Services and Chesapeake Bay Program STAC member; U.S. Senate Committee on Environment and Public Works Hearing on 'The Impact of Global Warming on the Chesapeake Bay' (September 26, 2007).

Table 2 shows different levels of risk associated with natural severe weather events for different counties in the Washington, DC, metropolitan area and adjoining region. As climatic change increases the intensity of these events, their associated costs will increase as well.

Table 2 . Risks by Jurisdiction in Maryland Associated with Severe Weather Events Potentially Exacerbated by Climate Change

Event	High Risk	Medium-High Risk
Drought	Frederick, Montgomery, Howard, Carroll, Baltimore City and County, Harford	None
Extreme Heat	Baltimore City	Frederick, Prince George's, Charles, Calvert, Howard, Anne Arundel, Harford
Flash/River Flooding	Frederick	Montgomery, Carroll, Baltimore County, Anne Arundel
Thunderstorm	Frederick, Montgomery, Anne Arundel	Prince George's, Carroll, Howard, Baltimore County, Harford
Tornado	Frederick, Anne Arundel	Prince George's, Charles, Carroll, Baltimore County, Harford
Winter Weather (Snow and Ice)		Frederick, Montgomery, Prince George's, Anne Arundel, Howard, Carroll
Tidal/Coastal Flooding		Anne Arundel, Calvert

Source: Koontz et al 2000. Maryland Emergency Management Administration, *Maryland Hazard Analysis*, Koontz, Michael, et al., GEOMET Technologies, Inc., and Towson University, Department of Geography, January 2000.

5. Taking Stock: Current and Projected Regional Greenhouse Gas Emissions

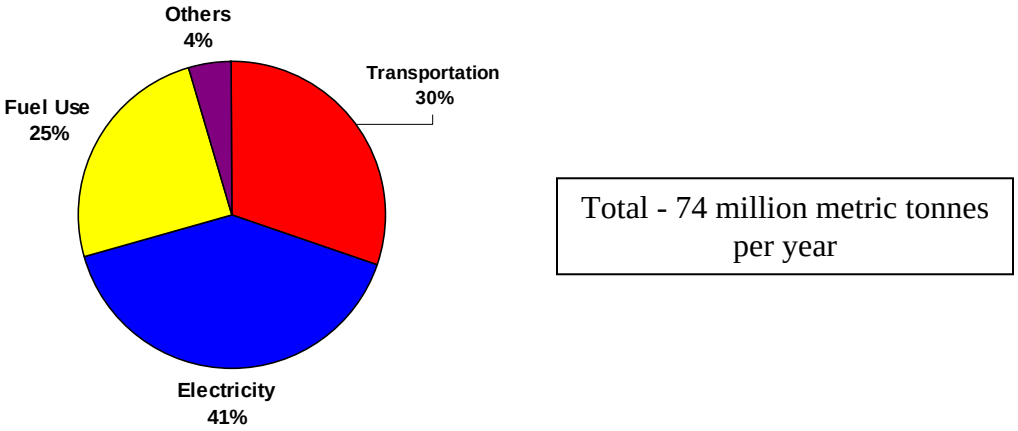
Developing a greenhouse gas inventory is an important first step in reducing the region's contribution to global CO_2 levels.[11] The inventory provides a basis for developing an action plan and setting goals and targets for future reductions, helps to identify the largest sources of greenhouse gases, enables tracking of trends over time, and documents the impacts of actions taken to reduce emissions. The 2005 base year was chosen because data were readily available, and 2005 was reasonably consistent with the base years selected by Metropolitan Washington Council of Governments (COG) member jurisdictions in the Cool Counties agreement and the surrounding states for their climate programs.

Base Year Regional Greenhouse Gas Emissions

In 2005, greenhouse gas emissions in the metropolitan Washington region totaled 74 million metric tons (MMt). As shown in Figure 8, the inventory includes emissions from electricity generation; on-road motor vehicle transportation; residential/commercial/industrial and commercial aviation fuel use; and other sources, including hydrofluorocarbons used as refrigerants and solvents, and methane from wastewater and landfills. ***In 2005 two sectors, transportation and electricity use, contributed over 70 percent of regional CO_2 emissions.*** The electricity generation inventory is a consumption inventory associated both with electricity generation within the region and imported power.

The inventory projections do not account for the recently adopted federal CAFE and energy efficiency standards. The inventory also does not account for the 4.1 MMt of CO_2 emissions that are absorbed (or "sequestered") by the metropolitan area's 1.3 million acres of undeveloped forests and grassland. As development increases, these areas are expected to decline, reducing the region's overall capacity to absorb and temporarily store greenhouse gas emissions. Further research is needed to better project the anticipated loss of forest and grassland in the region.

Figure 8. Washington Region Greenhouse Gas Emissions, 2005

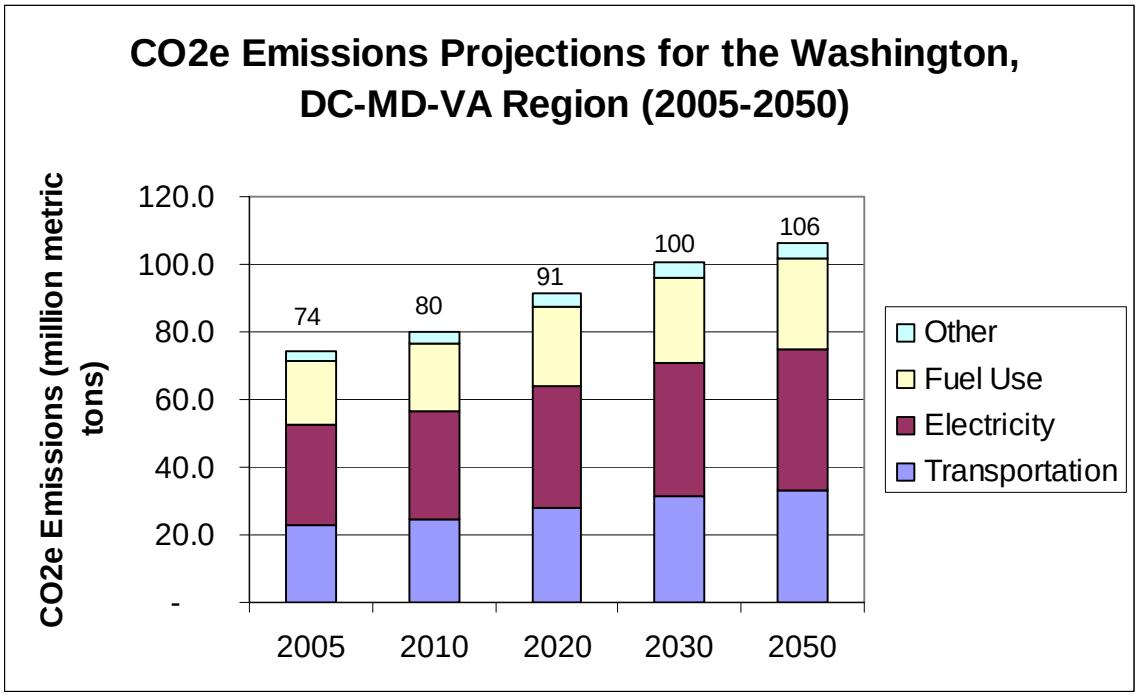


[11] Details on the Washington Region's greenhouse gas emissions inventory are in the Appendix B.

Future Growth in Emissions: Business As Usual

The Washington metropolitan region is growing. According to COG's Cooperative Forecast, between 2005 and 2030, the region will gain 1.6 million new residents and 1.2 million new jobs. This economic prosperity will be accompanied by a growing demand for new buildings, increased demands on the regional transportation system, and creation of new businesses. To a great extent, how the region grows will determine the new energy and fuel demands. Based on current business-as-usual (BAU) projections of growth in population, housing, employment, and energy use, ***total emissions from energy consumption (electricity and fuel use) in the region will increase by 35 percent by 2030 and 43 percent by 2050*** (Figure 9). The estimated increase in emissions does not account for expected gains in energy efficiency due to the Energy Security Act of 2007 and the changes in the corporate average fuel economy (CAFE) standards increasing automobile fuel efficiency to 35 miles per gallon by 2020. The benefits of the new federal CAFE standards are discussed later in this report (see Table 7).

Figure 9. Projected Growth in Regional Greenhouse Gas Emissions Under a Business As Usual Scenario



Notes:

[a] Equivalent CO_2 (CO2e) is the concentration of CO_2 that would cause the same level of radiative forcing as a given type and concentration of greenhouse gas. Examples of such greenhouse gases are methane, perfluorocarbons and nitrous oxide.

[b] Other sources include methane from wastewater treatment and landfills, as well as high GWP gases used as refrigerants and solvents.

[c] The inventory does not account for the 4.1 MMt of CO_2 emissions that are absorbed (or "sequestered") by the metropolitan area's 1.3 million acres of undeveloped forests and grassland.

[d] The business as usual projections do not account for new federal energy efficiency and CAFE standards. The benefit of the new lower CAFE standards is shown in Table 7.

6. Taking Aim: Setting Targets for Reducing Regional Emissions

The Climate Change Steering Committee is recommending goals to reduce regional greenhouse gases that are consistent with the climate science and with the goals adopted by state and local governments in the Washington region. The goals in proposed federal legislation and adopted by states and localities are based on what scientists say is needed to stabilize the projected rise in global surface temperatures to below 2.5-3°C (4.5-5.4°F) by 2050. Under different international growth scenarios, greenhouse gas emissions will grow to 50-75 GtCO2e/year globally by 2030, an approximate 25 to 90 percent increase from 2000 levels. A consensus of IPCC and U.S. scientists is that greenhouse gas emissions must be reduced by 50–85 percent by 2050 to avoid the dire consequences of global warming.[12]

In the metropolitan Washington region, state and local governments recognize the urgency of addressing climate change to protect their citizens and economies. The Maryland Commission on Climate Change recommends a statewide goal of reducing greenhouse gas emissions by 10 percent below 2006 levels by 2012, by 25–50 percent below 2006 levels by 2020, and by 90 percent below 2006 levels by 2050. The District of Columbia, a signatory to the U.S. Mayors Climate Protection Agreement, has pledged to reduce greenhouse gas emissions by 7 percent below 1990 levels by 2012. The Commonwealth of Virginia has a goal of reducing greenhouse gas emissions by 30 percent by 2025. And Fairfax, Arlington, Montgomery, and Prince George's counties have signed the Cool Counties agreement, committing to halt the growth of greenhouse gas emissions by 2010, and to reduce greenhouse gas emissions by 80 percent below 2006 levels by 2050.

Table 3. Climate Change Reduction Targets in Metropolitan Washington Region

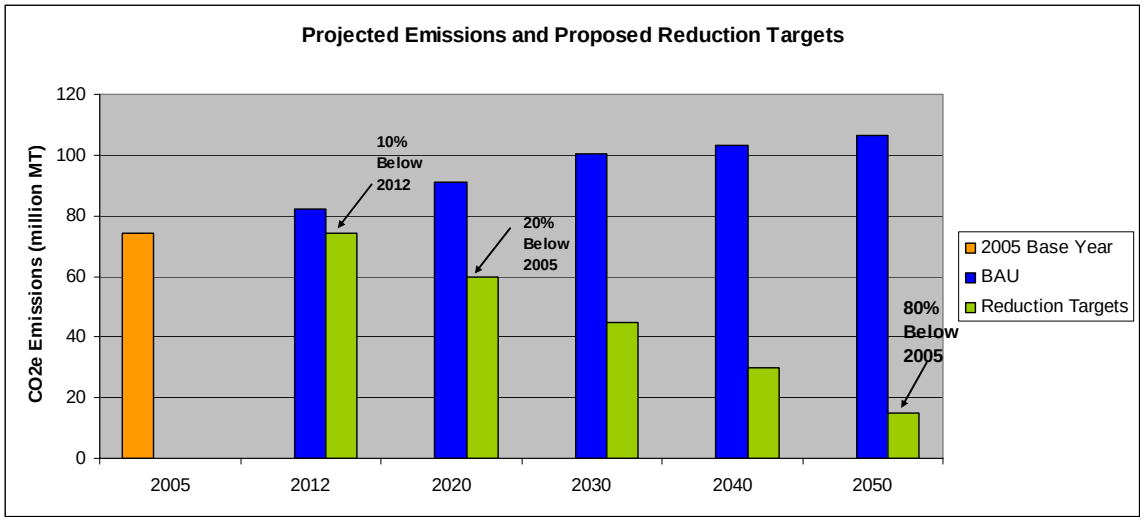
	Short term (2010-2012)	Medium Term (2020-2025)	Long Term (2050)
IPCC			50-85% reduction
DC	7% below 1990 by 2012		
MD (state)	10% below 2006	25% or 50% below 2006	90% below 2006
Montgomery Co.*	stop emissions growth by 2010		Reduce 80% below 2006 by 2050
Takoma Park	7% below 1990 by 2012		
College Park	7% below 1990 by 2012		
Rockville	7% below 1990 by 2012		
VA (state)		Reduce 30% by 2025	
Arlington Co.*	stop emissions growth by 2010		Reduce 80% below 2006 by 2050
Fairfax Co.*	stop emissions growth by 2010		Reduce 80% below 2006 by 2050
City of Alexandria	7% below 1990 by 2012		
*Cool Counties	Stop GHG emissions growth by 2010; achieve a 10% reduction every five years thereafter until 2080		

[12] 2007 Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC).

Recommended Targets for Reducing Regional Greenhouse Gas Emissions

Figure 10 depicts the Climate Change Steering Committee's recommendations for reducing regional greenhouse gas emissions for the targeted years 2012, 2020, and 2050. The Committee studied the IPCC report recommendations and reviewed greenhouse gas reduction goals set by states, cities and regions in the U.S. As a compromise between IPCC recommended reduction levels and those adopted by COG member local governments (Table 3), the Committee chose to set three goals. The goals include an early goal (2012) to force early action, a medium-range goal (2020) to encourage expansion of recommended policies and programs, and a long-range goal (2050) to stimulate support for research into technologies and clean fuels needed to stabilize greenhouse gas emissions.

Figure 10. Comparison of Projected Regional Greenhouse Gas Emissions Under BAU and and Proposed Emission Reduction Scenarios: 2005–2050



BAU = Business as Usual

2012 Target: Reduce Business As Usual (BAU) Emissions by 10 Percent Below 2012 Levels
Between 2005 and 2012, regional energy consumption and greenhouse gas emissions are expected to grow by about 10 percent under a BAU scenario. The Climate Change Steering Committee recommends establishing 2012 as a near-term goal. The goal is to stop projected growth in regional greenhouse gas emissions by achieving a 10 percent reduction in regional emissions between 2008 and 2012.

Strategy to Modify Individual and Household Behaviors
Changing the energy-consuming behavior of individuals and households offers a potentially significant gold mine for greenhouse gas reductions. Opportunities for education and outreach efforts include persuading consumers to purchase more energy-efficient cars, appliances, and heating and air conditioning units, and to consider alternatives for commuting to work other than by driving alone. Many of the measures are relatively easy to achieve through incentives from utilities and local governments working together.

Research performed by Vanderberg indicates that individuals contribute about one-third of U.S. greenhouse gas emissions through travel and household behaviors. Some of these carbon-emitting behaviors can be modified to generate emissions reductions in the near term. The average American contributed about 20 metric tons of CO_2.[13] According to Vanderberg,[14] most (63%) of the emissions are from personal car use, mass transit, and air travel, and the rest (37%) is from residential use of appliances, air conditioning, and heating.

There are many things that can be done to reduce household energy use, ranging from simple actions to larger investments. These actions reduce energy use, cut electric bills and reduce pollution, as well as reduce carbon dioxide emissions.

Businesses and institutions can also take action to reduce emissions, including locating near transit, purchasing green power, turning off electronic devices, purchasing clean vehicles, and installing more energy efficient equipment.

Table 4. Suggested List of Actions to Reduce GHG Emissions

Immediate Actions (*Individuals*)

Transportation

- Walk, ride bike, take mass transit (drive less)
- Combine trips when possible (trip chaining)
- Carpool with two other people
- Try telecommuting
- Avoid unnecessary idling
- Maintain automobile (tune ups, tire pressure)
- Use renewable fuels

Households and Businesses

- Locate your household in close proximity to work, schools, shopping, recreation and transit
- Locate your business in close proximity to employees, customers, and transit
- Insulate and weatherize house
- Reduce inside temperature to 68°F/days, 65°F/nights (winter)
- Increase inside temperature to 78°F (summer)
- Reduce water heat by 20°F/Insulate hot water heater/Use less hot water
- Change light bulbs to compact fluorescent lighting (CFL) or Light Emitting Diode (LED)
- Install programmable thermostat
- Use the OFF switch for lights, TV, computer and unplug when not in use
- Buy locally grown food/Grow your own food
- Reduce synthetic fertilizer use
- Avoid use of hot water for laundry

[13] Energy Information Administration, International Energy Annual, U.S. Department of Energy, October 2007.

[14] Vandenbergh, Michael P. 2007. "The Carbon-Neutral Individual," *New York University Law Review* 82 (2007).

- Air dry laundry
- Be aware of the carbon footprint of purchased products, including foods
- Avoid heavily packaged products
- Purchase bio-based products
- Support clean energy/Use Green Power
- Use water efficiently
- Use push mower
- Compost yard waste
- Reduce, Reuse, Recycle

Personal Outreach

- Share your success stories
- Encourage your town, business or faith community to take action
- Encourage protection and conservation of forests globally

Green Investments

- Buy more efficient car
- Install more efficient heating/air conditioning systems
- Install more efficient appliances (refrigerators/freezers, stoves, water heaters)
- Get a home energy audit
- Install ENERGY STAR® windows and doors
- Install geothermal heat pump
- Install solar hot water system
- Plant trees
- Buy an electric bike/light electric vehicle

2020 Target: Reduce BAU Emissions by 20 Percent Below 2005 Levels

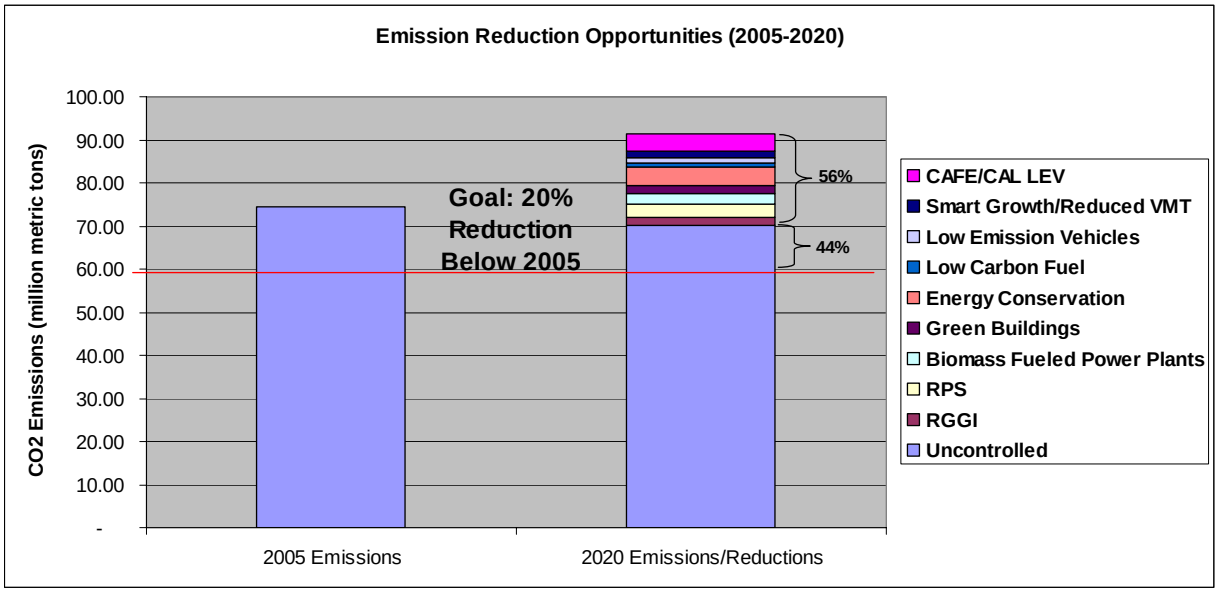
The Climate Change Steering Committee recommends an interim goal of 2020 to reduce emissions to 20 percent below 2005 levels. Some of the reduction will be achieved by a combination of federal, state, and local policies, such as the Energy Efficiency Act of 2007, the new federal CAFE standards, and regional cap-and-trade program for utilities, such as the Regional Greenhouse Gas Initiative (RGGI). To assess what would be involved in meeting the 2020 goal, the Climate Change Steering Committee prepared a preliminary analysis of current and potential future greenhouse gas reduction measures with an estimated reduction benefit by 2020 (Table 5). The measures in the Table 5 are a 23-25 percent reduction from the 2020 BAU. That reduction works out to be 55-57 percent of the quantity of reductions needed to reach the 2020 goal. The Committee believes that a plan for achieving the full reduction can be developed in the next 1-2 years.

Table 5. Potential Regional Impacts of Federal, State, and Local Actions on Meeting 2020 Goal

Measure	% GHG Reduction	Assumption
RGGI	2%	Apply to DC/MD/VA, (may double count VA and DC)
RPS	3%	10% RPS, applied to all electricity, including imports (may double count RGGI reductions)
Biomass-Fueled Power Plants	3%	8% of electricity generation in Maryland
Green Buildings	2%	40% of buildings achieve a 10–30% reduction; assume all adopt
Energy Conservation	5%	Empower Maryland, Virginia Energy Plan, assume 15% (double count Green Buildings reductions)
Low-Carbon Fuel	1%	Displace 0.8 to 1.6% by 2012, guess 3% by 2020
Low-Emission Vehicles	1%	Above and beyond CAFE
Smart Growth/Reduced VMT	2-4%	Between 2% and 10% of transportation sector emissions (Kirby and Ewing)
CAFE/CAL LEV II	4%	14% for transportation sector=4% for total GHG (DTP)

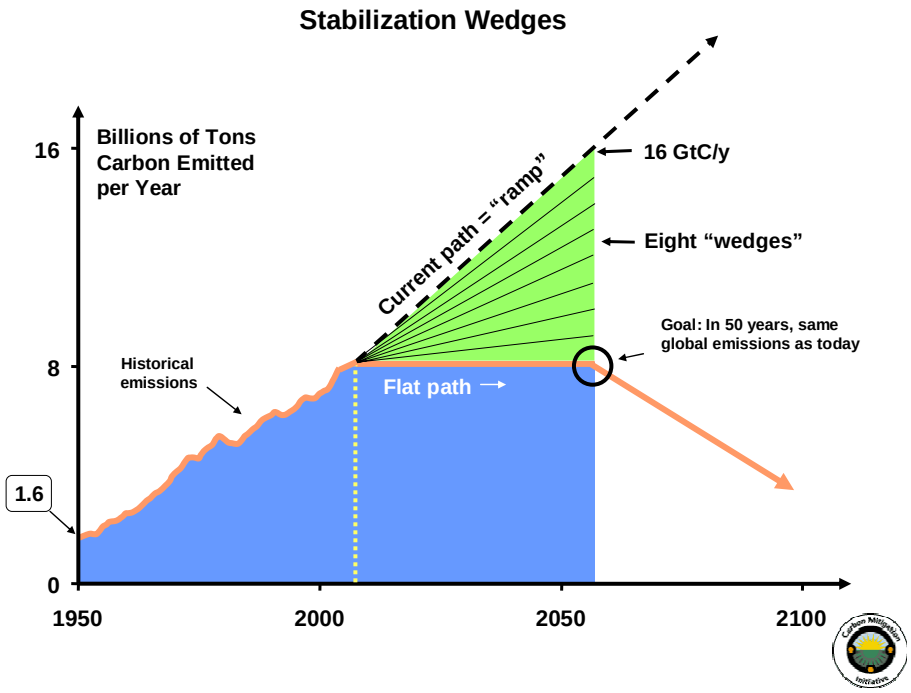
RGGI = Regional Greenhouse Gas Initiative; RPS = renewable portfolio standard; VMT = vehicle miles traveled; CAFE = corporate average fuel economy; CAL LEV II = California Low Emission Vehicle Phase 2; DC = Washington, DC; MD = Maryland; VA = Virginia. MWCOG analysis, February 2008.

Figure 11. Regional Opportunities for Reducing Greenhouse Gas Emissions: 2005–2020



An ambitious long-term goal of reducing emissions to 80 percent below 2005 levels by 2050 would present a challenge to the region and would place the region among national leaders calling for aggressive action to address climate change. Reducing a rising BAU path to a flat path with no growth in CO_2 emissions would require cutting projected U.S. carbon emissions by 8 billion metric tons per year. Socolow and Pacala propose dividing the total amount into eight wedges of 1 billion metric tons of carbon emissions avoided (Figure 12).[15] The four categories of wedge strategies are energy efficiency and conservation; fuel switching and carbon capture and storage; renewable fuels and electricity/forest and soil storage; and nuclear fission. All of these strategies require a coordinated regional effort that will involve individual actions, state and local government actions, business actions, federal and state policy and regulations, academic research and development, and new technology.

Figure 12. Approach for Stabilizing Greenhouse Gas Emissions by 2050



[15] Socolow and Pacala, presentation, February 3, 2005 at www.stabilisation2005.com. Based on article in Science 2004. One billion tons equals one gigaton of carbon or GtC.

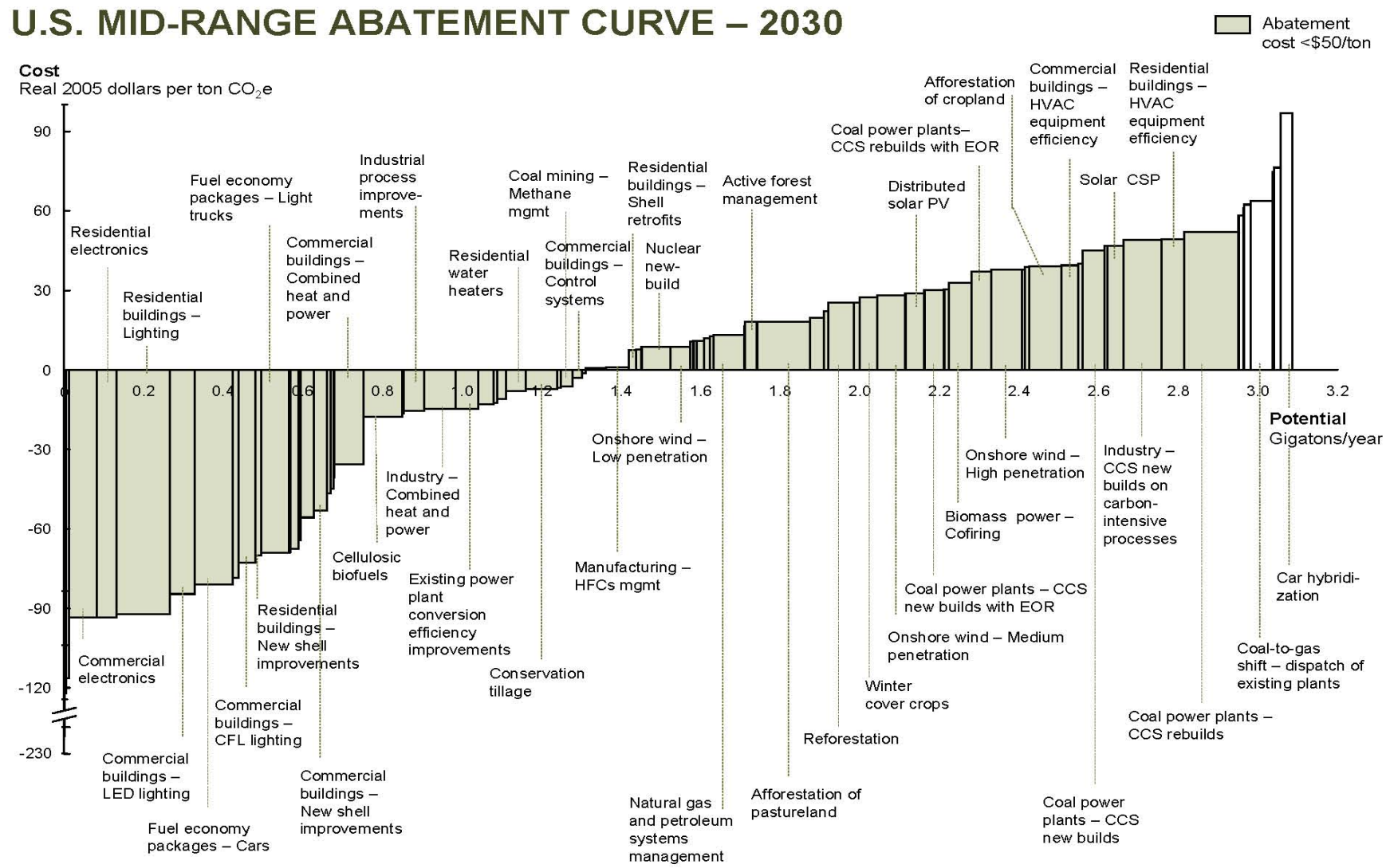
Cost of Meeting the Recommended Targets

In the context of a growing metropolitan region, there are concerns about the cost of the measures needed to meet goals for reducing greenhouse gas emissions. McKinsey & Company and the Corporation Board (2007) studied the cost of measures to reach a 2030 goal. Their report presents estimates of the net costs of and abatement benefits from more than 250 measures.[16] The abatement options analyzed are available at marginal costs of less than $50 per metric ton of avoided emissions. The authors chose a cost of $50 per metric ton as a reasonable cost and a measure of cost effectiveness. Plotted on an abatement curve, several options have negative costs—i.e., would provide savings—over their lifetime. The most cost-effective options are improving the energy efficiency of buildings (e.g., lighting and heating, ventilation, and air conditioning systems) and appliances, and increasing the fuel efficiency of vehicles. Such investment in energy efficient technology can actually save consumers money. The most expensive options—but still less than $50 per metric ton of avoided emissions—involve shifting to less carbon-intensive energy sources, such as wind, solar, and nuclear power. The study concluded that the savings of these measures outweigh the costs, and the measures can significantly abate greenhouse gas emissions.

Further economic benefit analysis of the measures recommended in this report is needed to establish their feasibility and how they will be implemented.

[16] McKinsey Report, December 2007; "Reducing GHG Emissions: How Much at What Cost?" Used with permission.

Figure 13

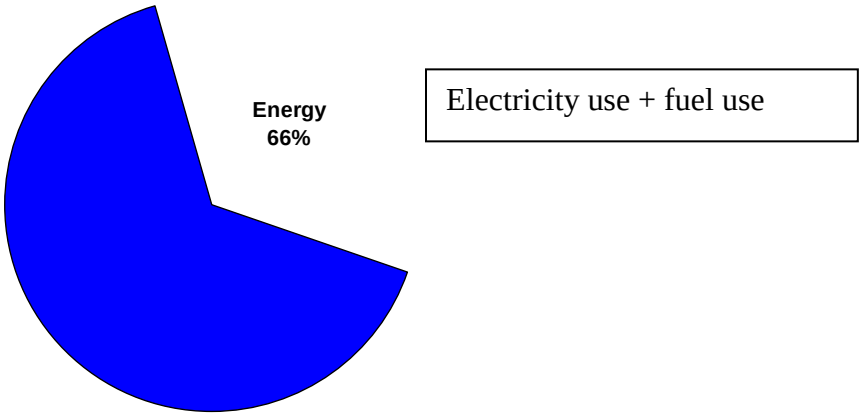


Source: McKinsey analysis

II. TAKING ACTION

The following sections on energy and transportation describe COG's current projections for the region in terms of population, employment, households, and transportation and land use. The current projections are the best information about the future based on known development and transportation projects. County and city planning offices provided the information for future projects in their jurisdictions to 2030. State and local transportation agencies provided information about transportation projects in the region's long-range transportation plan (CLRP).[17] *There is significant uncertainty about the impact of energy prices on economic growth, housing, and transportation patterns in the region, which could have an effect on the projections in this report.*

7. Taking Action: Mitigating Emissions From Energy Consumption



While local governments and the private sector are investing in energy efficiency and renewable energy, the region remains dependent on fossil fuel-powered energy sources to meets its growing demand for energy. The energy sector accounts for approximately 66 percent (electricity and fuel use) of greenhouse gas emissions in the metropolitan Washington area. Any solution to reduce emissions in the region must address energy supply and demand into the future.

There are three ways to reduce emissions from energy consumption: (1) improve energy efficiency, (2) reduce demand for energy, and (3) develop clean (alternative) energy sources. The COG Strategic Energy Plan promotes all three as goals to manage the region's energy resources. Certain measures, such as investments in energy efficient technology, can actually save consumers money. Some possible longer-term solutions, such as increased nuclear generation, carbon sequestration, hydrogen fuel cells, and widespread use of solar are not yet commercially available, face significant hurdles to implementation, or are not cost-effective. Technologies such as plug-in electric hybrids could also have implications for future electricity demand. Cap-and-trade and/or carbon tax programs are being widely discussed as possible options for reducing overall U.S. greenhouse gas emissions.

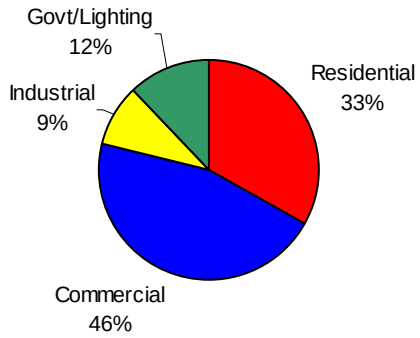
[17] MWCOG. National Capital Transportation Planning Board, Constrained Long Range Plan.

The Energy Future: Challenges and Opportunities

The Washington metropolitan region is growing. The Metropolitan Washington Council of Governments (COG) forecasts that between 2005 and 2030, the region will gain 1.6 million new residents and 1.2 million new jobs. This economic prosperity will be accompanied by a growing demand for new buildings. How the region builds will to a great extent determine the extent of new energy demand. Based on current business-as-usual projections of growth in population, housing, employment, and energy use, total emissions from energy consumption in the region will increase by 33 percent by 2030.

The energy future also involves concerns about rising prices. Regional energy prices increased significantly between 2000 and 2005: electricity, 14 percent; natural gas, 53 percent; gasoline, 68 percent; and diesel, 78 percent. Since 2005, upward price pressures have continued, and there is no indication that prices will decline in the near future.[18] Mounting fuel costs are reducing disposable incomes making consumers more aware of their purchases as well as their energy consumption.[19]

Figure 14. Sector Shares of Regional Energy Use



Opportunities in the Residential Sector

The residential sector accounts for 33 percent of total energy demand in the region (see Figure 14). Energy is used for home heating, air conditioning, refrigeration, and to power a variety of electrical appliances such as personal computers, televisions, and electric ranges.

There are significant opportunities to reduce energy demand in the residential sector. In addition to establishing strong Green Building codes region-wide, individual actions can include weatherization, purchase of efficient appliances, and installation of programmable thermostats and other energy saving devices such as high efficiency lighting.

Opportunities in the Commercial/Industrial Sector

The commercial and industrial sector accounts for 46 percent and 9 percent of total energy demand, respectively, in the region. Government operations and lighting accounts for approximately 12 percent of regional energy demand. In addition to energy use for heating, air conditioning, commercial refrigeration, the sector also includes uses such as wastewater treatment which consumes large amounts of electricity. Other significant consumers of electricity include large data centers, municipal and federal government buildings, including schools, hospitals/universities, and big box stores.

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[18] U.S. Department of Energy, Energy Information Administration, http://www.eia.doe.gov/overview_hd.html.

[19] Woolard, R. 2008. *Soaring Gas Prices Forcing Lifestyle Changes Across U.S.* AFP News, June 26, 2008.

There are significant opportunities to reduce energy demand in the commercial sector. For example, improving the energy performance of commercial buildings can reduce building energy consumption by 10-30 percent. Also, wastewater treatment facilities consume significant amounts of electricity so have an opportunity to take action to reduce emissions. The Washington Surburban Sanitary Commissions for instance has recently begun to purchase electricity generated from a new wind farm developed near the region. In addition, through methane capture and on-site utilization as well as reprocessing of wastewater biosolids into a fuel source, wastewater treatment facilities have the opportunity to significantly reduce their carbon footprint. Land application of biosolids has the potential to sequester carbon. The Blue Plains Wastewater Treatment Plant, the region's largest facility, is currently reviewing such options. Other facilities in the region may also follow suit.

Opportunities to Expand Local Renewable Energy Sources

In addition to state renewable portfolio standards, it is important to explore opportunities to increase the production of energy locally using renewable energy resources. Resources to develop include geothermal, solar, wind, and biomass.

Currently, there are four large coal-fired power plants in the metropolitan Washington region. Together, coal-fired plants produce approximately 50 percent of the electricity produced in the region. The Calvert Cliffs nuclear plant in Calvert County produces approximately 40 percent of the electricity produced in the region. Two large natural gas-fired plants produce approximately 5 percent of the electricity produced in the region. Landfill gas and municipal solid waste incinerators produce about 3.5 percent of the electricity generated in the region. The region also imports approximately 35 percent of its electricity from outside the region.[20]

As the region begins to develop programs to reduce carbon emissions, it will be important to expand the percentage of energy provided by renewable energy sources to displace the significant impact of reliance on fossil fuels.

Current Initiatives for Reducing Greenhouse Gas Emissions From Energy Use

RGGI Will Cap Emissions from Maryland Power Plants

In 2007, Maryland joined the Regional Greenhouse Gas Initiative (RGGI), an agreement between states in the Mid-Atlantic and Northeast that caps emissions from coal-fired power plants in 2009. Each state will receive allowances to emit CO_2 and will allocate allowances to power plants through auctions or other means. The cap will be lowered by 2.5 percent per year from 2015 to 2019, for a total reduction of 10 percent by 2020. As emissions from Maryland power plants are capped, it is possible that the volume of electricity imported into the region will increase (i.e., leakage). States participating in RGGI are expected to monitor leakage and explore potential mitigation options.[21]

[20] Information on electricity markets was obtained from EPA eGrid and electricity consumption data provided by utilities.

[21] Carbon leakage occurs when there is an increase in carbon dioxide emissions in one jurisdiction as a result of an emissions reduction by a second jurisdiction with a strict climate policy.

States Have Established Renewable Portfolio Standards
States in the region have adopted renewable energy portfolio standards (RPS), which establish a minimum percentage of electricity supply that must be derived from zero-emission renewable energy sources. Examples of renewable energy sources include solar energy, wind, biomass, methane, geothermal, ocean, fuel cells, hydroelectric power other than pumped storage generation, and waste-to-energy. This program displaces power generation from coal, oil, and/or gas-fired sources. The District of Columbia Renewable Energy Portfolio Standard Act of 2004 was adopted to "ensure that the benefits of electricity from renewable energy sources, including long-term reduced emissions accrue to the public at large."

The increased supply of renewable energy will displace fossil fuel generated power in the PJM Interconnection area[22], thus reducing greenhouse gas emissions as well as other air pollutants such as nitrogen oxide and sulfur dioxide. The total annual consumption of electricity in the region is approximately 57 million megawatt-hours (MWh). A 10 percent renewable requirement will reduce greenhouse gas emissions by approximately 3.5 $MMtCO_2$ annually. States in the region are adopting more aggressive RPS requirements, such as a 20 percent RPS requirement for 2022 in Maryland.

Table 6. Renewable Portfolio Standards, MD, VA and DC

State	Renewable Portfolio Standard (RPS)
District of Columbia	11% by 2022 (mandatory)
Maryland	20% by 2022 (mandatory)
Virginia	12% by 2022 (voluntary)

States Have Established Energy Efficiency Goals
States in the region are improving their energy efficiency. EmPOWER Maryland was adopted to reduce state per-capita energy consumption by 15 percent by 2015. The initiative is composed of seven steps: improve building operations, expand use of energy service performance contracting, increase the state agency loan program, require energy-efficient buildings, purchase ENERGY STAR® products, and expand the community energy loan program. The Virginia Energy Plan (2007) includes goals to reduce the rate of growth of energy use by 40 percent by 2017, and to reduce greenhouse gas emissions from energy use by 30 percent by 2025. The District is evaluating the creation of a Sustainable Energy Utility, which will fund additional energy efficiency programs into the future.

[22] PJM Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. Acting neutrally and independently, PJM operates the world's largest competitive wholesale electricity market and ensures the reliability of the largest centrally dispatched grid in the world.

Local Governments Are Adopting Energy-Efficient Green Buildings Policies
COG's Intergovernmental Green Building Group supports COG's vision of making the region a national leader in green building, with local governments leading in innovation and stewardship. In December 2007, COG adopted a regional green building policy. A key component of the policy identifies the Leadership in Energy and Environmental Design Green Building Rating System™ (LEED) as the region's preferred green building system for rating commercial construction and high-rise residential projects. The region's Green Building policy includes meeting LEED Silver for all new government buildings and LEED certified plus for all new commercial buildings. Local governments are embracing LEED standards in municipal buildings and other public buildings. Depending on the energy efficiency and renewable energy components of these programs, green buildings will decrease demand for electricity; displace power generation from coal, oil, and gas-fired sources; and reduce greenhouse gases and other air pollutants.[23]

Localities Are Expanding Their Purchase of Green Power
One of the recommendations of COG's Strategic Energy Plan is to increase the share of regional energy provided by alternative and renewable sources. Since 2004, local governments in the region have been expanding their purchase of wind power to satisfy a portion of their electricity demand and to help improve air quality in the region. The government agencies purchase wind energy directly from an electricity supplier or purchase renewable energy certificates (RECs) that ensure that such wind energy is placed on the electric grid. Many companies and individuals have also opted to purchase green power to satisfy their energy demands. Based on commitments in the region's air quality plans, the current renewable energy purchase program is expected to involve purchase of 104,000 MWh of power or wind energy RECs annually, reducing greenhouse gas emissions by approximately 65,000 metric tons of CO_2 annually.

Governments and Businesses Are Benefiting From Energy Performance Contracting
Governments and businesses in the region conduct energy audits of buildings and operations (including fleets) to establish a performance baseline from which to measure future benefits from the energy efficiency measures they implement. Local governments are managing and analyzing data from utility bills to establish a baseline assessment of energy use. Energy managers use a variety of software tools to set up databases on energy consumption for municipal facilities. Beyond simply identifying the sources of energy use, an energy audit seeks to prioritize the energy uses according to the most and the least cost-effective opportunities for energy savings by reducing waste and improving energy efficiency. The Energy Efficiency Partnership for Greater Washington is an example of businesses using savings from energy efficiency improvements to pay for the building retrofits. The Partnership goal is to reduce greenhouse gas emissions and energy consumption in 500 targeted buildings by 20-50 percent.[24]

[23] Green Building Report link - http://www.mwcog.org/store/item.asp?PUBLICATION_ID=304.

[24] Presentation by Patrick Sweeney, Pepco Energy Services, to COG Climate Change Steering Committee, "Energy Efficiency Partnership for Greater Washington," October 27, 2007.

Local Jurisdictions Are Implementing Incentives to Promote Green Energy and Conservation
The Montgomery County Clean Energy Rewards Program provides incentives to residents, small businesses, and community organizations purchasing clean energy products certified by the county's Department of Environmental Protection. The county estimates the program will provide incentives for 31,900 MWh of clean energy, reducing consumption of electric power and production of nitrogen oxide emissions from coal, oil, and/or natural gas-fired generation. At current funding levels, this program could reduce greenhouse gas emissions by approximately 20,000 metric tons of CO_2 annually. Montgomery County has also adopted an energy tax and carbon surcharge.

Local Governments Have Established Sophisticated Solid Waste Management Programs
One way to reduce the carbon footprint of the National Capital Region is to use resources more wisely and to reduce the demand for new products through recycling. In the past twenty years, local governments have progressed from simple landfill disposal and incineration of municipal solid waste to options that help reduce greenhouse gas emissions. These strategies, such as recycling programs, waste reduction programs, waste-to-energy plants, and landfill gas capture, result in energy savings.

For over a decade, jurisdictions have required residents and businesses to have recycling service. These jurisdictions have expanded the program convenience and list of materials accepted over time. Recycling saves energy by providing manufacturing feedstock that eliminates the need to mine new raw materials. National estimate data from 2006 shows 298.3 million metric tons of CO_2 equivalents avoided by existing recycling activities. This constitutes approximately four percent of the entire U.S. carbon inventory. Additionally, the Curbside Value Partnership has estimated that the common recyclables in the waste stream that are not currently captured total 99 MMt CO_2e. Also, waste reduction initiatives that encourage the wise use of resources and the reuse of materials help reduce energy consumption by limiting the creation of waste.

For waste that must be disposed, the region has three waste-to-energy plants and five landfills with methane recovery for energy systems. Studies done using the U.S. EPA Decision Support Tool have determined: electricity produced by waste-to-energy plants displaces power produced from traditional fossil-fuel power plants resulting in a net saving in the emissions of carbon dioxide; metals separated from waste at the plants for recycling result in a significant savings in energy and greenhouse gas emissions due to a reduced need to mine virgin materials; and when waste is processed at an waste-to-energy plant instead of a landfill, methane emissions from the landfill are avoided. Municipal solid waste landfills are the largest human-generated source of methane emissions in the United States. Landfill gas (LFG) for energy collection systems reduce emissions of carbon dioxide and methane. Additionally, energy produced with LFG as a primary fuel source offsets the use of non-renewable resources.

Further information on local jurisdiction initiatives and best practices in the Washington region are presented in the Climate Change Steering Committee's report in February, 2008: *National Capital Region: Best Practices and Policies to Reduce Greenhouse Gases* which is available online at http://www.mwcog.org/uploads/pub-documents/8ldcXQ20080328151326.pdf

Recommendations for Mitigating Greenhouse Gas Emissions from Energy Consumption

The Climate Change Steering Committee reviewed policies and initiatives in other states and regions of the U.S. and identified initiatives that would help reduce greenhouse gas emissions from energy consumption in the region. The Committee's review yielded a number of recommendations that are within control of COG member governments or could be accomplished through individual actions. There are many other steps that require federal or state action, or action by businesses or individuals for the region to achieve its greenhouse gas reduction goals. In addition to the following recommendations for local action, the Committee recommends advocacy positions for state and federal action to achieve maximum regional greenhouse gas reductions from improved energy efficiency, reduced energy consumption and use of low-carbon fuels. The Committee makes the following recommendations:

Energy Efficiency Measures

Regional Green Building Policy

- Implement a 2007 COG regional green building policy requiring all new public sector buildings to achieve LEED Silver levels and all private-sector commercial buildings to meet a regional LEED-certified plus standard or equivalent. (1)
- Set energy performance goals for public buildings. (2)
    - Benchmark energy performance in all buildings using common metrics (such as kWh/sf or BTU/sf) and readily-available tools such as ENERGY STAR®'s Portfolio Manager.
    - Set a goal for improving the energy performance of existing public sector buildings, to be achieved through retrofits for greater energy efficiency.
    - Develop educational campaigns for public sector employees to encourage energy conservation as a smart business practice.
- Develop incentives and educational outreach to improve the energy efficiency of existing private commercial and residential buildings. (3)
- Identify best practices for improving energy utilization in existing buildings including energy performance contracting. (4)
- Develop policies and programs that promote implementation of green affordable housing. (5)

Energy Conservation and Efficiency

In collaboration with energy utilities and other stakeholders:

- Develop regional energy conservation goals and timetables. (6)
- Develop a regional energy conservation and efficiency plan that supports meeting regional greenhouse gas emission reduction goals. (6)
- Develop regional program for utilities to pay for home weatherization and recoup investment costs through utility bills. (7)
- Explore provision of energy audits and energy retrofits for individuals and businesses through regional cooperative effort. (7)

- In collaboration with local governments and area wastewater utilities, identify best practices and evaluate the potential for reducing greenhouse gas emissions through methane recapture and use of biosolids as a fuel as means for reducing energy requirements for operations at area wastewater treatment plants and landfills. (8)

Local Governments Leading by Example: Energy Use

- Identify best practices to support reducing overall local government energy use by 15% by 2012. (9)
- Examine the feasibility of setting a regional percentage goal for incorporating ENERGY STAR® standards in new buildings. (10)
- Establish regional goal of 20% renewable energy purchase by 2015 by local governments.[25] Evaluate regional cooperative purchase and/or reverse auctions to facilitate green power implementation among COG members. (11)
- Consider a regional cooperative purchasing approach to facilitate cost-effective implementation. (12)
- Examine options and develop plans for replacing street lights with energy efficient street lighting (LED or other options) across the region. (13)
- Promote regional energy performance contracting to reduce energy use in public buildings. (14)
- Develop a long-term goal for carbon neutrality for all government buildings. (15)
- Enhance and expand existing recycling programs. Consider specific regional recycling goals. (16)

Reduce Energy Consumption/Demand Management

- Develop partnerships with the private sector and other organizations. (17)
    - Partner with the Greater Washington Board of Trade Green Committee and Potomac Conference to assist businesses with taking action to reduce greenhouse gas emissions and implement best practices.
    - Identify regional environmental and community group partners.
    - Partner with electric, gas, and water utilities on regional energy conservation and energy efficiency program outreach.
    - Partner with schools, universities, and local governments to establish the region as a leader in green teaching.
    - Partner with schools, universities, and local governments abroad to find and apply innovative lessons about climate mitigation, renewable energy and energy efficiency.

[25] It is acknowledged that due to budget constraints, some localities may not be able to reach this goal.

- Identify and consider leading models in European metropolitan regions to inform the region on effective application of renewable energy from solar, wind and biomass sources.

Clean Energy Sources

Renewable Energy

- Establish the region as a leader in the production and use of renewable energy.
- Promote adoption of a 20% RPS (Renewable Portfolio Standard), including local government purchases (18)
- Work with jurisdictions exporting electricity into the metropolitan Washington region to encourage investments in clean low-emitting energy sources. (18)

Regional Greenhouse Gas Reduction Initiative (RGGI)

- Advocate for expanding RGGI to DC and Virginia. (19)
- Collaborate with RGGI to support implementation of energy conservation and renewable energy projects in the Washington region. (20)

Potential Advocacy Positions

State and Local Energy and Climate Policy

- Revise state and/or local building codes and ordinances to promote energy efficiency.
- Examine potential options for removing barriers that may prevent implementation of solar panel or other small-scale renewable energy installation.
- Advocate for adoption of Cool Schools[26] or equivalent by local school boards or local governments.
- Advocate for the establishment of a 20% RPS in the District of Columbia and Virginia by 2020. Urge Public Service Commissions to focus on energy efficiency and demand reduction, maximizing use of renewable energy sources, and reducing use of coal for generating electricity.
- Advocate for the creation of state financial incentives for implementation of renewable energy and energy efficiency.
- Encourage state governments to meet the same energy conservation and green power goals as local governments in the Washington region.
- Support establishment of and funding for programs designed to supply locally-produced food to schools (e.g., Statewide farms to schools program)[27].

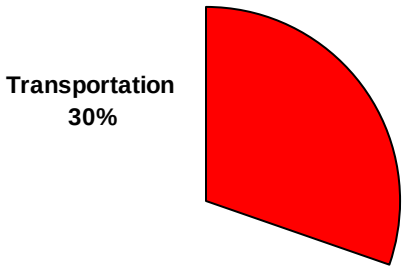
[26] Cool School programs are designed after Cool Cities or Cool Counties programs, with the goal of enlisting organizations to set and achieve greenhouse gas emission reduction goals.

[27] See: http://www.farmtoschool.org/index.php. Such programs connect schools with local farms with the objectives of serving healthy meals in school cafeterias, improving student nutrition, providing health and nutrition education opportunities, and supporting local small farmers.

Federal Climate Policy

- Encourage the federal government to meet the same energy conservation and green power goals as local governments in the Washington region.
- Advocate for national financial incentives to promote the use of renewable energy implementation.
- Organize a consortia of local governments to apply for Energy Efficiency Block Grant funds as they become available.
- Support federal climate change legislation, including cap-and-trade mechanisms, to limit greenhouse gas emissions consistent with scientific recommendations to achieve climate stabilization. Advocate for local governments to be recipients of allowances or funds generated through auction of allowances.

8. Taking Action: Mitigating Emissions From Transportation and Land Use



Emissions from transportation are approximately 30 percent of the overall regional CO_2 emission inventory, thus the ability of the transportation sector to reduce emissions will have a large bearing on the region's ability to meet its greenhouse gas emission reduction goals. The region is growing by many measures. Between 2002 and 2008, population, households, and employment have each grown by approximately 11 percent, increasing the number of vehicle trips from 20 to 22 million and total vehicle miles traveled (VMT) from 146 to 160 million miles per day. The fastest rate of growth in the region is occurring in the outer suburbs, leading to significant increases in VMT and congestion in these areas (Figure 9). Based on current business-as-usual projections of growth in population, housing, and employment, total emissions from transportation in the region will increase by 38 percent by 2030 and 47 percent by 2050.

Note that population growth estimates and employment forecasts are based on historic trends and do not account for potential behavior change (travel behavior and demand for housing) due to increasing energy prices. Recent evidence suggests that due to higher prices, consumers are dramatically changing lifestyles, including driving habits.[28] To the extent that transit usage increases and VMT declines, there could be significant impacts on tax revenue, transit demand and funding, and land use patterns over time. When a plan for meeting the 2020 regional goal is compiled, a review of the VMT reduction potential will be included.

There are three ways to reduce transportation emissions: (1) reduce VMT, (2) increase vehicle fuel efficiency, and (3) reduce the carbon content of fuel (e.g., use alternative fuels such as biofuels, lower carbon gasoline, hybrid-electric vehicles, or advanced fuel cells run on hydrogen). Each of these strategies will play a role in helping the region reduce greenhouse gas emissions from the transportation sector, and most also offer co-benefits, including improved air quality, increased opportunity for walking and bicycling, and reduced traffic congestion. This section briefly explores projected trends in transportation and land use in the region, discusses current initiatives for reducing VMT and greenhouse gas emissions, and offers recommendations for adopting new transportation and land-use guidelines that will help reduce greenhouse gases and the risk of climate change.

[28] Woolard, R. 2008. *Soaring Gas Prices Forcing Lifestyle Changes Across U.S.* AFP News, June 26, 2008.

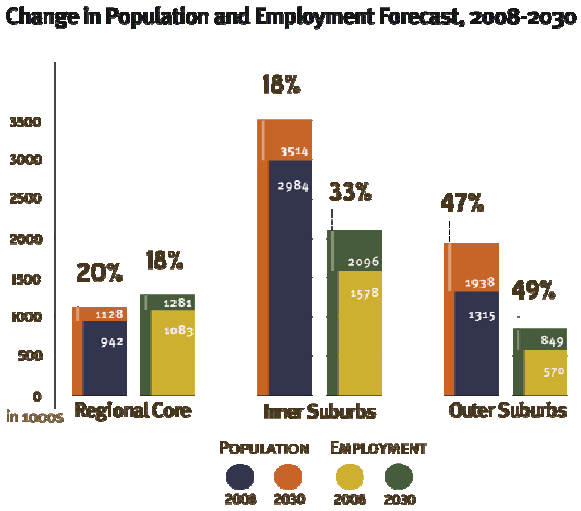
Projected Transportation and Land Use Trends in the Metropolitan Washington Region

Population and Employment Will Increase Significantly

Between 2005 and 2030, according to COG's most recent Cooperative Forecast (Round 7.1), regional economic growth is projected to generate nearly 39 percent additional jobs, attracting approximately 64,000 new residents a year and fueling increased demand for transportation options. Most of the population growth will be in Fairfax, Loudoun, Montgomery, and Prince William counties. Population in the outer suburbs will experience the fastest growth rate—a 47 percent increase by 2030, compared to 18–20 percent in the regional core and inner suburbs.[29]

The region is anticipating a population/employment imbalance by 2030, which is expected to increase traffic congestion and VMT. According to COG's report "Growth Trends to 2030: Cooperative Forecasting in the Washington Region," between 2005 and 2030, the regional shares of population and household growth for the outer suburbs are 46 and 40 percent, respectively. However, local planners do not anticipate sufficient job growth within the outer jurisdictions to provide employment for all of the new residents located there. The regional share of employment growth in the outer suburbs during this time is only 28 percent. This imbalance is expected to cause more commute trips from the outer jurisdictions to jobs located outside of the region's activity centers, including trips to the regional core and inner suburbs. This problem is likely to be exacerbated by the lack of adequate transit facilities servicing the outer suburbs.

Figure 15. Projected Changes in Population and Employment by Location



Source: TPB, "Long-Range Transportation Plan, 2007 Update."

[29] MWCOG, "Growth Trends to 2030: Cooperative Forecasting in the Washington Region," 2007.

Regional VMT, Transit and Highway Congestion, and Greenhouse Gas Emissions Will Rise
VMT is a function of several different factors, including land-use patterns, access to and availability of alternative transportation choices, fuel prices, other fees and taxes that affect the cost of driving, congestion, and individual lifestyles and behavior. Only 30 percent of the region's employment growth and 20 percent of its household growth is expected to occur near Metrorail and commuter rail stations.[30] As the outer suburbs rapidly grow, traffic and transit congestion, vehicle trips, VMT, congested lane miles, and greenhouse gas emissions all will continue to rise.

Between 2008 and 2030, the projected regional growth in population and jobs, coupled with the imbalance of the location of these jobs in relation to housing, will lead to additional vehicles, trips, and congestion in the region's transportation system. Transit work trips are forecast to increase by 31 percent, as a rising number of people commute to work, exacerbating current crowding problems on the Metrorail system.

Fuel Efficiency and New Federal Standards
The Washington metropolitan region ranks high in the purchase of hybrid vehicles, but has a fairly low average fleet fuel economy (approximately 17 miles per gallon [mpg]). TPB analyzed the 2007 federal CAFE standards contained in the federal energy bill to assess the impact on the region's efforts to achieve greenhouse gas reduction targets. The 2007 federal energy bill will improve overall fleet fuel economy through 2020 to 35 mpg for cars and light trucks. TPB's analysis (Table 7) indicates that the 2007 CAFE standard by itself will not achieve the 2020 regional greenhouse gas emission reduction goal, but it's a significant step in the right direction. The analysis shows that mobile-source CO_2 emissions will still exceed 2005 levels by 7.8 percent in 2020 and 8.1 percent in 2030. This represents a large improvement over the baseline, but falls far short of the 20 percent decrease by 2020 and the 40 percent decrease by 2030 that would be consistent with the proposed regional goal.

Table 7. CO_2 Emissions from Cars, Trucks, and Buses (in Millions)

Scenarios	2005	2020	2030
Baseline Emissions	24.89	31.02	34.45
% Change from 2005 levels	—	24.6%	38.4%
Emissions With CAFE Reductions	24.89	26.83	26.91
% Change from 2005 levels	—	7.8%	8.1%
COG CCSC Proposed Regional Goal	24.89	19.91	*14.93
% Change from 2005 levels	—	–20%	*–40%

*Interpolated from the 2050 goal of –80%.
Note: All figures are annual tons of CO_2 emissions in the 8-hour ozone nonattainment area.
COG = Metro. Washington Council of Governments; CCSC = Climate Change Steering Committee

The analysis of CAFE shows it provides significant reductions but further improvements will be needed to meet regional reduction targets. The gradual increase in the mpg standard under

[30] The Regional Mobility and Accessibility Scenario Study: What if the Region Grew Differently? National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments. October 2006.

CAFE ends in 2020, so the beneficial effects between 2020 and 2030 are due only to continuing turnover of the vehicle fleet. Further, the CAFE standard applies only to light-duty vehicles, which account for about 80 percent of regional CO_2 emissions; heavy duty vehicles, which contribute the remaining 20 percent, are unaffected. The analysis shows that the fleet average fuel economy would need to be significantly higher than the new CAFE standards to achieve the regional reduction goal for the transportation sector, assuming no other actions to reduce VMT or fuel use. Clearly, it will take some combination of further increases in fuel economy, shifts to alternative fuels that generate less life-cycle CO_2 emissions (e.g., plug-in hybrids), and reductions in VMT to reach the CO_2 goals currently under discussion. If approved, the California Low Emission Vehicle Phase 2 (CAL LEV II) program could provide further improvements in fleet fuel efficiency.

Current Metropolitan Regional Initiatives for Reducing Transportation Emissions

The Metropolitan Washington region has been working to reduce vehicle miles traveled since the early seventies when the Commuter Club was formed. In 1996 the program became known as Commuter Connections. Commuter Connections promotes a variety of programs to reduce single vehicle occupancy and to promote mass transit.

Public Transit Ridership Is Increasing

The Washington metropolitan region has a vast network of transit options, including Metrorail and Metrobus, local bus transit, commuter rail (VRE and MARC), and commuter bus. The recent hike in gasoline prices, coupled with improved transit access (including an increase in mixed-use and walkable community projects), have resulted in increased transit ridership. Also, employers are encouraging public transit by identifying employees' home locations served by public transit; keeping current transit schedules on hand and posted; arranging meetings with public transit operators and assist in developing transit support programs (Guaranteed Ride Home, SmartBenefits, etc.) and transit use monitoring programs; and arranging for the implementation of SmartBenefits for employees.

Bicycle/Pedestrian Initiatives Are Growing

The bicycle/pedestrian plan adopted in 2006 contains a list of projects designed to improve bicycle and pedestrian capacity throughout the region. Some large transportation projects, such as the Woodrow Wilson Bridge, include bicycle and pedestrian paths in their plans. In addition, higher priority is being placed on pedestrian safety and access. The District of Columbia and Arlington County have recently launched a bike-sharing program, and bike racks and lockers are now common features on mass transit.

Teleworking Is on the Rise

In 2004, COG and the Board of Trade announced an aggressive 20 percent telecommuting goal. Significant progress has been made. As a result of this and other initiatives, employers throughout the region are allowing their employees to occasionally work at home, at a telework center, or an employer's satellite office during an entire work day instead of traveling to their regular work place. In 2007, more than 450,000 workers (>18%) in the region were teleworking, reducing traffic congestion and air pollution, increasing the area's economic vitality, and bolstering overall quality of life. According to COG estimates, for every 10 of employees who telework an average of 1.3 days per week, commuter trips will be reduced by about 2–3%.

Ridesharing Services Are Growing in Popularity

Ridesharing services enable commuters to find other individuals who share similar commute routes and work hours. A free list of all alternative commuter options is available in the region through Commuter Connections at http://www.commuterconnections.org or by calling 800-745-RIDE. Also, upon request, Commuter Connections can provide data to identify potential carpool and vanpool partners. Ridesharing benefits include savings in fuel cost and overall expenses, reduced traffic congestion and wear and tear on roads, access to high-occupancy vehicle lanes, and reduced pollution and greenhouse gas emissions. Ridesharing with a guaranteed ride home component will reduce commuter trips by 0.5–3 percent.

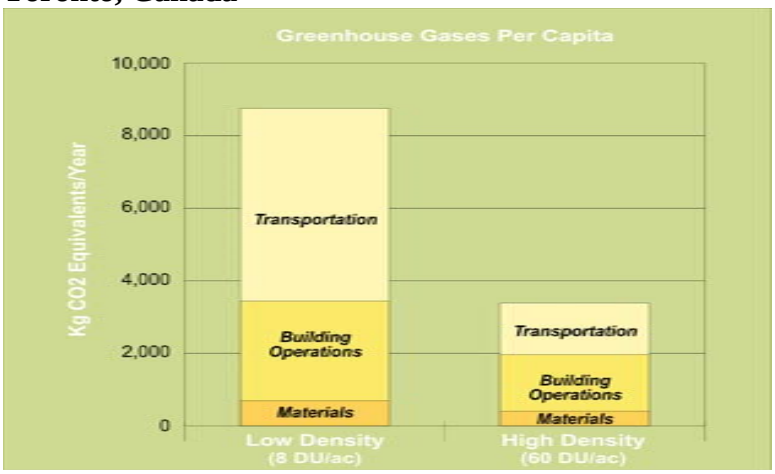
Transit-Oriented Development

State and local governments in the Washington Region promote transit-oriented development (TOD) in several ways. State governments encourage TOD by investing state funds in transit station area planning initiatives and assisting with infrastructure improvements that facilitate transit access. Local governments also promote TOD through targeted infrastructure improvements, as well as developer incentives in local zoning and permitting processes. These can include density credits, reduced parking requirements, and even financing collaboration. Such efforts encourage efficient use of land around transit stations and stops, where residents and workers can access their homes and jobs without the use of a car.

Concentrated Mixed-Use Development

Localities in the Washington Region facilitate concentrated, mixed-use development through comprehensive planning of activity centers and use of various tools and regulatory authority to steer growth to preferred locations. Pursuit of a strategy of concentrated, mixed-use development around the region significantly reduces the region's development footprint, mitigating the environmental impacts of growth and decreasing reliance on automobile travel (see Figure 16). Analysis in the recently released book "Growing Cooler" suggests that 20-40 percent reductions in emissions are possible for individual developments that are mixed use and near to transit options (Ewing 2007). Figure 16 suggests even larger benefits of high density development

Figure 16. Greenhouse Gas Comparison for Low and High Density Development in Toronto, Canada



Source: Norman et al. 2006 as presented by Schilling 2008.

Activity Centers and Clusters

At the request of the Transportation Planning Board (TPB), COG's Planning Directors Technical Advisory Committee (PDTAC) developed the initial Regional Activity Centers between January and July of 1999. The current set of revised Activity Centers maps are based upon COG's Round 7.0 Cooperative Forecasts -- the adopted growth projections for the COG member jurisdictions and the Constrained Long Range Transportation Plan.

Area governments are using the maps and tables to encourage land use and transportation policies that promote more concentrated regional growth patterns and trends. They do not preclude development, but encourage "smarter" development by attempting to inform coordinated transportation and land use decision-making. According to COG estimates, the highest percentage of jobs and households in activity clusters are in the central jurisdictions of Alexandria, Arlington, and the District. Between 2005 and 2030, 54 percent of household growth and 72 percent of employment growth will be concentrated in regional activity clusters (MWCOG 2007a). Significant benefits could occur if much higher percentages of household and employment growth took place in the regional activity centers.

Transportation Planning Options for Meeting Regional Greenhouse Gas Emission Reduction Goals

The National Capital Region Transportation Planning Board (TPB) is developing a "What would it take?"analysis, to assess what combinations of actions would achieve the greenhouse gas reduction goals. The TPB is considering strategies to incentivize higher fuel efficiency and alternative fuel use and also to reduce VMT and congestion through compact growth, pricing, and greater mode choice, including evaluating the impacts of more infill and mixed-use development and supportive transit projects and policies. Based on the "What would it take?" analysis, the TPB will identify regional policies and plans to meet regional greenhouse gas emission reduction goals for the transportation sector. The scenario is expected to be developed and analyzed by February 2009, which will be followed by public outreach and comment on the completed scenario until June 2009. The end of this scenario timeline aligns with the four-year CLRP update cycle required under SAFETEA-LU, which will occur next in 2010. This 2010 update will include several major changes to the CLRP and will provide a timely opportunity to incorporate the results produced by the scenario study and associated public comment in the regional long-range transportation plan.

Further information on local jurisdiction initiatives and best practices in the Washington region are presented in the Climate Change Steering Committee's report in February, 2008: *National Capital Region: Best Practices and Policies to Reduce Greenhouse Gases* which is available online at http://www.mwcog.org/uploads/pub-documents/8ldcXQ20080328151326.pdf

Recommendations for Reducing Greenhouse Gas Emissions from Transportation and Land Use

Reducing greenhouse gas emissions from transportation and land use is a significant challenge in the face of anticipated growth in the region. The main strategies being considered are increasing fuel efficiency, lowering the carbon intensity of fuels/vehicles, and reducing vehicle miles traveled (VMT) through a number of strategies including smart growth planning, shifting transportation modes for existing trips, and reducing the number or length of trips.

Increase Fuel Efficiency and Clean Fuel Vehicles

Promote Clean Vehicles and Fuels

- Evaluate options for promoting CAL LEV II, extending CAFE past 2020 and to cover heavy trucks, and facilitating adoption of high mileage vehicles through incentives and tax policies. (1)
- Promote/accelerate adoption of efficient clean fuel vehicles, including hybrids (cars, trucks, and buses). (1)
- Assess the benefits from a "Cash-for-Clunkers" program and rebates or tax incentives for purchase of hybrid vehicles. (2)
- Further explore alternative-fuel vehicles, such as biofuel-, electric-, or hydrogen-powered vehicles. (1)
- Strengthen financial and other incentives (e.g., tax rebates) to encourage residents to purchase cleaner more, efficient vehicles and/or cleaner fuels. (1,2)

Regional Green Fleet Policy

- Establish a regional green fleet policy with measurable goals and timetables. Target public and private fleets, transit, taxicabs, rental cars, and refuse haulers. Evaluate the benefits of specific "green fleet" conversion percentages. (3)

Traffic Engineering Improvements and Roadway Management

- Identify and promote best practices for traffic engineering improvements and roadway management to reduce VMT, congestion, and emissions of greenhouse gases. (4)
- Identify locations of significant recurrent congestion, and prioritize investments to reduce congestion. (4)
- Implement the Metropolitan Area Transportation Operations Coordination Program (improve coordination among transportation agencies for data sharing, incident management). (4)

Idling

- Increase enforcement of existing idling regulations to prevent extended vehicle idling. (5)

Reduce VMT

VMT Reduction

- Collaborate with the Transportation Planning Board (TPB) to develop VMT reduction goals for 2012 and 2020 and associated options for meeting the goals. (6)
- Identify the percentage of auto trips under 3, 2, 1, and ½ miles, and develop a strategy to shift half of these trips to bike, pedestrian, or transit modes and evaluate the benefits. (7)
- Evaluate the potential greenhouse gas emission reduction benefits and costs of using financial incentives (e.g., pay as you travel insurance or congestion pricing) to reduce VMT. (8)
- Promote car sharing. (9)
- Examine parking policies and their relation to VMT, and implement new parking policies to reduce VMT. (10)
- Strengthen financial and other incentives (e.g., tax rebates, higher parking costs, and transit benefits) to encourage residents to drive less. (11)
- Advocate for federal income tax benefits for transit use that equal or exceed the benefits for employer provided/subsidized parking (21)

"Conformity" Process for Greenhouse Gas Emissions

- Collaborate with TPB to evaluate how a regional process modeled after the current regional conformity process for air quality planning might be adapted to address greenhouse gas emissions.
- Quantify projected greenhouse gas emissions from major new transportation and other new capital projects. (12)
- Make greenhouse gas reduction a stated goal of regional transportation planning activities, including the newly launched multi-stakeholder *Greater Washington 2050 Initiative*, [31] poised to generate additional growth scenarios, a growth compact, and quality growth strategies. (13)

Smart Growth/Transit-Oriented Development

Many studies inside and outside of this region have demonstrated the VMT and greenhouse gas reduction benefits of compact community development that incorporates mixed use, transit accessibility and availability, infill development, higher densities, pedestrian infrastructure, and connected streets.

[31] http://www.greaterwashington2050.org/

- Evaluate the benefits from achieving a range of possible goals (up to 95%) for directing new residential and commercial growth to designated regional activity centers, including growth around transit as well mixed-use higher-density development. (14)
- Encourage local governments to evaluate opportunities to provide incentives (including zoning changes) to encourage mixed-use development, including workforce housing at transit stations and hubs to reduce sprawl and VMT. (14)
- Encourage localities to revisit current land-use plans, in light of current shifts in the real estate market, coupled with high energy costs. (14)
- Establish TOD as the region's preferred growth strategy. (14)

Alternative Modes of Transportation

- Support expanded transit infrastructure and use.
    - With WMATA, MARC, VRE, and the local transit operators, evaluate the greenhouse gas reduction benefits of specific incremental expansion of transit capacity and commuter rail service. (15)
    - Evaluate the greenhouse gas reduction benefits of expanding existing and establishing new exclusive bus transit routes, lanes, on-ramps, corridors, and intercity high-speed rail. (16)
    - Examine options to promote the increased use of existing transit capacity. (17)
    - Evaluate funding requirements for transit incentives and an expanded metrocheck program. (17)
- Building on the accomplishments of the Commuter Connections Program, develop specific targets for shifting modes from single-occupancy vehicles to transit, walking, and bicycling for commuting and noncommuting trips. (18)
- Promote transit-supportive street designs. (15)
- Expand existing and fund new programs to enhance access to transit and alternative modes, commuter connections, guaranteed ride home, telework programs, bike/pedestrian access, and park/ride lots. (19)
- Encourage new commercial construction to include a “travel management plan.” (20)
- Promote the equalization of transit and parking benefits. Advocate for federal income tax benefits for transit use that equal or exceed the benefits for employer provided/subsidized parking.(21)

Bicycle/Pedestrian

- Fully fund the construction of bicycle/pedestrian paths in the region, as outlined in the regional bicycle/pedestrian plan. (22)

- Provide incentives to developments that speed improvements in bicycle/pedestrian access, including improvements in sidewalks, curb ramps, crosswalks, and lighting. (22)
- Promote regional implementation of SmartBike program similar to the "zip car" concept. (22)

Land Use Planning

- Preserve the region's tree canopy. (23)
  - Establish a goal and develop a program and plan to achieve "no net loss" in the region's tree canopy. Evaluate associated benefits and costs.
  - Consider associated issues related to density and height requirements for buildings.
- Carefully plan the location and design of new, infill, and redevelopment projects. (24)
  - Promote regional policies that support walkable communities and affordable housing near transit, and that protect green infrastructure (25)
- Evaluate the US Green Building Council's Leadership in Energy and Environmental Design - Neighborhood Development (LEED-ND) standards for its utility in guiding new development. (26)
- Integrate greenhouse gas emissions analyses and climate change considerations into local government comprehensive planning practices and policies. (27, 28)
  - Identify best practices enabling local governments to include greenhouse gas reduction and energy efficiency/conservation as elements in their local comprehensive planning.
    - Include practices that address climate change risk reduction and guide local zoning, building codes, site planning, and review.
  - In cooperation with COG's Planning Directors Committee and local government environmental and energy planners, convene a working group to devise a consistent, standardized methodology for evaluating the greenhouse gas emissions from proposed individual development projects.

Potential Advocacy Positions

- Advocate for federal support for transit funding.
- Advocate to equalize parking and transit employer benefit caps.
- Promote adoption of CAL LEV II standards for all jurisdictions in the region (DC, Maryland, Virginia).
- Advocate for extending CAFE past 2020 and to include heavy trucks.

9. Taking Action: Regional Economic Development

Green Jobs/Green Economic Development

In the Washington region employment is projected to grow 39 percent by 2030. What types of jobs will be created in the next 20-25 years? Are we adequately training our workforce to assume these positions? What is the potential for environmental protection, greenhouse gas reduction, and green energy development to become a major economic driver and job creator in the Washington region?

What Type of Green Business and Jobs Will Be Created?

Currently the Washington region has the largest environmental services employment pool in the country, with nearly 14,000 environmental workers, according to Greater Washington Board of Trade. As headquarters of the U.S. Environmental Protection Agency and hundreds of environmental consulting firms and organizations, the region has a plethora of environmental scientists, biologists, lawyers, lobbyists, and other professional staff. Increasingly, however, policymakers see the opportunity to create "green collar" jobs at all skill levels. The Center for American Progress, for instance, views green job creation as an opportunity to create middle-skill jobs that serve as entry level or transitional jobs for urban residents. This may include jobs in manufacturing, construction, operations and maintenance (e.g. wind turbine manufacturing, solar panel installation, energy efficiency retrofits and green building construction.) In 2007, for example, 6,000 new jobs were created nationally in the field of solar energy, with many in construction and manufacturing. The American Wind Energy Association estimates that 500,000 new jobs (both direct and induced) were created in wind power. According to industry estimates, in 2006, there were 8.5 million jobs nationwide in renewable energy and energy efficiency.

Public policy plays an important role in stimulating the green economy and in creating new green jobs. The passage and expansion of renewable portfolio standards and increased purchases of renewable energy, for instance, have been important drivers for new investments in renewable energy, drawing major companies to the industry – including British Petroleum, General Electric, Sharp and Shell. Europe has experienced tremendous growth in green jobs as a result of accelerated investments in renewable energy. The looming threat of peak oil, coupled with potential federal and state climate change legislation, is shifting the economics of the green sector and it appears we are on the brink of a major green economic explosion, both nationally and regionally.

How Can the Washington Region Take Advantage of this Opportunity?

To ascertain the potential of green economic development/green collar job opportunities in the area, District of Columbia Office of Planning has a project underway to evaluate the job demand of emerging and existing environmental industries and determine how they can use green policies as drivers to fill skill and employment deficits for Washington residents. Their hope is to create career ladders for people who are unemployed or under employed. Results of their research will be available in the summer 2008, and there may be opportunities to expand the scope of the analysis to the entire region.

The Delaware Valley Regional Planning Commission (Philadelphia region), for example, conduced an economic analysis in 2006 of new economic development opportunities, concluding it needed to develop "Eco-Industry Clusters," promote location efficiency and smart growth, and "Eco-brand" the Delaware Valley. They are currently working on a green jobs inventory, to evaluate the different categories and classes of potential jobs. An economic analysis of this type would be well-advised in the Washington region.

Recommendations

Green Jobs/Green Economic Development

- In collaboration with the business community, support and identify programs to promote green businesses and green collar job development in the region. (1)
- Examine incentives for promotion of green businesses and develop an information database. (1)
- Develop best practices or model regional policies to promote local government implementation of eco-business or green business zones. (2)
- Examine options to promote cooperative green purchasing. (3)
- Promote local food production options to reduce emissions. Coordinate with the Statewide Farms to Schools Programs. (4)
- Promote local vendors and suppliers to reduce transportation-related emissions associated with imports of goods and services. (5)
- Evaluate the potential for expanding the District of Columbia's green jobs analysis to the region. (6)

10. Taking Action: Preparing for the Impacts of Climate Change

The full scope of the impacts of climate change on the Washington region is yet to be analyzed. Risks and costs are critical to any set of decisions that will require an investment of substantial resources. That said, it's not too early for the region to begin a systematic investigation of high-priority program areas and initiate early planning. The state of Maryland has been actively addressing adaptation priorities and opportunities, but so far has focused mainly on coastal areas, which are particularly vulnerable. Virginia has also begun to assess the potential damage climate change could have on its coastal areas, agriculture and recreational resources.

Jurisdictions across the nation are undertaking a variety of actions to adapt to the impacts of climate change (Box 1). In the Washington metropolitan region, local governments and water and wastewater utilities are taking steps to reduce their "carbon footprint," and are beginning to face choices to directly address the current and potential impacts of climate change. Following are some potential actions for adapting to the risks of climate change.

Adaptation Planning Across the Nation

A substantial amount of adaptation planning is already underway elsewhere in the nation. The following examples from a recent survey of such work provide a flavor of the types of impacts and areas of adaptation being addressed (Heinz 2007).

- Boston is examining bridge scour, energy use, public health, flooding, sea level rise, wind damage to buildings, transportation, and water quality and supply.
- Chicago is looking at climate change impacts on aviation, buildings, energy demand, lake level increase, public health, transportation, and water supply.
- Fort Collins, Colorado, is planning to address flooding and water supply.
- King County, Washington, is focusing on biodiversity and ecosystems, climate science, economic impacts, land use, buildings and transportation, public health, safety, and emergency preparedness.
- A Los Angeles climate change action plan emphasizes massive tree planting to counteract heat-island effects and acknowledges the need to address drought, wildfires, sea level rise, and public health.
- New York is addressing air quality, flooding, heat waves, sea level rise, and heat islands.

Recommendations for Adapting to Climate Change in the Region

Adaptation Research

- Increase research efforts regarding how to best prepare for the effects of a warming regional environment. (1)
- Partner with a major university to prepare a report on the expected changes to the region by 2050 as a result of climate change and possible adaptation strategies. (1)

- Analyze changes and risks to the Metropolitan Washington region, its transportation infrastructure, buildings, and population living in low-lying areas. (1)
- Develop regional adaptation polices based on the results of the adaptation research efforts, including policies for infrastructure, land-use and emergency response planning. (2)

Regional Adaptation Workshops (3)

- Conduct the following workshops to provide elected officials, program staff, and other stakeholders an opportunity to focus on risk assessment and potential adaptation strategies:
  - *Workshop 1: Capacity of the Regional Water Supply to Withstand a Prolonged Drought*—Explore the long-term (2030 and beyond) prospects for sufficient water supply in the event of an unprecedented drought coupled with the anticipated regional population growth-related rise in demand.
  - *Workshop 2: Vulnerability of Infrastructure, Residences, and Other Buildings to Increased Wind and Flood Risks*—Assess the risk that current building codes may be inadequate for future conditions. (Site-planning regulations generally prohibit development in flood-prone areas, as delineated by Federal Emergency Management Agency floodplain maps.)
  - *Workshop 3: Vulnerability to Spikes in Heat and Air Pollution*—Assess the capacity of the region's emergency response and health care systems to respond to acute increases in heat and air pollution.
  - *Workshop 4: Opportunities for "No Regret" Actions*[32] *That Provide Benefits Beyond Climate Change*—Drawing on the experience of other locales, explore opportunities to take actions (such as reducing demand for energy and water and expanding tree cover) that generally align with other program priorities, and also provide mitigation and/or adaptation benefits.

[32] This term was coined by Dr. Robert Wilkinson, University of California–Santa Barbara. It is descriptive of such initiatives as Los Angeles's massive tree-planting campaign.

11. Taking Action: Financing Mechanisms

While no study has yet been completed on the economic implications of greenhouse reduction to the Washington region, national and international studies indicate the cost to reduce greenhouse gases is far less than the cost of responding to changes anticipated to occur as a result of global warming. A Stern Review on the Economics of Climate Change, written by the British Chancellor, indicates that dealing comprehensively with climate change would cost about 1% of the gross domestic product (GDP) – but the failure to deal with climate change would cost 20% of the GDP, or more. The U.S. Environmental Protection Agency projects the Lieberman-Warner Climate bill would affect U.S. regional GDP by less than 3 percent, with the greatest impact in the Plains states. They did not evaluate economic benefits.[33]

Reducing greenhouse gases in the Washington region presents significant economic growth opportunities and many co-benefits. A national study performed by McKinsey Global Institute for Ceres, an organization devoted to enhancing corporate responsibility, concluded that investments in energy efficiency of $170 billion/year would yield a profit of 17 percent or $29 billion a year.[34] Energy efficiency investments, to date, already support 1.6 million jobs, nationally.[35] Local greenhouse gas reduction actions can help the region stabilize energy demand, diversify energy supply, lower utility bills, improve air quality, create more walkable community designs, and provide the region the chance to develop our impressive transit system, green collar workforce, and green building and technology base.

Nevertheless, there will be upfront costs and growing pains associated with the shift to cleaner energy sources and greener technologies and practices. The Congressional Budget Office, for instance, indicated a greenhouse gas "cap and trade" program could disproportionally affect people at the lower end of the economic scale and industries that use energy intensively. Government, at all levels, will be called upon to buffer the up front costs associated with the transition to a low-carbon future. From a local government perspective, new staff positions may have to be created, new capital costs may be incurred, and tax revenue may be lost in rebates, tax breaks and grants to businesses and residents to assist the transition to a cleaner energy economy.

There are several ways area governments can cover the costs associated with climate change activities, some of which are listed below. COG can play an important role in keeping local governments well informed about alternative financing mechanisms, in creating economies of scale, and in helping local governments take advantage of the clean energy economy.

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[33] U.S. Environmental Protection Agency, *EPA Analysis of the Lieberman-Warner Climate Security Act of 2008,* March 14, 2008.

[34] McKinsey Global Institute, *The Case for Investing in Energy Productivity*, February 2008. See also, CERES, *Managing Risks and Opportunities of Climate Change: A Practical Toolkit for Investors*, April 2008.

[35] American Council for an Energy Efficient Economy, *The "Invisible" U.S. Energy Efficiency Boom*, May 2008.

Selected Financing Mechanisms for Local Climate Change Efforts

Redirect utility savings directly into new mitigation efforts. As energy prices rise, the savings a local government can incur through energy efficiency improvements and the installation of renewable energy, could be considerable. Instead of crediting the general fund, local government utility bill savings can be redirected into new climate change activities.

Use projected energy savings to fund upfront energy efficiency/renewable energy improvements through a third-party contractor. Using energy performance contracting, for example, an energy services company can supply upfront financing for local government improvements with the associated benefits shared between the contractor and the local government to repay the initial investment.

Create a dedicated fund to support greenhouse gas reduction and energy efficiency improvements, drawing on funds from a variety of sources. The District of Columbia is considering a measure that would create a Sustainable Energy Utility, funded by an assessment on the electric and natural gas utilities, to incentivize and help fund energy efficiency and renewable energy improvements on the consumer level. The State of Maryland has established a Strategic Energy Fund to support energy enhancements (including "early action items"), which will be supported by proceeds from the Regional Greenhouse Gas Initiative (RGGI), a cap and trade system in the northeast for electricity generating plants.

Create partnerships with local utilities to implement energy efficiency improvements and demand management activities. The PEPCO Company, in conjunction with Hannon Armstrong and Virginia Tech University, for example, created the Energy Efficiency Partnership of Greater Washington, which has dedicated $500 million to finance building energy efficiency improvements over the next five years. Expansion of this partnership and/or creation of other innovative financing partnerships show tremendous promise for reducing greenhouse gas emissions and saving energy.

Integrate climate change activities into existing job responsibilities and/or shift staff to new assignments. In some cases, jurisdictions might feel that climate change is such an important priority it warrants reassigning existing staff to new activities. Greenhouse gas reduction objectives could serve as an overlay on the existing work plans of environmental specialists, public works professionals, facility managers, and land-use planners. A central coordinator might be needed to help oversee these activities.

Create economies of scale. By working together, area local governments may get reduced prices for new energy technologies and services. This could include a COG cooperative purchasing effort and the use of a Reverse Energy Auction, or e-auction to optimize energy prices. Montgomery County has a cooperative wind purchase, open to area local governments, which could be expanded and COG recently conducted a reverse energy auction for the purchase of natural gas, a model which could be investigated for application to renewable energy.

The Metropolitan Washington Council of Governments coordinates a cooperative purchasing program on behalf of its member jurisdictions as well as school boards and agencies and

commissions throughout the metropolitan Washington region. The primary purpose of the program is to provide an opportunity for the participants in the program to save money on the purchase of commodities and services through economies of scale and through the reduction of administrative costs. There are approximately 50 purchasing departments that participate in COG's Cooperative Purchasing Program. They include COG's member jurisdictions, other local governments in the region as well as school boards such as Montgomery and Fairfax Counties and other agencies including the Washington Metropolitan Area Transit Authority, the Metropolitan Washington Airports Authority and a number of the region's water and sewer authorities.

The jurisdictions can cooperatively purchase through a single solicitation issued by one of the participating jurisdictions on behalf of all of the other participating jurisdictions or a jurisdiction can "ride" another jurisdiction's contract that has the COG Rider Clause. Cooperative Purchasing is always voluntary and is most successfully used for the purchase of commodities that are purchased in bulk or large volume.

Secure state and federal assistance for greenhouse gas measures. Localities in Maryland will likely benefit from the proceeds accumulated through the Regional Greenhouse Gas Initiative (RGGI), a "cap and trade" program for electric utilities. The federal Energy Independence and Security Act of 2007 authorized Energy Efficiency Block Grants for local governments, to fund a variety of local government activities related to greenhouse gas reduction. COG has worked to help secure passage and funding for these local grants.

Levy carbon fee or utility tax. Local governments may want to consider the creation of a new carbon tax or local utility fee, which could support new greenhouse gas reduction activities. Arlington County, for example, adopted in 2007 a local residential utility tax which is expected to raise $1.5 million. Montgomery County has also adopted an energy tax and carbon surcharge.

Carbon offset program. COG could consider developing a regional carbon offset program, whereby local governments or businesses could support reduction activities in other parts of the region. In some cases, a locality or business may determine it is cheaper for them to purchase a regional offset, than it is for them to put a reduction program in place. COG could also help localities identify opportunities to have local offset projects be supported by national offset efforts, including the Climate Registry's new *Climate Action Reserve*.

Voluntary carbon offset programs are rapidly growing with the sale of voluntary offsets reaching $91 million in 2006 and projected to grow over 10 times by 2010.[36] High quality carbon offsets could play a role in providing cost effective GHG emission reductions in the near to medium term. However, the region should take great care in developing any voluntary carbon offset programs. Carbon offsets are gaining in popularity as climate change becomes a priority issue in the U.S. With this rise in popularity and increase in financial value of the voluntary carbon offset markets, there is renewed scrutiny from consumers, environment advocates, state and federal regulators, and Congress largely due to quality concerns. Concerns over quality are eroding

[36] Michael Gillenwater, Derik Broekhoff, Mark Trexler, Jasmine Hyman & Rob Fowler. "Policing the voluntary carbon market", *Nature Reports Climate Change* (2007) Published online: 11 October 2007.

support for the use of offsets as GHG emission reduction mechanisms. The problem with the existing voluntary offset market is that there is no standardized regulation of offsets. Ensuring the quality of offsets is likely going to be a more important issue than setting the price of offsets. The issues that determine the quality of offsets include: additionality, permanence, third party certification and verification standards, and avoidance of double-counting.[37] In short, any voluntary carbon offset program that the region develops should be very transparent, result in real and high quality GHG emission reductions, and be independently audited or verified on a routine basis. The supply also needs to be clearly separate from the region's voluntary climate targets to avoid double counting.

The non-profit, Clean Air-Cool Planet has much experience with offset programs and has developed the following lists of questions that consumers should ask when purchasing offsets.[38] The region should keep these questions in mind as it develops any offset programs:

- Do current voluntary carbon reduction commitments impede the ability to generate 'additional' offsets?
- Do your offsets result from specific projects?
- Do you use an objective standard to ensure the additionality and quality of the offsets you sell?
- How do you demonstrate that the projects in your portfolio would not have happened without the GHG offset market?
- Have your offsets been validated against a third-party standard by a credible source?
- Do you sell offsets that will actually accrue in the future? If so, how long into the future, and can you explain why you need to 'forward sell' the offsets?
- Can you demonstrate that your offsets are not sold to multiple buyers?
- What are you doing to educate your buyers about climate change and the need for climate change policy?

[37] M.J. Bradley & Associates, Clean Air-Cool Planet, *Feasibility Analysis of a Voluntary Carbon Offset Program in Washington, DC,* April 2008.

[38] Clean Air-Cool Planet, *A Consumer's Guide to Retail Carbon Offset Providers*, December 2006. http://www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf

Recommendations
COG's Climate Change Steering Committee recommends that COG investigate alternative financing mechanisms, such as listed above, for use by area local governments. This could include developing a financing seminar (e.g., Climate Change Colloquia) on topics such as energy performance contracting, incentives, subsidies, rebates, tax breaks, cap and trade, and other creative financing schemes/mechanisms; conducting a study of regional green economic development opportunities; and helping localities access federal and state climate change funding.

Financing Mechanisms

- Evaluate the following financing mechanisms:
  - Redirect savings from energy efficiency. (1)
  - Establish an energy fee/carbon tax. (1)
  - Use performance contracting. (1)
  - Establish a clean energy fund or sustainable energy utility. (1)
  - Participate in cap-and-trade program revenues. (1)
  - Develop a regional carbon offset fund that finances tree planting and canopy enhancements in the region. (2)
  - Identify and secure additional financing for transit. (3)
  - Identify and secure additional financing for building retrofits. (4)

12. Taking Action: Outreach and Education

The Climate Change Steering Committee believes that education and outreach is critical to achieving the target greenhouse gas reduction goals. Addressing the challenge of climate change requires changing individual and institutional lifestyles and behaviors to consume less energy and to prepare for the effects of climate change. A sustained outreach and communications effort will be essential to achieve changes in government, commercial and residential energy consumption and to promote alternatives to motor vehicles for personal transportation.

Concern but Lack of Understanding

Studies of American public opinion indicate a growing concern about climate change. An MIT comparative study of national opinion found a dramatic shift in concern between 2003 and 2006. In 2003 global warming ranked sixth on a list of ten environmental problems. In 2006 it was ranked first.[39] A 2007 Pew Research Center study found a majority of those interviewed said that global warming is a problem that requires immediate government action.[40]

Despite evidence of concern, the studies show a lack of public understanding of the causes of climate change, the nature of climate change and confusion about how actions and technologies contribute to global warming.

Potential for Achieving 2012 Target

Consumer choices and actions offer potential for reducing emissions to achieve the near-term regional reduction target of 10% below business as usual by 2012. Individual and household behavior patterns ranging from home heating to daily commuting are largely responsible for much of the emissions in the region from energy and transportation use. Taking steps as simple as turning off lights or installing a compact fluorescent lightbulb (CFL) can reduce energy use and electric bills. Save the Planet.org, Environmental Defense Fund, Sierra Club and other organizations offer advice for reducing energy in the home, office and traveling.

Partnerships with regional stakeholders, businesses and institutions will be necessary to implement most of the recommendations to achieve regional greenhouse gas emissions targets. An outreach and communication effort is needed to improve public understanding and encourage collaborative efforts to reach the region's goals.

Commuter Connections, Clean Air Partners, Go Recycle and Wise Water Use are a few of COG's social marketing programs. These programs were designed by professional marketing consultants appealing to a defined audience to produce a specific outcome. With the help of consultants, COG measures the success of the marketing programs periodically revises messages, timing or media based on measured performance. Social marketing research provides substantial evidence for the type of audience, the message and the medium that is most effective in producing the desired behavior.

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[39] "A Survey of Public Attitudes towards Climate Change and Climate Change Mitigation Technologies in the U.S.: Analyses of 2006 Results," MIT Laboratory for Energy and the Environment, April 2007.

[40] Pew Research Center: "Global Warming: A Divide on Causes and Solutions," 1/24/07.

The recommendations below address the need to improve public understanding and encourage collaborative efforts to address climate change in the region.

Recommendations for Outreach and Education

- *Implement a Regional Public Education Campaign.*
  - Encourage participation in Cool Capital Challenge, Cool Counties, Cool Cities, ICLEI, and Climate Communities. (1)
  - Develop a "Top 10 Things You Can Do" list that encourages individual energy efficiency activities, alternative commuting; retiring of older, less efficient vehicles, replacing old appliances, replacing incandescent light bulbs with compact fluorescent or LED bulbs, etc. (1)
  - Partner with Clean Air Partners greenhouse gas emission reduction campaign and other existing regional campaigns. (1)
  - Partner with Commuter Connections on promotion of alternative commuting options. (1)
  - Establish a regional "Climate Action Week" to coincide with September "Car Free" activities or other appropriate events. (1)

- *Develop Partnerships with Private Sector and Other Organizations*
  - Partner with Greater Washington Board of Trade Green Committee and Potomac Conference to assist businesses with taking action to reduce greenhouse gas emissions and implement best practices. (2)
  - Identify regional environmental and community group partners. (2)
  - Partner with electric, gas and water utilities on regional energy conservation and energy efficient outreach. (2)
  - Partners with schools, universities and local governments to establish the region as a leader in Green Teaching. (2)

- *COG Member Outreach*
  - Assist COG members with education and information on climate change, best practices, and related technical assistance. (3)
  - Create a "Regional Climate Leaders" Annual Awards program to recognize public and private sector leadership. (4)
  - Maintain and enhance COG Climate Change website to make it more interactive. (5)

III. MOVING FORWARD

13. Moving Forward: Recommendation on Organizational Structure for COG's Climate Change Initiative

The Climate Change Committee Has Successfully Responded to its Board Charge

Part of the COG Board Resolution R31-07 (see Appendix A) included a charge to the Climate Change Steering Committee to provide a recommendation on "any need for a long term organizational structure for the regional climate change initiative."

The Committee has been meeting on a regular basis since May, 2007. As provided in this report, the Committee has completed the following major tasks assigned to it by the Board:

- Prepared a report cataloguing best practices and greenhouse gas reduction activities already underway in the region.
- Prepared an inventory of greenhouse gas emissions in the region for 2005 through 2050
- Recommended greenhouse gas emission reduction goals for 2012, 2020, and 2050.
- Examined local impacts of climate change on the region and conducted an initial review of adaptation strategies.
- Prepared regular advocacy recommendations for consideration by the Board including recommendations on federal energy and climate change legislation, Maryland and Virginia energy legislation, endorsement of grassroots greenhouse gas reduction campaign "Cool Capital Challenge", and sent letter of concern regarding a proposed coal-fired power plant in Wise, Virginia.
- Tracked the work of the Maryland and Virginia Climate Commissions.

COG's Regional Climate Change Initiative Should Continue

This report contains a series of recommendations which may be classified as policy principles, policy positions, specific or quantitative action proposals, and proposals requiring further analysis or research that could lead to specified action in the future.

The committee believes that while it has satisfied the essential elements of its assignments under Resolution R31-07, a regional climate change initiative at COG should continue on an indefinite basis. Reasons for continuing the climate change initiative include:

- The region's climate is already changing, and even with aggressive action in the United States and globally, significant change is likely to occur at least through the middle of this century. There is a clear need for a regional program to be in place as the climate evolves, to help shape policy, to address impacts, to formulate adaptation strategies, and to analyze options for mitigating climate change.
- Climate change remains a very high profile issue for COG's members, the District of Columbia, the state of Maryland and Commonwealth of Virginia, among the business community, among the majority of the states, before the United States Congress, and internationally. It clearly is very high on the regional agenda and therefore appropriately must remain a high priority for COG.

- Climate Change is a cross-cutting issue that affects all of COG's major program areas: environment, transportation, metropolitan development and regional planning, public health, public safety, and human services. An ongoing climate change program is and can be an integrative and synergistic force to help achieve COG's overarching goal of supporting initiatives to enhance the region's quality of life.
- The committee is recommending regional greenhouse gas emission reduction goals for 2012, 2020, and 2050. While the committee has identified a number of initiatives that will help meet the recommended goals, preparation of detailed recommendations for achieving these goals, including the associated analysis required for many of the goals, warrants continuation of the regional climate change initiative.
- Tracking of progress and refinement to the regional climate action plan warrant continuation of the regional climate initiative.
- Successful advocacy on behalf of the interests of COG's members necessitates an active climate change program at COG.
- The Greater Washington 2050 Coalition has identified climate change as a central driver that will shape the region and regional policies for years to come. A supporting structure for climate change is essential for assisting the work of the Coalition.

Proposed Governance Structure for Ongoing COG Climate Change Initiative

The committee considered several options for continuing COG's Climate Change initiative.

- Establishment of Regional Climate Action Public-Private Partnership housed at COG.
- Incorporation into the Metropolitan Washington Air Quality Committee.
- Merger with the Greater Washington 2050 Coalition.
- Incorporation into a regional COG Environmental Policy Committee.
- Incorporation into a regional COG Climate and Energy Policy Committee.

The committee concluded that the last option above**, formalizing the creation of a COG Climate and Energy Policy Committee reporting to the COG Board is the preferred option at this time.** Membership on the Climate and Energy Policy Committee should be broader than the current Steering Committee and open to elected and senior policy officials from all COG member governments. In addition, state agencies, federal agencies, the business community, environmental and civic community, and other potential stakeholders including liaisons from other COG policy committees should be invited to participate. It would be assigned oversight for COG's existing technical committees on energy (the Energy Advisory Committee), green building (the Intergovernmental Green Building Group), and be supported by COG's Alternative Fuels Partnership.

The fundamental roles of the Climate and Energy Policy Committee would be to (1) supervise and facilitate the implementation of the recommendations contained in this report; (2) to direct the design and development of a regional climate change outreach program; (3) to provide ongoing recommendations on advocacy positions on climate and energy policy; (4) to assist other COG policy committees and the Greater Washington 2050 Coalition as required.

The committee believes that several of the other recommendations are also potential options for future consideration as regional and national policy evolves.

- A public-private partnership might very well be an outgrowth of this effort and the committee at some point in the future may recommend creation of such an entity, given the huge role the community and private sector must play to achieve the regional climate change goals recommended in this report.
- If federal law and regulation require preparation of regional greenhouse gas reduction plans analogous to regional air quality implementation plans, then potentially the responsibility would appropriately be assigned to the Metropolitan Washington Air Quality Committee, perhaps with somewhat augmented representation.
- Once the work of the Greater Washington 2050 Coalition is completed, further consideration of the structure would be appropriate.
- While not the recommended approach at this time, the possibility of creating an overarching regional environmental policy committee or other entity that integrates across the various environmental programs should be reconsidered in the future. As of now, the nature of the work programs for COG's water resources, air quality, climate and energy, and airport policy have required dedicated committees to address the significant number of policy and technical issues. However to facilitate effective communication, coordination, and programmatic efficiency, period forums or leadership meetings should be considered as a means of insuring better integration of cross-cutting policy development across the various committees.
- The COG Board Climate and Energy Policy Committee should consider and recommend action steps to help individual jurisdictions meet the regional goals, including:
    - A regional standardized reporting mechanism for baseline emissions data, on a jurisdictional basis
    - Voluntary agreement by individual jurisdictions for targeted reductions,
    - Annual report to COG of progress toward the declared reduction targets by individual jurisdictions.

Conclusions and Recommendation

The committee concludes that creation of a permanent COG Climate Change initiative is essential given the long-term nature of this challenge.

- To provide oversight and direction for the initiative, a COG Board Climate and Energy Policy Committee should be established with a broad membership from COG members, and participation from state and federal representatives, and broad business and stakeholder representation. (1)

14. Moving Forward: COG Climate Change Program

This report contains a series of analyses and recommendations that provide a framework and structure to guide COG's and the region's climate change program. Three science-based but nevertheless aggressive regional greenhouse gas reduction goals will be established as a major outcome from the work of the committee during the past year. The analytical work, consensus building, and associated plan for achieving these goals and related initiatives will be the central focus for work over the coming months and years ahead. Crafting a regional outreach effort, tracking progress, and continuing to advocate regional positions on national, state and local policies are also integral to the success of the regional climate initiative. In some areas of the work during the past year, such as the examination of likely climate impacts on our region and potential adaptation strategies, the committee only had time for an initial examination. It is essential that such work be carried out as part of the next phase of the effort.

Context for COG's Climate Change Initiative Going Forward

COG's Climate Change initiative is not being conducted in isolation, but rather in a rapidly changing political and technical environment. In January, 2009, there will be a new President, and with all of the current candidates pledging action on climate change, a greatly increased focus is likely. The U.S. Congress will soon be actively considering national climate change "cap-and-trade" legislation that may result in national climate policy guidance and funding authorizations shaping U.S. climate programs for at least several decades. Putting a price on carbon will almost certainly accelerate efforts to reduce greenhouse gas emissions.

Maryland has already taken a number of far-reaching steps toward reducing greenhouse gas emissions and soon will issue the report of its Climate Commission. Virginia's Climate Commission is scheduled to make recommendations in December, 2008. In both states, actions are probable in the next legislative session. The District of Columbia is actively considering creation of a Sustainable Energy Utility and has state of the art green building requirements in place that will dramatically change the landscape for energy efficiency. The District is promoting green jobs, pedestrian and bicycle friendly communities that may become regional and national models. Many of COG's local government members are leading by example by actively pursuing cutting edge policies on energy efficiency and conservation, smart-growth development, building conservation improvements, fleet enhancements, use of green power (i.e., renewable energy), and other actions. The National Capital Region Transportation Planning Board is actively assessing a range of policies and measures focused on meeting the regional greenhouse gas reduction goals that could profoundly change transportation planning in the region. High and rising gas prices and more broadly increasing energy prices are factors that seem likely to persist, leading to changes in behavior as well as driving new and much more efficient and environmentally friendly technology.

COG's Greater Washington 2050 initiative is looking broadly at regional growth and development policies, many of which are likely to be driven by climate change considerations. The continued work on the regional climate program will help inform the Greater Washington 2050 Coalition's efforts to craft a new regional compact to guide our region's growth and development in the years ahead.

The Greater Washington Board of Trade's "Green as a Competitive Advantage" conference held in October, 2007, and subsequent creation of a "Green Committee" of 30 leaders from the top companies in the region is now actively organizing and motivating the region's business community to take action to reduce regional greenhouse gas emissions and support environmentally friendly policies. A partnership between government and the private sector is critical to achievement of regional greenhouse gas emission reduction goals.

Creation of green jobs, implementing energy and climate-friendly patterns of growth and development, and major investments in new energy efficient technology, represent exciting business opportunities that are expected to contribute greatly to the continued vitality of the regional economy. In a region with the most educated workforce in the country, the Washington metropolitan area will undoubtedly be in the forefront of addressing the imperatives associated with climate change and helping shape national policy.

Individuals are also taking action. One mechanism endorsed by the committee, the "Cool Capital Challenge," has provided a way for individuals as well as public and private entities to commit to steps to reduce their contribution to greenhouse gas production. People are purchasing energy efficient light bulbs, energy efficient appliances, conserving at home and changing their travel modes and vehicles. That the Washington region is a leader in ownership of hybrid-electric vehicles is but one indicator of individual commitment across the region.

Given that approximately 96% of the greenhouse gas emissions in the region come from the daily activities of individuals and businesses, participation in the regional effort to reduce greenhouse gas emissions is fundamental to its ultimate success. Through a combination of new technology, new patterns of growth, changes in transportation modes, as well as changes in the way we do business as individuals and in our places of work, the region can move forward toward achieving its collective climate change goals.

COG's Climate Change Program Direction in the Coming Year

The recommendations contained in this report fall broadly into several categories. Certain recommendations, such as the regional greenhouse gas emission reduction goals, are quantitative and time-specific. A significant number of the recommendations set the direction for regional policy, but require further analysis to support a definitive and quantifiable proposal, for example, setting a regional green power purchase goal, or a regional vehicle miles of travel (VMT) reduction goal. Other recommendations reflect policy principles to guide the region and COG's members as the climate change program moves forward.

A number of the recommendations can be carried out in the near term while others will take time to reach their conclusions. Most of the recommendations will be best achieved in partnership with regional stakeholders.

The emission reduction benefits and costs also vary greatly, as well as economic co-benefits associated with many of the initiatives. The financial feasibility of many of the recommendations, and establishment of priority rankings still is to be conducted.

To help define the work program in the coming year and beyond, the committee has developed the following matrix (Table 8) that contains, classifies, and analyzes all of the recommendations included in this report. The matrix provides a sense of implementation timing, with many of the initiatives listed as having an immediate time frame. The initiatives identified as immediate necessarily will be the focus in the next year. In addition, a list of recommendations for local governments leading by example is provided in Appendix D.

Regional Climate Action "Implementation" Plans and Tracking Progress

The establishment of regional greenhouse gas emission reduction goals for 2012, 2020, and 2050 creates an imperative to develop detailed plans for achieving the goals, as well as tracking progress toward the goals.

In the coming year, as the climate initiative proceeds with implementation actions that can or are moving ahead now, coupled with evaluating and quantifying additional emission reduction efforts, a plan, or building blocks of a plan can be developed that demonstrate how the region is moving toward achievement of its goals. Actions by the states as well as by COG's members will need to be enumerated, in some cases reconciled, and incorporated into a regional progress report and ultimately a regional plan. A system for quantitatively tracking progress, thorough updating the regional greenhouse gas emissions inventory, will need to be devised. The committee recommends periodic reviews of progress, at least once every three years during the initial phase of the program.

Financing COG's Climate Change Initiative

There is a need for additional funding support to fully execute the work tasks identified in the recommendations. Significant funding exists in COG's FY 2009 environmental and transportation planning work programs and budgets to support much of the staff work required to advance the regional climate change initiative and carry out many of the recommendations contained in this report, but more resources are needed. Additional funding will be sought from foundation sources and government agency grants to enable earlier action and more complete implementation of the program covered in this report. A detailed work program and funding plan will be crafted by mid-summer, 2008 to help target potential funding sources to support the initiative. In-kind contributions from partners and stakeholders could help carry out some of the work and these opportunities need to be identified. Consultant support may also be needed to supplement the capacity of the COG staff.

Recommendations for COG Climate Change Program

- Develop work program for FY 2009 (complete summer 2008)
    - Identify Work Program Priorities, Products and Timetables (2)
    - Design Outreach and Education Program (3)
    - Develop Advocacy Positions for Federal and State legislation (4)
    - Evaluate recommended greenhouse gas reduction measures for cost effectiveness (5)
    - Identify regional goals for recommended greenhouse gas reduction measures (6)
    - Prepare plan to reach 2012 goal (7)
    - Develop system for tracking progress toward greenhouse gas reduction goals (8)
- Seek additional resources such as in-kind contributions from stakeholders, partners, consultants (9)
- Seek additional funding from foundations, grants to support selected work program elements (10)

Table 8. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
I. Regl GHG Reduction Goals					
1. 2012: Reduce 10% by 2012	Medium	Immediate	Low	Medium-High	COG Members, Fleet, Energy, and Building Managers, General Public, Board of Trade, Procurement Officers
2. 2020: Reduce 20% below 2005	High	Midrange-Long Term	Low-Medium	Medium-High	COG Members, Federal Government, Board of Trade, WMATA, MWAA, Procurement Officers
3. 2050: Reduce 80% below 2005	High	Midrange-Long Term	Medium-High	Medium-High	All
II. Energy					
1. Regional green building policy	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
2. Energy performance goals for public buildings	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers
3. Incentives/outreach to improve private building efficiency	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
4. Identify best practices for private buildings, improve efficiency	High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, GSA, USGBC
5. Green affordable housing policies/programs	Medium-High	Immediate-Midrange	Varies	Medium-High	COG Members, IGBG, Facilities Managers, Housing Directors, MDPC, Planning Directors, GSA, USGBC
6. Energy conservation and efficiency goals, plan	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Energy Advisory Committee, State Energy Offices, Utilities, Universities, Businesses, General Public, ACEEE
7. Home weatherization program, energy audits, retrofits	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Utilities, State Energy Offices
8. Best practices to reduce methane, use biosolids	Medium-High	Midrange-Long Term	Medium-High	Medium-High	COG Members, Wastewater Treatment Facilities, Landfills, EPA
9. Identify best practices for local govt, reduce 15%	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Energy Advisory Committee, State Energy Offices, Utilities, Universities, Businesses, General Public, ACEEE
10. Energy Use: Energy Star goals for new buildings	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, EPA, Energy Advisory Committee, Board of Trade, AIA, Trade Asscns
11. Green Power: utilization goals	Medium-High	Immediate-Midrange	Medium-High	Medium	COG Members, EPA Green Power Partnership, Energy Managers, Utilities, Procument Officers
12. Green Power: regional cooperative purchase	Low-Medium	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Advisory Committee, Energy Managers, Utilities, Procument Officers
13. Regional street lighting analysis	Low-Medium	Immediate	Medium-High	Medium	COG Members, Energy Managers, Utilities, Board of Trade, Private Sector
14. Regional energy performance contracting	Low-Medium	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Managers, State Energy Offices, Utilities, Private Sector
15. Long term goal: carbon neutrality for public buildings	High	Long-Term	Varies	Medium	COG Members, IGBG, Facilities Managers, USGBC, AIA
16. Recycling programs	Low-Medium	Immediate-Midrange	Varies	High	COG Members, Recycling Committee
17. Partnership programs	Medium-High	Immediate-Midrange	Low-Medium	Medium-High	COG Members, EPA Energy Star, USGBC, Board of Trade, Utilities
18. Promote 20% RPS, including imports	High	Immediate-Midrange	Medium-High	Medium	COG Members, Energy Advisory Committee, Energy Managers, Utilities, State Energy Offices
19. RGGI - Expand to DC & VA	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	Virginia, DC, Maryland, RGGI States
20. RGGI funds for efficiency and renewables	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Maryland, RGGI States

Table 8. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
III. Transportation and Land Use					
1. Promote adoption of clean vehicles, including CAL LEV II	High	Immediate-Midrange	Medium-High	High	COG Members, State Legislature, Fleet Managers, Auto Manufacturers
2. Provide incentives for early vehicle retirement	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Local and State Govt, Auto Dealers
3. Green fleet policy	Medium-High	Immediate-Midrange	Medium-High	Medium-High	COG Members,
4. Traffic engineering and roadway improvements	Low-Medium	Midrange-Long Term	Varies	High	COG Members, DOTs, TPB
5. Anti-idling initiatives: rules and enforcement	Low-Medium	Immediate	Low-Medium	Low-Medium	COG Members, Local Govt, Police
6. VMT Reduction: goals	Medium-High	Midrange-Long Term	Medium-High	Low-Medium	COG Members, TPB, DOTs, Local Govt, Transit Authorities
7. VMT Reduction: shift short trips	Low-Medium	Immediate-Midrange	Low	Medium-High	COG Members, Local Govt, Transit Authorities, Commuter Connections
8. VMT Reduction: financial incentives	Low-Medium	Immediate-Midrange	Medium-High	Low	COG Members, State and Local Govt
9. VMT Reduction: car sharing	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Local Govt, Zipcar, Flexcar
10. VMT Reduction: parking policies	Low-Medium	Immediate-Midrange	Medium-High	Low-Medium	COG Members, State and Local Govt
11. VMT Reduction: financial and other incentives	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, State and Local Govt, Private Sector
12. Develop conformity process for GHGs	Medium-High	Midrange-Long Term	Medium-High	Low	COG Members, TPB, DOTs
13. Stated goal of GHG reduction in transportation planning	Medium-High	Midrange-Long Term	Medium-High	Low	COG Members, TPB, MDPC, DOTs, WMATA
14. Direct development to activity centers	Low-Medium	Midrange-Long Term	Varies	High	COG Members, Planning Directors, MDPC, TPB, Board of Trade, DOTs, WMATA
15. Expand transit infrastructure and use	Medium-High	Midrange-Long Term	Medium-High	Medium-High	COG Members, Transit Authorities, TPB, DOT
16. Alternative Modes: exclusive transit routes	Low-Medium	Midrange-Long Term	Medium-High	Medium-High	COG Members, TPB, DOTs, State and Federal Govt, Transit Authorities
17. Alternative Modes: promote increase transit use	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, Commuter Connections, TPB, DOTs, Local Govt, Transit Authorities
18. Targets for shifting modes	Low-Medium	Midrange-Long Term	Medium-High	Medium-High	COG Members, Private Sector
19. Alternative Modes: enhance access	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, TPB, DOTs, Local Govt, Transit Authorities
20. Travel management plan for new developments	Medium	Midrange-Long Term	Low-Medium	Low-Medium	COG Members, Private Sector, Planning Directors, MDPC
21. Equalize transit and parking benefits	Low	Immediate-Midrange	Low	Low	COG Members, State and Local Govt
22. Bicycle/pedestrian programs	Low-Medium	Immediate-Midrange	Medium-High	Medium-High	COG Members, TPB, DOTs, Local Govt, WMATA
23. Land Use Planning: Tree canopy preservation	Low-Medium	Midrange-Long Term	Low-Medium	High	COG Members, State and Local Forestry Agencies, U.S. Forest Service, Casey Trees, Center for Chesapeake Communities
24. Land Use Planning: Promote location & design of new development around regional activity centers	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Local Planning Agencies, Local Developers, Greater Washington 2050
25. Land Use Planning: Promote walkable communities and affordable housing near transit	Medium-High	Midrange-Long Term	Medium	High	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers, WMATA
26. Evaluate LEED-ND Standards	Medium-High	Immediate-Midrange	Medium	Varies	COG Members, Planning Directors, MDPC, TPB, Board of Trade, DOTs, WMATA
27. Comprehensive Planning: best practices	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers
28. Comprehensive Planning: environmental review	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, MDPC, Planning Directors, Local Planning Agencies, Local Developers

Table 8. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
IV. Economic Development					
1. Promote green business & green jobs	Low	Immediate-Midrange	Medium-High	Medium-High	COG Members, Board of Trade, Universities, Sustainable Business Alliance
2. Promote eco-business or green business zones	Low	Immediate-Midrange	Medium-High	Medium-High	COG Members, Board of Trade, Universities
3. Promote cooperative green purchasing	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, Procurement Officers, Board of Trade
4. Promote local food production options	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, State and Local Govt, Farmer's Cooperatives, Regional Agricultural Workgroup, Community Supported Agriculture, Freshfarm Markets
5. Promote local vendors and suppliers	Low-Medium	Immediate-Midrange	Low-Medium	Medium-High	COG Members, State and Local Govt, Farmer's Cooperatives, Economic Development Authorities
6. Regional green jobs analysis	Low	Immediate	Low-Medium	Medium-High	COG Members, Board of Trade, Universities, Sustainable Business Alliance
V. Adaptation					
1. Partner w/ university to develop 2050 Impacts Report	Low	Immediate-Midrange	Medium	Medium	COG Members, University of Maryland, NOAA
2. Develop adaptation policies based on report	Low	Midrange-Long Term	Medium	Medium	COG Members, Utilities, Private Sector, State and Federal Govt.
3. Conduct regional adaptation workshops	Low-Medium	Midrange-Long Term	Medium	Medium	COG Members, University of Maryland, NOAA
VI. Financing					
1. Evaluate financing mechanisms for GHG reduction & Energy Efficiency Projects	Medium-High	Immediate-Midrange	Low-Medium	High	COG Members, Chicago Climate Exchange, MD Strategic Energy Fund, Block Grants, Energy Efficiency Partnership of Greater Washington
2. Regional offset fund for tree canopy enhancement	Medium	Immediate-Midrange	Medium	Medium	COG Members, State and Local Forestry Agencies, U.S. Forest Service, Casey Trees, Center for Chesapeake Communities
3. Identify funding for transit	Medium-High	Immediate-Midrange	High	High	COG Members, State and Federal Govt, WMATA
4. Identify funding for building retrofits	Medium-High	Immediate-Midrange	High	High	COG Members, State and Federal Govt, ESCOs
VII. Outreach & Education					
1. Citizen Outreach Campaign	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Clean Air Partners, Commuter Connections, Wise Water, Recycling Committee, IGBG
2. Develop partnerships w/private sector & others	Medium-High	Immediate-Midrange	Medium-High	Low-Medium	COG Members, Board of Trade, Federal Government, WMATA, MWAA, Cool Capitol Challenge
3. COG member outreach (assistance)	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, Cool Capitol Challenge, EPA, ICLEI, Sierra Club
4. Recognition program	Low-Medium	Immediate-Midrange	Low-Medium	Low-Medium	COG Members, EPA, ICLEI, US Conference of Mayors
5. COG Climate Change website	Low-Medium	Immediate	Low-Medium	Low-Medium	COG Members, ICLEI, EPA

Table 8. Recommendations: Summary and Preliminary Assessment

Recommendations	Emission Impact	Implementation Timing	Cost	Economic Co-Benefits	Potential Partners
VIII. COG Climate Change Program					
1. Establish the COG Climate and Energy Policy Committee	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
2. Identify work program priorities, products and timetables	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
3. Design outreach and education program	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
4. Develop advocacy positions for federal and state legislation	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
5. Evaluate recommended greenhouse gas reduction measures for cost effectiveness	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
6. Identify regional goals for recommended greenhouse gas reduction measures	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
7. Prepare plan to reach 2012 goal	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
8. Develop system for tracking progress toward greenhouse gas reduction goals	-	Immediate	Low-Medium	-	COG Members, State/Local Govt
9. Seek additional resources such as in-kind contributions from stakeholders, partners, consultants	-	Immediate-Midrange	Low-Medium	-	COG Members, Greater Washington Board of Trade, EPA, DOE
9. Seek additional funding from foundations, grants to support selected work program elements	-	Immediate-Midrange	Low-Medium	-	COG Members, Foundations

Key:

Timing:
Immediate - Now to June 2009.
Midrange - 1-3 years.
Longterm -More than 3 years.

Emission Impact:
Low - Minimal emission reduction expected.
Medium - Some emission reduction anticipated.
High - Significant emission reduction anticipated.

Cost:
Low - Relatively low cost.
Medium - Moderate financial costs.
High - Expensive option to implement.

Economic Co-Benefits:
Low - Action will have limited impact on other areas of the economy.
Medium - Some economic synergies are anticipated.
High - Significant enhancement to the economy or sector are possible.

IV. REFERENCE INFORMATION

15. TERMS AND DEFINITIONS

Adaptation. Actions taken to respond to the effects of climate change. Examples include building sea walls, constructing facilities at higher elevations, and reservoir expansion.

ACEEE. American Council for an Energy Efficient Economy.

AIA. American Institute of Architects.

BAU. Business as Usual. Scenario assuming no additional new measures to reduce emissions.

BMP. Best Management Practice.

CFL. Compact Fluorescent Light.

Cool Counties. On July 16, 2007 at the National Association of Counties Annual Conference in Richmond, Virginia, 12 pioneering counties representing 17 million people launched "Cool Counties." The Cool Counties initiative seeks to marshal the resources of all 3,066 counties across the nation to address the challenges climate change poses to our communities. Participating counties commit to four smart actions:

- reducing our own contributions to climate change through our internal operations;
- demonstrating regional leadership to achieve climate stabilization and protect our communities;
- helping our community become climate resilient;
- urging the federal government to support our efforts.

CO2e. Carbon Dioxide Equivalent. Emissions of any greenhouse gas (methane, nitrous oxide, HFCs) can be expressed in terms of its equivalent emissions of CO_2 through adjustments using the respective Global Warming Potential (GWP).

Climate Change. Any long-term significant change in the "average weather" that a given region experiences. Average weather may include average temperature, precipitation and wind patterns. It involves changes in the variability or average state of the atmosphere over durations ranging from decades to millions of years. These changes can be caused by dynamic process on Earth, external forces including variations in sunlight intensity, and more recently by human activities. In recent usage, especially in the context of environmental policy, the term "climate change" often refers to changes in modern climate (see global warming). Current studies indicate that radiative forcing by greenhouse gases is the primary cause of global warming. Greenhouse gases are also important in understanding Earth's climate history. According to these studies, the greenhouse effect, which is the warming produced as greenhouse gases trap heat, plays a key role in regulating Earth's temperature. (wikipedia)

DEP. Metropolitan Washington Council of Governments Department of Environmental Planning.

DTP. Metropolitan Washington Council of Governments Department of Transportation Planning.

EAC. Energy Advisory Committee, a COG committee.

ESCO/Energy Performance Contract. Energy Service Company. Firms offer upfront capital to complete energy project and use energy cost savings as repayment.

GHG. Greenhouse Gas. A gas, such as water vapour, carbon dioxide, methane, and hydrofluorocarbons (HFCs), that absorbs and re-emits infrared radiation, warming the earth's surface and contributing to climate change (UNEP).

Global Warming. Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-twentieth century, and its projected continuation. The Intergovernmental Panel on Climate Change (IPCC) concludes "most of the observed increase in globally averaged temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations" via the greenhouse effect. Natural phenomena such as solar variation combined with volcanoes probably had a small warming effect from pre-industrial times to 1950 and a small cooling effect from 1950 onward. (wikipedia)

GtC/yr. Gigaton carbon per year.

Green Power. Electricity generated through non-fossil fuel sources, such as wind, solar, geothermal.

GSA. General Services Administration.

GWP. Global Warming Potential. A measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. It is a relative scale which compares the gas in question to that of the same mass of carbon dioxide (whose GWP is by definition 1). (wikipedia)

ICLEI. Local Governments for Sustainability is an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development. ICLEI was founded in 1990 as the 'International Council for Local Environmental Initiatives'.

IGBG. Intergovernmental Green Building Group, a COG workgroup.

IPCC. Intergovernmental Panel of Climate Change. The Intergovernmental Panel on Climate Change (IPCC) is a scientific body tasked to evaluate the risk of climate change caused by human activity. The panel was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations. (wikipedia)

Kyoto Protocol. The Kyoto Protocol is an international agreement reached in 1997 in Kyoto, Japan to address the problems of climate change. The Kyoto Protocol commits 38 industrialized countries to cut their greenhouse gas emissions. The Kyoto Protocol has a target of reducing greenhouse gas emissions to six percent below 1990 levels by 2012.

Leakage. Carbon leakage occurs when there is an increase in carbon dioxide emissions in one jurisdiction as a result of an emissions reduction by a second jurisdiction with a strict climate policy.

Mayor's Agreement. On February 16, 2005 the Kyoto Protocol, the international agreement to address climate disruption, became law for the 141 countries that have ratified it to date. On that day, Seattle Mayor Greg Nickels launched this initiative to advance the goals of the Kyoto Protocol through leadership and action by at least 141 American cities. By the 2005 U.S. Conference of Mayors Annual Meeting in June, 141 mayors had signed the Agreement – the same number of nations that ratified the Kyoto Protocol. In May of 2007, Tulsa Mayor Kathy Taylor became the 500th mayor to sign on. Under the Agreement, participating cities commit to take following three actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol -- 7% reduction from 1990 levels by 2012; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system.

MDPC. Metropolitan Development Policy Committee, a COG committee.

Mitigation. Actions taken to reduce the probability and risk of future climate change. Includes all measures to reduce emissions of greenhouse gases.

Mmt. Million metric tons.

MPO. Metropolitan Planning Organization. A federally required planning body responsible for transportation planning and project selection in its region.

MWAQC. Metropolitan Washington Air Quality Committee.

NACAA. National Association of Clean Air Agencies.

NVTC. Northern Virginia Transportation Commission.

PJM. PJM is the regional electricity grid operator for the mid Atlantic.

RGGI. Regional Greenhouse Gas Initiative.

RPS. Renewable Portfolio Standards establish a minimum percentage of electricity supply that must be derived from renewable energy sources such as solar energy or wind energy.

TPB. National Capital Region Transportation Planning Board. Serves as the Metropolitan Planning Organization (MPO) for the metropolitan Washington region.

UNFCCC. The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro in 1992. The treaty is aimed at stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty as originally framed set no mandatory limits on greenhouse gas emissions for individual nations and contained no enforcement provisions; it is therefore considered legally non-binding. Rather, the treaty included provisions for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself.

USGBC. United States Green Building Council.

VMT. Vehicle Miles Traveled.

WMATA. Washington Metropolitan Area Transit Authority.

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Resolution R31-07
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METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS
777 North Capitol Street, NE
Washington, DC 20002-4290

RESOLUTION SUPPORTING DEVELOPMENT OF COG CLIMATE CHANGE INITIATIVE

WHEREAS, a growing number of local governments, including localities in the Metropolitan Washington region, are adopting strong policy resolutions calling for cities, communities and the federal government to take collective actions to reduce greenhouse gases to protect the local and global environment; and

WHEREAS, local actions can help encourage national leadership, by providing working models of greenhouse gas reduction initiatives that reinforce other high-priority policy objectives and stimulate private actions, by businesses and citizens; and

WHEREAS, the Metropolitan Washington Region has a history of supporting a clean and sustainable environment through efforts such as the Green Building Program, Energy Star, the Strategic Energy Plan, Alternative Fuels Clean Cities Partnership, Clean Air Partners, Wise Water Use Program, the Environmentally Preferable Purchasing Program, the Clean/Green Fleet Program, Commuter Connections, and others; and

WHEREAS, the failure to reduce greenhouse gases can undermine the quality of life in our region and its economic and environmental sustainability.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS THAT:

1. The Metropolitan Washington Region, building upon existing priorities and programs, commits to developing a regional climate change initiative including implementation of best practices to reduce emissions of greenhouse gases.

2. The COG Board Chair shall appoint an interdisciplinary "Climate Change Steering Committee" to advise the Board on the development of a regional climate change program; including a recommendation on any need for a long term organizational structure for the regional climate change initiative. Elements of the regional climate change program to be considered by the steering committee shall include:

    a. Preparing a catalogue of greenhouse gas reduction activities already underway in the region.
    b. Preparing an inventory of greenhouse gas emissions in the region and the establishment of a regional greenhouse gas reduction goal or target based on an appropriate baseline.
    c. Identification of specific activities and best practices to achieve greenhouse gas reduction and a method for measuring progress in meeting reduction targets.
    d. Examination of local impacts of climate change on the Washington region.
    e. Examination of the feasibility of establishing a carbon offset fund, or other appropriate carbon reduction funding mechanism, for the Washington region.
    f. Recommendations on regional climate change policy and potential advocacy positions on federal, state and local climate change actions and proposals.

3. The Climate Change Steering Committee shall have tenure for one year from the date of its first meeting and it shall report at least bi-monthly to the COG Board on its activities and progress. It shall be further charged with development of a climate change work program and identification of resources and funding to support its mission. To ensure its initial success, the Board shall provide up to $100,000 from the FY 2007 COG contingency fund as seed money for this initiative to cover staff support, and for match to federal, state, local, and private foundation grants.

Appendix B

Regional Greenhouse Gas Emissions Inventory Methodology

Projections for 2020 and 2030 were developed by applying U.S. Department of Energy (DOE) *Annual Energy Outlook 2007* growth factors to the 2005 base year emissions by sector (Table A1).

Table A1. Growth Factors for the Projection Inventory

Emission Source	2020	2030	Growth Factor
Energy/Electrical Generating Units and Electricity Import	20%	33%	EIA Total Electric Power
Transportation Combustion	25%	38%	COG DTP
Residential Fuel Use	22%	33%	COG Population
Commercial Fuel Use	25%	39%	COG Employment
Industrial Fuel Use	10%	19%	EIA Total Industrial Energy
Other Fuel Use	18%	31%	EIA Total Energy Consumption
Commercial Aviation	35%	40%	EIA Jet Fuel
Hydrofluorocarbons	25%	39%	COG Employment
Wastewater	22%	33%	COG Population
Landfills	22%	33%	COG Population
Others:			
Population	22%	33%	COG
Households	23%	35%	COG
Employment	25%	39%	COG

Sources: U.S. Department of Energy, Energy Information Administration (EIA), *Annual Energy Outlook 2007*. Transportation growth percentage calculated based on the Metropolitan Washington Council of Governments (COG) Department of Transportation Planning (DTP) projections. COG Round 7.0a Cooperative Forecast projections for Population, Households, and Employment are provided for comparison purposes.

Data Sources—Electricity: Local utilities provide annual electricity consumption information, and the U.S. Environmental Protection Agency's (EPA's) Clean Air Markets Division reports annual CO_2 emissions from local power plants. Emissions associated with imported power are based on net electricity imports and regional emission factors for electricity generation (0.528–0.62 Mt CO_2/MWh) provided by DOE's Energy Information Administration.

Data Sources—Fuel Use: CO_2 emissions from fuel use were developed using data on commercial, residential, and industrial consumption of natural gas, distillate oil, and residual oil by state and emission factors for each fuel type, scaled to the region using population data (U.S. DOE 2006, MWCOG 2008, and U.S. Census). CO_2 emissions from aviation were based on total U.S. aviation emissions scaled to the region's share of total flight miles (U.S. EPA 2008b, U.S. Department of Transportation 2005). Growth rates are based on COG Cooperative Forecasts for population and employment, as well as U.S. Department of Energy projections for total energy consumption and jet fuel (U.S. DOE 2006).

Data Sources–Transportation: Networks for 2002, 2010 and 2030 were from the air quality analysis of the 2006 Constrained Long Range Plan (CLRP) and the FY2007-2012 Transportation Improvement Plan (TIP). The travel demand component for this work was based upon execution of the COG/TPB's Version 2.1D#50 travel forecasting process, see COG/TPB Travel Forecasting Model, Version 2.1/TP+,Release D,Calibration (Report), September 17, 2004. Inputs to the process include Round 7.0a Cooperative Forecast land activity assumptions, and CLRP and TIP network inputs contained in the conformity report adopted by the TPB in October 18, 2006. COG/DTP staff developed emission factors using EPA's Mobile6.2 emissions factor model, dated September 24, 2003, using locality specific inputs such as vehicle registration data. Emission factors were developed using inputs from the

conformity analysis of the 2006 CLRP and FY 2007- FY 2012 TIP for network, local roads, auto access to transit, transit and school bus.

Data Sources—Other Sources: Estimates were developed by scaling total U.S. emissions of HFCs to the region using regional and national employment data. HFC emissions from wastewater were developed using the EPA's State Inventory Tool with the default inputs, including biological oxygen demand and regional population. Methane from landfills based on information provided by the Maryland Department of the Environment.

APPENDIX C

National Capital Transportation Planning Board (TPB) Vision

Goal 5. The Washington metropolitan region will plan and develop a transportation system that enhances and protects the region's natural environmental quality, cultural and historic resources, and communities.

Objectives

1. The Washington region becomes a model for protection and enhancement of natural, cultural, and historical resources.
2. Reduction in reliance on the single-occupant vehicle (SOV) by offering attractive, efficient and affordable alternatives.
3. Increased transit, ridesharing, bicycling and walking mode shares.
4. Compliance with federal clean air, clean water and energy conservation requirements, including reductions in 1999 levels of mobile source pollutants.
5. Reduction of per capita vehicle miles traveled (VMT).
6. Protection of sensitive environmental, cultural, historical, and neighborhood locations from negative traffic and developmental impacts through focusing of development in selected areas consistent with adopted jurisdictional plans.

Strategies

1. Implement a regional congestion management program, including coordinated regional bus service, traffic operations improvements, transit, ridesharing, and telecommuting incentives, and pricing strategies.
2. Develop a transportation system supportive of multiple use and higher density (commercial and residential) in the regional core and regional activity centers as a means of preserving land; natural, cultural and historic resources; and existing communities.
3. Support regional, state and federal programs which promote a cost-effective combination of technological improvements and transportation strategies to reduce air pollution, including promoting use of transit options, financial incentives, and voluntary emissions reduction measures.
4. Develop a regional tourism initiative to encourage air and train arrival in the region, and additional transit access and automobile parking at the termini of Metrorail/rail services.
5. Provide equivalent employer subsidies to employees with the intent of "leveling the playing field" between automobile and transit/ridesharing.
6. Plan and implement transportation and related facilities that are aesthetically pleasing.
7. Implement a regional bicycle/trail/pedestrian plan and include bicycle and pedestrian facilities in new transportation projects and improvements.
8. Reduce energy consumption per unit of travel, taking maximum advantage of technology options.

APPENDIX D

Recommendations for Local Governments: Governments Leading By Example

ENERGY

Energy Efficiency Measures

1. Regional Green Building Policy: Implement 2007 COG Regional Green Building Policy: All new government buildings meet "LEED Silver" standard, ENERGY STAR®, or equivalent.

2. Energy Use: Identify best practices to support reducing overall local government energy use by 15% by 2012.

3. Examine options and develop plans for replacing street lights with energy efficient street lighting (LED or other options) across the region.

4. Promote regional energy performance contracting to reduce energy use in public buildings.

5. Consider regional cooperative purchase approach to facilitate cost-effective implementation.

6. Develop a long-term goal for carbon neutrality for all government buildings.

7. Recycling Initiative: Enhance and expand existing recycling programs.

8. Encourage provision of energy audits and energy retrofits for individuals and businesses through regional cooperative effort.

9. In collaboration with local governments and area wastewater utilities, identify best practices and evaluate the potential for reducing greenhouse gas emissions through methane recapture and use of biosolids as a fuel as means for reducing energy requirements for operations at area wastewater treatment plants and landfills.

Reduce Energy Consumption/Demand Management

1. Partner with electric, gas and water utilities on regional energy conservation and energy efficiency program outreach.

2. Partner with Greater Washington Board of Trade Green Committee and Potomac Conference to assist businesses with taking action to reduce greenhouse gas emissions and implement best practices.

Clean Energy Sources

1. Establish regional goal of 20% renewable energy purchase by 2015 by local governments.[41]

2. Evaluate regional cooperative purchase and/or reverse auctions to facilitate green power implementation among COG membership.

3. Work with jurisdictions exporting electricity into the metropolitan Washington region to encourage investments in clean low-emitting energy sources.

TRANSPORTATION and LAND USE

Increase Fuel Efficiency

1. Establish a regional Green Fleet Policy: Establish Regional Green Fleet Policy with measurable goals and timetables.

2. Promote transit-supportive street designs

3. Idling: Increase enforcement of existing idling regulations to prevent extended vehicle idling.

Low Carbon "Clean" Fuels

1. Promote adoption of CAL LEV II standards for all jurisdictions in the region.

2. Promote/accelerate adoption of efficient clean fuel vehicles, including hybrids (cars, trucks, buses). Target public and private fleets, transit, taxicabs, rental cars, refuse haulers.

3. Evaluate benefits of specific "green fleet" conversion percentages. Provide incentives for purchase of clean fuel vehicles.

4. Assess benefits from a "Cash-for-Clunkers" Program and rebates or tax incentives for purchase of hybrid vehicles.

Reduce Vehicle Miles Traveled (VMT)

1. Expand existing and fund new programs to enhance access to transit and alternative modes, commuter connections, guaranteed ride home, telework programs, bike/ped access, park/ride lots.

[41] It is acknowledged that due to budget constraints, some localities may not be able to reach this goal.

2. Evaluate greenhouse gas reduction benefits of expand existing and establishment of new exclusive bus transit routes, lanes, on-ramps, corridors.

3. Promote equalization of transit and parking benefits.

4. Promote car-sharing.

5. Examine parking policies and relation to VMT. Implement new parking policies to reduce VMT.

6. Bicycle/Pedestrian: 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 improvements to sidewalks, curb ramps, crosswalks, lighting, etc. Promote regional Smart Bike program.

7. Design regional program to promote bike sharing.

LAND USE PLANNING

1. Tree canopy preservation: 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.

2. Location and Design of New Development: Research and develop specific regional goals (up to 95%) to significantly increase percentage of new development located in regional activity centers.

3. Promote regional policies that support walkable communities and affordable housing near transit.

4. Comprehensive Planning: 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.

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