Montgomery County Greenhouse Gas Reduction Task Force

Greenprint for Montgomery County: Climate Change Action Plan

Final Report

Task Force Members

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*Co-chairs of Task Force

December 6, 2007

Dear Commissioners Ellis, Matthews, and Damsker:

We are very pleased to forward to you a copy of the final report of the Montgomery County Greenhouse Gas (GHG) Reduction Task Force. It has been a pleasure leading this very capable Task Force that you established at the beginning of this year. We have held nine meetings of the full Task Force and numerous committee meetings and teleconferences. The recommendations that you will see in this report were initially developed by committees that delved deeply into three broad subject areas: transportation and land use; energy; and agriculture, forestry, and waste management. The goals and specific actions proposed by each committee were vetted by the Task Force and reorganized to provide a comprehensive "green print" for reducing greenhouse gas production in the county. Public meetings were held at three locations to elicit feedback on these ideas.

The report also contains background information about greenhouse gas formation and the work that was done prior to the Task Force. We were very fortunate to begin our effort with the Montgomery County Greenhouse Gas Inventory prepared by Sarah Knuth. The report also summarizes the extensive analysis that our staff performed in evaluating the effectiveness of the proposed recommendations. Based upon this work, we were able to set ambitious, but achievable goals.

Although we have done a lot in the past ten months, we realize that there is a lot of work still needed to put this plan into action. To aid in this effort, we have attempted to formulate realistic implementation actions and overall management strategies that the County can undertake. Though climate change is a global issue, there are very practical things the County can and should do to make a difference.

We look forward to working with you in the implementation of the Greenhouse Gas Reduction Task Force's recommendations. If there are any questions that you have about this report, please let us know.

Sincerely

Michael J. O'Donoghue Robert B. McKinstry Jr.

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Appendices

"Energy security and climate change are two of the great challenges of our time. The United States takes these challenges seriously. The world's response will help shape the future of the global economy and the condition of our environment for future generations… we are major users of energy, and we have the resources and knowledge base to develop clean energy technologies. Our guiding principle is clear: We must lead the world to produce fewer greenhouse gas emissions, and we must do it in a way that does not undermine economic growth or prevent nations from delivering greater prosperity for their people. We know this can be done. Last year America grew our economy while also reducing greenhouse gases."

-- President George W. Bush
Major Economies Meeting on Energy Security and Climate Change, September 28, 2007

Introduction

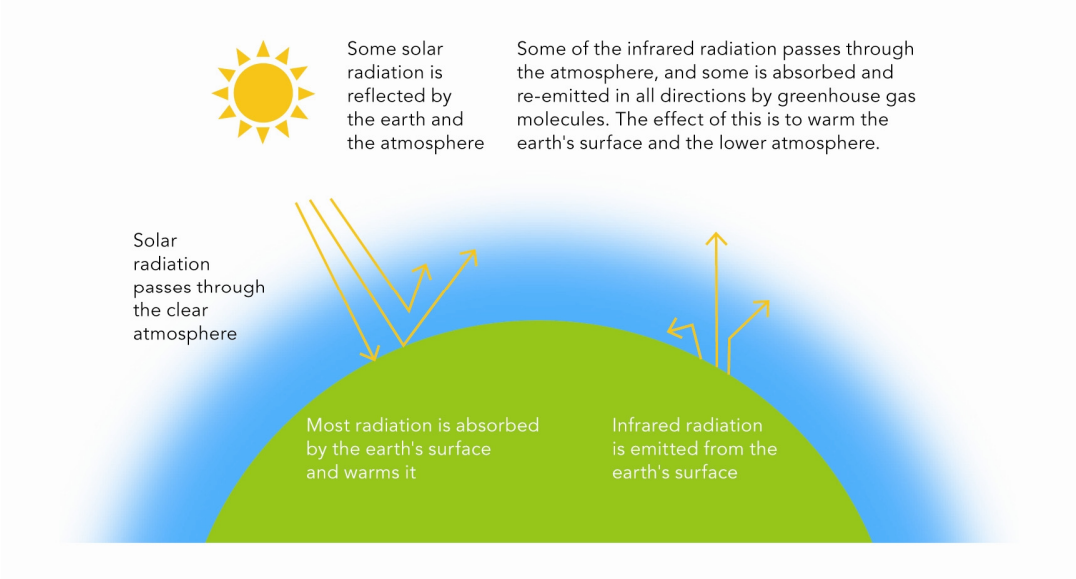
In their fourth assessment on climate change released this year the Intergovernmental Panel on Climate Change (IPCC), formed by the United Nations in 1988 to study global climate change, provides broad evidence that global climate change is a reality, and that human activity appears to be altering the climate by increasing atmospheric levels of greenhouse gases.[1] A healthy debate continues to occur among experts about the precise timing and magnitude of the impacts of greenhouse gas increases (the "sensitivity" of the climate system) and the most effective ways to reduce them. Further, the issue of appropriate greenhouse gas reduction strategies has become politically charged due to perceived social and economic ramifications associated with some reduction policies. Nevertheless, it appears clear that action is warranted due to the potential impact on public health, safety and welfare. Serious efforts to address the rise in greenhouse gas emissions need to be undertaken at all levels by government, business, and individuals. Actions to minimize greenhouse gas emissions will provide other significant benefits including energy conservation, less traffic congestion, open space protection, smart growth, increased economic development, reduced dependence on foreign oil supplies, and, in many cases, cost savings. Moreover, the expiration of PECO utility rate caps in 2011 will likely result in increased electricity bills for residents and businesses making energy conservation even more imperative. With increasing costs of all forms of energy, many greenhouse reduction strategies are simply good business decisions from a cost reduction perspective.

[1]Intergovernmental Panel on Climate Change, Climate Change 2007: Impacts, Adaptation, Vulnerability- Fourth Assessment Report, April 2007.

Montgomery County is certainly not the only community looking to address the issue of global climate change. Nearly 700 cities have signed the US Conference of Mayors Climate Protection Agreement which establishes goals for greenhouse gas reduction. Several states in the nation including California, New York, Massachusetts, and New Jersey have greenhouse gas reduction plans. Philadelphia has issued its own climate change plan, while Bucks, Delaware, and Chester Counties are all currently formulating greenhouse gas reduction strategies. It is important that Montgomery County join this growing number of states, regions, counties, cities, and towns committed to take action to reduce greenhouse gas emissions. While the actions of one county will result in a relatively small reduction of greenhouse gasses in the atmosphere, the cumulative effort of thousands of municipalities and counties will have a significant impact on the issue.

Greenhouse Gas and Global Warming

Greenhouse gases, such as carbon dioxide, nitrous oxide, fluorocarbons, and methane, impact the global climate. In the atmosphere, these gases can trap solar heat through a phenomenon called the "greenhouse gas effect." Without this naturally occurring process, the earth would be uninhabitable. Sunlight passing through the atmosphere and radiated from the earth's surface as heat energy waves becomes trapped by greenhouse gases that combine with moisture. The trapped heat energy warms the earth's atmosphere in the same way that heat collects behind the glass in a greenhouse, making the earth's climate warm enough to support human life. Any change in the quantities of greenhouse gas in the atmosphere result in global temperature change, though there may be differences in the amount of change in any one location due to the complex global weather patterns.



Source: www.ucsu.colorado.edu

A problem arises when additional greenhouse gases produced as a result of human actions, such as automobile emissions and burning fossil fuels for energy production, are added to the atmosphere causing too much of the heat energy reflected off the earth to be trapped inside of the earth's atmosphere. These additional emissions have altered natural greenhouse gas concentrations in the earth's atmosphere, which could result in increasing temperatures throughout the globe during the next century. Based upon studies by the Union of Concerned Scientists, climate change could be significant if, as predicted, Pennsylvania's temperature increases by 6-14 degrees Fahrenheit by the end of the century. [2] These same studies indicate that Pennsylvania's winters are already four degrees warmer than they were in 1970.[3] Credible scientific reports have described some possible world-wide impacts of global warming, including melting polar ice shields, rise in sea level, and more local, ecological changes involving the loss of several plants and animals that we depend upon, changes to crop productivity inducing food shortages, and the triggering of extreme weather conditions.

The levels of greenhouse gas in the atmosphere have changed throughout the life of the planet due to various natural forces. Significant anthropogenic changes throughout the world have occurred since the dawn of the industrial revolution, though the production of greenhouse gas has accelerated in recent years as a result of population growth, increased use of fossil fuels, and deforestation. Continuing current trends, especially with the growth in fossil fuel use in developing countries, will create conditions that will further the concentration of greenhouse gas in the atmosphere and cause the atmosphere to keep heating up, resulting in destabilization of the climate, and potentially more and frequent severe weather events. Changes can be made to reduce greenhouse gas concentrations, though these changes will take many years as carbon is absorbed out of the atmosphere and into the ocean and land. Greenhouse gases can persist for many years in the atmosphere and will not diminish readily through natural processes. The longer we wait to reduce greenhouse gas formation, the more difficult it will be in the future to reduce the concentration of greenhouse gas in the atmosphere.

Here are a few facts to consider:

- Pennsylvania generates 1 percent of all greenhouse gases emitted world wide- 316 million metric tons per year- ranks third among all

[2] Union of Concerned Scientists, Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions, July 2007 (Union of Concerned Scientists- is a nonprofit advocacy group based in Cambridge, Massachusetts, United States.
[3] Ibid.

states in greenhouse gas emission (trailing Texas and California), and creates more emissions than 105 developing countries combined. [4]

- Pennsylvania alone could be within the top 25 countries for greenhouse gas emissions. [5]

- U.S. autos emit more than 333 million tons of carbon dioxide each year, more than one-fifth of the nation's total carbon dioxide emissions.[6]

- If every household in the U.S. replaced their five most-used light fixtures or the bulbs in them with ones that earned the Energy Star, it would prevent greenhouse gasses equivalent to the emissions from nearly 10 million cars. [7]

The Impact of Climate Change on Montgomery County

Most people associate climate change and the heating of the earth's atmosphere with melting of polar ice in the arctic and the resulting rise in sea level. The consequences of these events could impact some of our most populated places in the world, our coasts, and lead to a migration away from coastal areas. Though sea level change will not directly impact the county, many other aspects of climate change could dramatically decrease the local quality of life. Areas of potential adverse impact on the county's health, safety, and welfare could involve: decreased agricultural production, new threats to public health, increases in natural hazards due to extreme weather conditions, and destruction of local habitat and natural conditions. There is of course no certainty that any of these impacts will occur, however the risk of ignoring them is great.

Increased temperatures could also affect our agricultural production, because agriculture is highly sensitive to climate variability and weather extremes. Montgomery County currently produces $17,311,000 per year in agricultural products. Losses in farm productivity could thereby lessen farmer's livelihoods, increase food costs, and destabilize food production systems. Climate change could increase the severity of weather events, including heavy rain and drought conditions, which can be devastating to the production of local crops.

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[4] National Environmental Trust. 2003. "First in Emissions Behind in Solutions: Global Warming Pollution from U.S. States Compared to 149 Developing Countries." National Environmental Trust, Washington, DC.
[5] Pennsylvania Environmental Council, Pennsylvania Climate Change Roadmap, 2007.
[6] US Environmental Defense Fund Web Site, 2007.
[7] US EPA Energy Star Program, Change a Light, Change the World 2007 Facts and Assumption Sheet-note statement is based upon nine bulbs in five fixtures, 2007.

A variety of potential health threats exist including the direct threat posed by increased heat and the effects of extreme weather events.[8] With an aging population, these threats become even more significant. Changing weather is also expected to affect the distribution of food and water borne diseases. Air pollution related diseases could also increase with elevated temperatures which promote the formation of ozone. The range and seasonality of various diseases such as Lyme disease, West Nile virus, and malaria could change, putting more people at risk to infection.

Climate change is anticipated to alter the frequency, timing, intensity, and duration of extreme weather events such as hurricanes and floods. It is estimated that over 2,500 homes and 400 businesses are currently located in flood prone areas in the county.[9] Recent flood events in the county have resulted in localized property damage and fatalities. With the increased severity of rain storms, even more residents and businesses could be subject to future floods. Additionally, because these natural disasters will be more difficult to predict, as weather variability increases, the potential for human harm could increase as well.

The impact from loss of habitat and animals is perhaps less direct but could result in a diminishment in the quality of life for county residents. Changes to climate will stimulate changes in the range of plants and animals. However, adaptation to these changes may be difficult for certain species. Generally rare or endangered plants may not be able to adjust and will disappear, while invasive plants which are quick to adjust may take over certain ecosystems.

Opportunities in Addressing Climate Change

On the other side of the coin, there are certainly economic opportunities resulting from climate change. The current economy in Montgomery County is diverse with a robust technology and manufacturing base. Existing manufacturing could expand into energy saving equipment or alternative energy products. Montgomery County, with its diversified economy and skilled technical labor force, is well positioned to take advantage of these opportunities. In the next several decades, there will be considerable demand worldwide for energy conservation technology and equipment for reducing greenhouse gas emissions. Products and services developed for use in the county will have an expanding market for their use as

[8] Statement of Julie L. Gerberding, M.D., M.P.H. Director of Centers for Disease Control and Prevention before the US Senate, Climate Change and Public Health, October 23, 2007.

[9] Montgomery County Planning Commission, Montgomery County Natural Hazards Mitigation Plan, 2007.

greenhouse gas reduction efforts grow in other parts of the world. Venture capital and business start up assistance could be part of the effort to grow green technologies here within the county.

Already investments have been made to promote alternative power and green technologies to reduce greenhouse gas emissions. Here are a few examples:

- In Falls Township, Bucks County, Exelon Corporation, Conergy AG, and Waste Management Incorporated are partnering in a $20 million solar array installation.[10]
- Wells Fargo is investing $266 million in solar technology.[11]
- Silicon Valley's preeminent venture capitalist has stated that "going green is the largest economic opportunity of the 21st Century" and is investing $200 million in venture capital.[12]

Additionally, needed changes in buildings to make them more energy efficient will require skilled labor to improve insulation and heating systems. New green building techniques could be developed here for use throughout the world. Local vocational-technical training facilities and the community college could play a key role in readying the labor force for these changes.

Even farming in the county has a key role to play in growing crops for biofuels. Since emissions from automobiles account for more than one-fifth of the nation's total carbon dioxide emissions biofuels could be produced from local crops to reduce carbon emissions.

Montgomery County Greenhouse Gas Inventory and Trends

Montgomery County has recognized that greenhouse gas emissions are a serious issue. In 2005, the Planning Commission worked with Pennsylvania Consortium for Integrated Environmental Policy and Penn State University to explore the relationship between growth and development and greenhouse gas emissions in Montgomery County. Sarah Knuth, a Penn State graduate student at that time, prepared a comprehensive greenhouse gas emissions inventory for the county, focusing special attention on how different types of growth and development generate local emissions. She also prepared a "Global Warming Plan of Action" for the county with many suggestions for reducing greenhouse gas emissions.[13]

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[10] Gelles, Jeff. "Going Solar in a big way in Bucks County." Philadelphia Inquirer. August 30, 2007. http://www.philly.com/inquirer/home_top_stories/20070830_Going_solar_in_a_big_way_in_Bucks.html

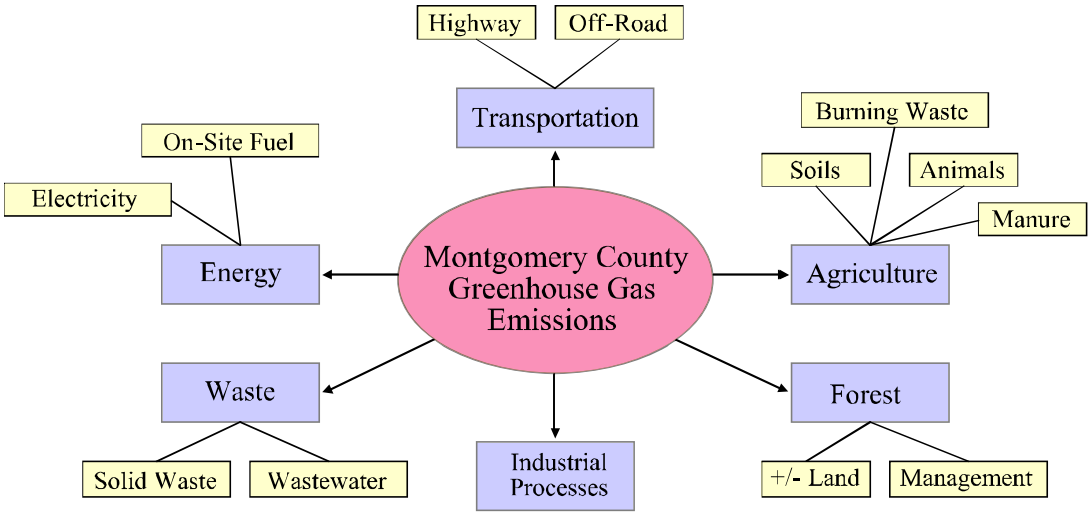
[11] Green Biz.com, August 28, 2007

[12] John Doerr, quoted at Ted.com

[13] Sarah Knuth, A Global Warming Plan of Action for Montgomery County, Pennsylvania, 2006.

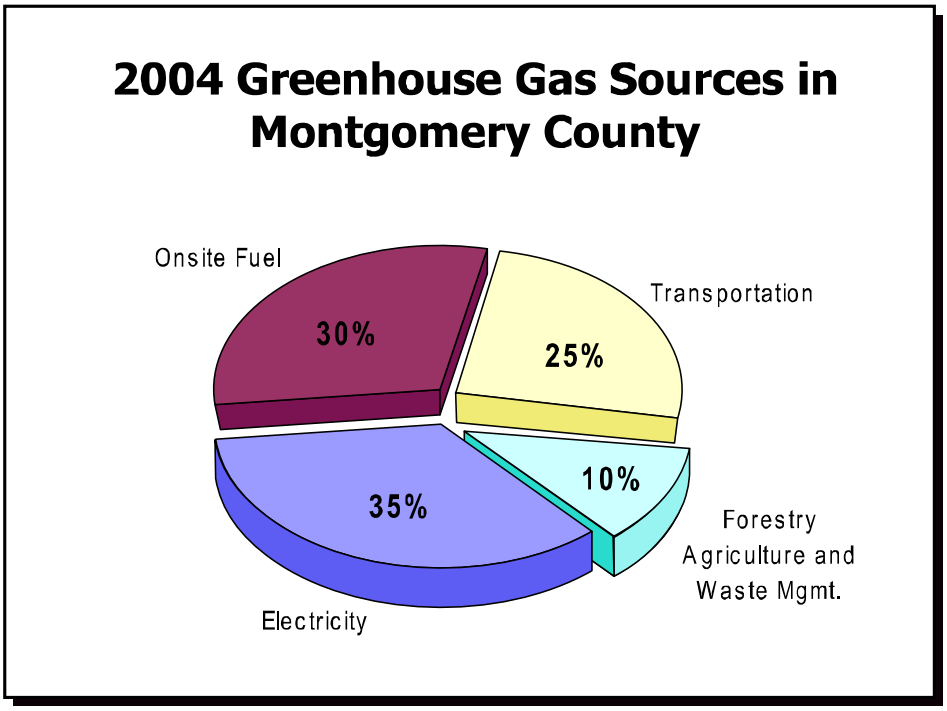
The study involved two phases. Initially an inventory of the possible sources of emissions was developed. (Appendix A includes a full copy of the inventory) From this inventory, projections of future emissions were made. Two rounds of meetings were held with various stakeholders throughout the county to confirm assumptions used in the inventory and to develop strategies to mitigate local greenhouse gas emissions. The implementation strategies were generally evaluated as to their applicability to the county.

The figure below shows the typical sources and sinks inventoried for Montgomery County. These include emissions from energy use, transportation, solid waste disposal and wastewater treatment, agriculture, and forestry management and land-use change. Due to a lack of available data, emissions from off- road vehicle use and industrial processes were not inventoried.



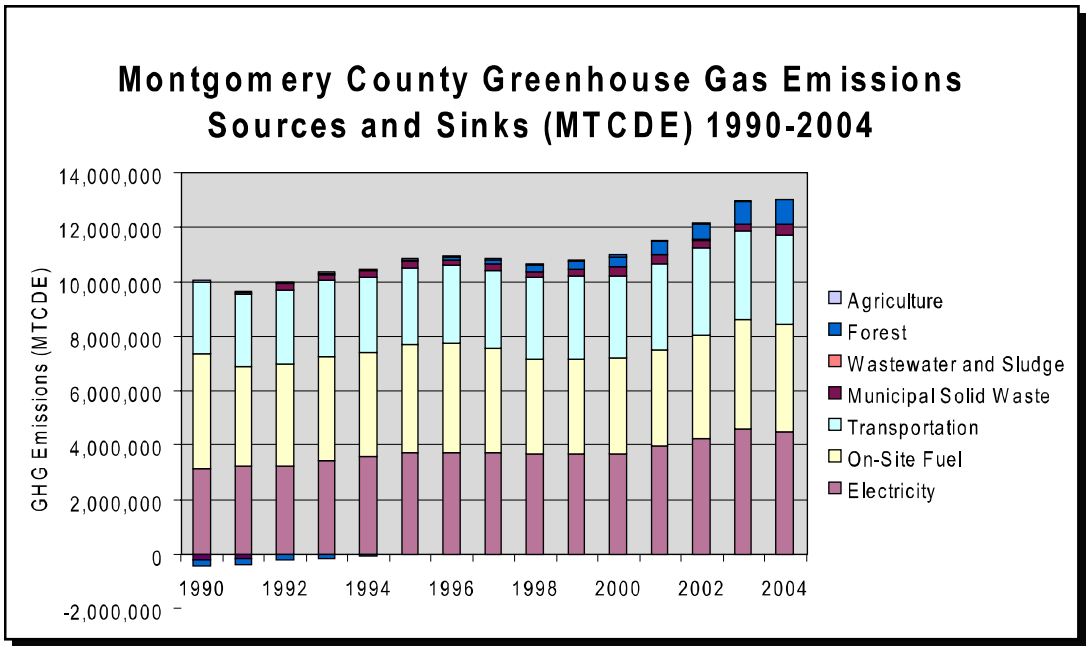
As displayed below in the pie chart, the major sources of greenhouse gas emissions in Montgomery County are from fuel energy, electric consumption, and transportation. When combined, fuel and electric use which is generally associated with buildings represented over half of the source of green house gas emissions. Combined, forestry, agriculture, and waste management account for only about 10% of the emissions. Forest cover change and solid waste account for most of these emissions, while agriculture and wastewater emissions appeared to be insignificant. [14]

[14] Sarah Knuth, Greenhouse Gas Inventory of Montgomery County, 2006.

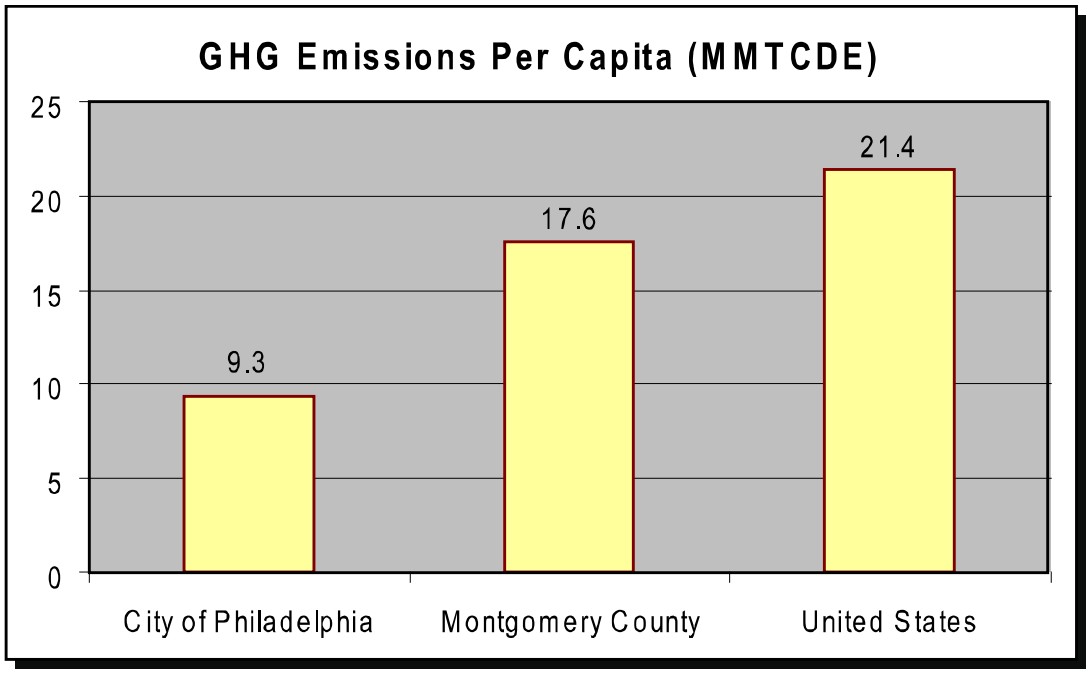


The inventory showed that the county's overall greenhouse gas emissions increased almost every year from 1990- 2004. The total emissions grew from about 9.5 million metric tons of carbon dioxide equivalent (MMTCDE) greenhouse gas emissions in 1990 to 13.2 MMTCDE in 2004, a 36% increase. By way of comparison, during this same time period, population increased 14% and employment increased 10%. This 3.7 MMTCDE increase is equivalent to nearly 670,000 cars driving 12,000 miles each in a one year period of time

As shown in the graph below, growth of greenhouse emissions between 1994 and 2004 was largely due to increase in transportation, electrical use, and fuel energy. Loss of forest land during that time period resulted in increased greenhouse gas production since trees play a key role in capturing carbon dioxide. At the same time there was a small increase in municipal waste management.



Per capita estimates are used to compare greenhouse gas production in the county with other locations. As can be seen in the graph below, the per capita greenhouse gas emissions in the county appeared to be between the rates of Philadelphia and the United States as a whole. The differences between the county and the city can be explained by factors such as commerce per capita, house size, overall affluence, and the amount automobile use. The differences between the county and the nation may have to do with the mix of fuels used to generate electricity, differences in the methodology of each inventory, and the types of facilities and emissions inventoried. Overall, Montgomery County and the Philadelphia region use electricity which is largely generated by nuclear sources that do not result in greenhouse gas emissions. Other parts of the county utilize electricity from coal fired generating facilities that have high greenhouse gas emissions. Certain very intense greenhouse gas emission sources such as refineries are not located in the county, but are included in national inventories.



Plan Development Process

Recognizing the threat to the county from climate change, the County Commissioners formed the Montgomery County Greenhouse Gas Reduction Task Force in January 2007 to create a plan for reducing greenhouse gas emissions. The Task Force was comprised of representatives from the business community, clean air advocates, government, transportation, faith, and academic institutions. In their deliberations it was acknowledged that though greenhouse gas reduction is a global issue, the County can do its part carrying out various initiatives. In formulating this plan, the Task Force explored the various roles that the County plays – major employer, building and fleet owner, trend setter, advocate, adviser to municipalities, financier of buildings, and the related efforts that can be undertaken by the County that will result in greenhouse gas reduction. For example, in its role as an owner of buildings, the County can reduce greenhouse gases by installing a variety of energy conservation products; as an advocate, the County can also influence the energy consuming behavior of residents and developers by producing educational material and promoting best practices.

The Task Force also investigated and analyzed the greenhouse gas inventory work performed by Sarah Knuth. This study provided a valuable base from which the Task Force was able to quickly review potential actions. The methodology in the study was used to provide the necessary inputs as the various implementation actions were evaluated for their impact on emissions. The Task Force focused on actions that were feasible, achievable, realistic, and are able to be implemented without any change to state or federal legislation or policy.

After deliberating eight months, the Task Force presented an interim action plan to the Montgomery County Commissioners. They further developed and refined the recommendations in the interim report during three public workshops held on September 24 at Upper Merion Township Building, September 25 at the Pottstown Campus of the Montgomery County Community College, and October 3 at the Upper Dublin Township Building. The comments from the public are provided in Appendix F.

The recommendations in this report are the culmination of the Task Force's work. The Task Force recognizes that due to uncertainty about greenhouse gas projections, federal and state actions, and the effectiveness of the recommendations, the actions proposed in this report will need to be adjusted in the future.

Setting a Target

It is difficult to achieve success without a target. Plans done throughout the nation have established various goals for greenhouse gas reduction. These targets either set out to maintain or reduce current emission levels to emission levels achieved in previous years or by a certain percent of overall greenhouse gas emissions.

Some targets adopted elsewhere that were considered by the Task Force include the following:

- Reduce emissions by 10% below 1990 levels in 2010 (Philadelphia)[15]
- PA Environmental Council has recommended that Pennsylvania reduce emissions by 25% below 2000 levels in 2025[16] [This hasn't been adopted by the state.]
- Reduce to 10% below 1990 levels by 2020 (New Jersey and New England states)
- Reduce greenhouse gas emissions to 2000 levels by 2010, to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050.[17] (California)

[15] City of Philadelphia, Local Action Plan for Climate Change, 2007
[16] PEC, Pennsylvania Climate Change Roadmap, 2007
[17] The 80% reduction by 2050 is what will be required to achieve the longer term 96-97% reduction required for US emissions if emissions are allocated on a per capita basis and the emissions reductions required to stabilize worldwide levels of GHGs at 450-550 parts per million-volume of CO_2 equivalents are to be achieved.

- Reduce greenhouse gas emissions to 1990 levels by 2012 (US Congress of Mayors- 667 cities, including Philadelphia, have signed on as of 9/2007)

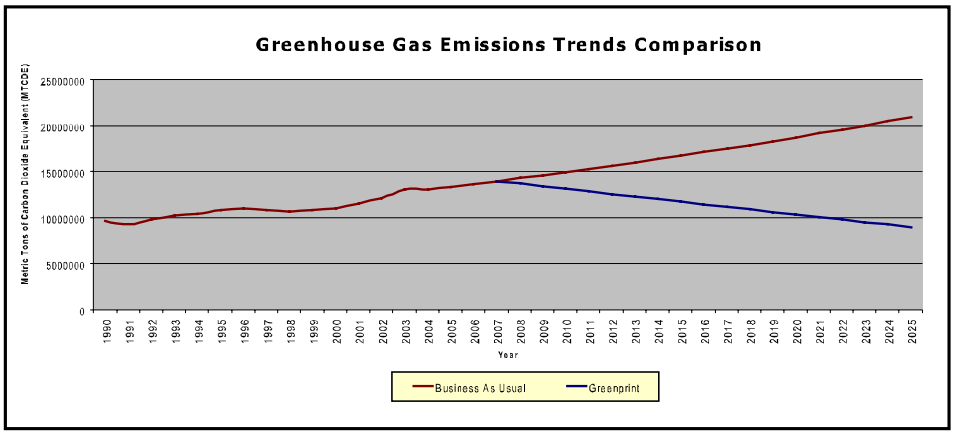
As is shown above, a mix of long term, medium term, and short term targets are frequently used in climate change planning because the very significant climate change reductions required to stabilize GHG levels in the atmosphere will require both immediate action and far longer term planning than has been used in the past.

The Task Force embraced the idea of a range of targets and chose the following reduction targets to address short and long range planning concerns:

- In 2012, reduce greenhouse gas levels to more than 4% below 2004 levels (without action to reduce greenhouse gas emissions, levels will continue to emissions could continue to grow by more than 2% each year)
- In 2017, reduce greenhouse gas levels to less than 15% below 2004 levels
- In 2025, reduce greenhouse gas levels to less than 32% below 2004 levels

2025 was chosen as one of the long range target dates, since it is also the date used for the Montgomery County Comprehensive Plan. The two other dates provide very near term targets, five and ten years out, that will allow the County to measure progress and make early adjustments as needed to successfully implement this plan and reach the reduction targets. The reduction targets were established based upon forecasting of projected potential reductions achievable from the recommendations that the Task Force is proposing. Detailed analysis of the potential reduction that could result from each recommendation is included in the Appendix D. Additionally, the reduction targets were selected to establish trends to enable the County to achieve an 80% reduction of 1990 greenhouse gas emission levels by 2050. This reduction target has been embraced by the scientific community as a target that needs to be achieved in order to significantly slow global warming effects.[18] These targets will need to be reevaluated periodically to insure that new information is incorporated as it becomes available.

[18] Union of Concerned Scientists, "How to Avoid Dangerous Climate Change: A Target for U.S. Emissions Reductions," 2007. www.ucsusa.org/emissionstarget.html)



County Leadership: Leading by Example, by Education and by Enticements

There are two arenas for county efforts to reduce greenhouse gas emissions- internally within county government and externally throughout the entire county community. Naturally, the amount of greenhouse gases from the County's own operations is small compared to the broader county community (e.g. Montgomery County operations consume less than 4/10^{ths} of 1% of all the electricity consumed in the county as a whole). It is important for the County to lead in this effort by first making a significant reduction on its own.

Montgomery County is currently helping to reduce greenhouse gases in a number of ways described below including funding of a portion of SEPTA transit service, advocating transit-oriented design, funding open space and farm preservation, funding revitalization in our established communities, purchasing 100% of its electricity as renewable wind power, and offering a clearinghouse of information relating to greenhouse gas reduction on the internet. However, there are many other opportunities to reduce greenhouse gas emissions in the county government.

Montgomery County is a major employer with more than 3,100 full time and 300 part time employees. Through innovative employment policies, the County family can work smarter in ways that have a beneficial impact on greenhouse gases. Increased use of transit, biking to work, telecommuting, turning lights and

equipment off when not in use, and increased recycling are some of the positive behavioral changes County employees can be encouraged to make during work hours. An ancillary benefit of the County reducing greenhouse gases includes the lowering of energy costs through a more efficient operation, which in the long run creates less pressure to increase taxes.

Furthermore, as employees are educated in the ways in which they can reduce their carbon footprint, or the measure of the impact human activities have on the environment in terms of the amount of green house gases produced, they may begin to take this message home. Employees could also influence changes in the employees' friends and family.

The County operates on a large annual budget expending approximately $500 million dollars. A significant portion of this is used on the procurement of goods. Writing "green" procurement standards into purchasing guidelines would foster reduced greenhouse gas impact. For example, purchasing energy conserving light bulbs is likely to be both an energy and money saver for the County.

Other County expenditures are in the form of grants to municipalities for various activities. Grant funding or various loans provided through the County could be linked to the fulfillment of some type of greenhouse gas reduction activity.

The County fleet of over 300 vehicles is another potential target for greenhouse gas reduction. There are many fleet management opportunities that the County could employ such as the use of alternative fuels, purchase of low roll resistance tires, filling tires with nitrogen, purchase of hybrid vehicles, and sharing a fleet with other governmental agencies.

The County plays an important role in funding various transportation improvement capital projects and contributes to the Southeastern Pennsylvania Transportation Authority (SEPTA). The continued development of a robust, multi-modal, reliable transportation system serving the County can lead to less auto use (and consequently congestion) and a reduction in greenhouse gas emissions.

The County also owns and maintains numerous properties with buildings including the County Court House, One Montgomery County Plaza, the Human Services Center, Parkhouse (geriatric facility), the County Correctional Facility, the Emergency Operations Center, the Fire Training Academy and numerous park and historic site buildings. Opportunity for potential greenhouse gas reduction exists in all these facilities, where smart investments and operation changes may yield both energy cost savings and reduced greenhouse gas emissions.

Building on Success

The County is beginning this initiative from a solid foundation. The County has already undertaken a variety of actions that are reducing greenhouse gas emissions. Though some of these efforts were initiated for other reasons, they are still effective and can be built upon to achieve even greater results. All of these initiatives are important and should be continued and enhanced where possible.

Open Space and Farmland Preservation Program - Since the early 1990s, Montgomery County has led the way with a comprehensive program to protect open space and preserve farmland. In 1993 the County established a $100 million open space program involving grants to municipalities and non-profit organizations as well as County acquisitions. This effort was furthered with the Green Fields/ Green Towns Program adopted in 2003 and funded through a $150 million voter endorsed referendum. Under the program over 10,000 acres of land have been preserved and nearly 10,000 trees have been planted since 1993. As of June 2007, 109 farms have been approved for permanent preservation, for a total of 7,145 acres of county farmland that will never be developed. About 48 additional farms have applied for conservation easements.

Wind Power - On September 27, 2007, the Montgomery County Commissioners signed a two-year agreement to purchase all of the energy used by County facilities from wind generation sources. With this purchase the county ranks among the top 10 largest governmental wind power purchasers in the country, and is the first 100% wind powered county according to the U.S. Environmental Protection Agency.

Trails and Bikeways - Montgomery County is in the process of establishing a 160-mile bike and pedestrian trail system to provide many of the same recreational, conservation, and scenic functions of traditional county parks, while also enhancing the mobility of residents and workers in the county. By the end of this year, the County will have completed 65 miles of trails. Importantly, the trail system interconnects many large municipalities and employment centers and provides linkages to mass transportation.

Montgomery County Community College - The County financially supports the Montgomery County Community College and appoints its governing board. The college with two campuses has grown dramatically in the past five years to nearly 11,000 students. The college facility offers nearby education resources for county residents and provides a tremendous opportunity for greenhouse gas reduction demonstration efforts. The Community College has signed on to the American College and University Presidents Climate Commitment acknowledging their concern about global warming and committing to take leadership action to reduce future green house gas emissions.

SEPTA/Transportation Management Associations - The County is a member of the Southeastern Pennsylvania Transit Authority (SEPTA) contributing yearly capital and operating funds and appointing two members of the SEPTA Board. The County also supports the Greater Valley Forge and Partnership Transportation Management associations in their efforts to provide various forms of transit service.

Montgomery County Waste to Energy Plant - The County developed a public/ private partnership waste to energy plant in Plymouth Township near Conshohocken to process municipal waste generated in the eastern portion of the county. This facility, which commenced operations in 1992, can manage over 1,200 tons of waste per day and is able to produce in excess of 169 million kilowatts of electricity each year from the combustion of the processed waste. Additionally, ferrous metals are separated out of the waste stream at the plant to be recycled. Waste is delivered to the facility through a system managed by the Waste System Authority of Montgomery County.

Revitalization Program - The Montgomery County Community Revitalization Program was started by the County Commissioners in 2000 to help create a strategic economic development program that strengthens and stabilizes the county's older communities for the long term. The program also aims to help these communities become more vibrant, livable, and attractive places to work, live, and visit. The program provides "seed" money that assists municipalities in their revitalization, redevelopment, and rebuilding. It is hoped that by doing so; these places will have an appropriate and sustainable future in the regional economy. Healthy communities would attract new growth, connecting people with mass transportation opportunities and existing infrastructure that are often underutilized. From 2000 through 2007, nearly $30 million in community revitalization grants have been approved by the County. These funds have leveraged an equally large share of state, federal, and private investment.

County Comprehensive Plan - The Montgomery County Board of County Commissioners adopted the comprehensive plan on September 22, 2005. The plan addresses land use, transportation, economic development, housing, water resources, community facilities, and open space. The overall guiding visions in the plan include ongoing multi-municipal and regional cooperation and smart growth and preservation. Sustainable compact development in and near existing towns with infrastructure and transportation opportunities is essential in meeting these visions. This land use pattern called for in the plan would reduce reliance on automobile use and would support existing mass transit facilities. Further the plan recognizes the importance of energy use and conservation.

Model Land Use Ordinances - A key vehicle for the implementation of the County Plan is through local land use controls. The Montgomery County Planning Commission has prepared several model ordinances for use by municipalities in fostering smart growth. Recent grant funding has enabled the Planning

Commission staff to provide free technical assistance to municipalities in updating land use codes to bring them into better conformance with the County Comprehensive Plan.

E- Government - The County has established a comprehensive web based electronic government resource that enables residents and businesses to work effectively with the County on line- eliminating trips to County facilities for information and application forms. This site now contains resources to assist in greenhouse reduction efforts.

TreeVitalize- Montgomery County is a partner in the TreeVitalize program. In March 2003, the USDA Forest Service and American Forests, Inc, in collaboration with Pennsylvania Department of Conservation and Natural Resources (DCNR) released a study that estimates the five-county region lost 8 percent of heavy tree cover (-34,000 acres) over 15 years. To reverse this trend, DCNR and DEP have committed $3 million to fund local tree planting efforts through the TreeVitalize program. TreeVitalize seeks an $8 million investment in tree planting and care over a four year period. Goals include planting 20,000 shade trees; restoring 1,000 acres of forests along streams and water protection areas; and training 2,000 citizens to plant and care for trees. This year alone, Montgomery County and various non-profit organizations within the county have participated in 36 TreeVitalize planting efforts resulting in approximately 6,600 new trees.

County Park Standards and Master Planning - The newly restructured Montgomery County Parks and Heritage Service Department is preparing standards for maintenance and operations which will better guide the management of various county park landscapes. These standards could lead to a reduction in mowing and an expansion of naturalized areas on County property. Further work in the individual park master plans may enhance the natural aspects of the County parkland.

Hybrid Vehicle Test - A Miles ZX40S, a zero emission electric vehicle, was recently tested by the parks department to determine its feasibility for park use. After a trial period, the County parks department personnel determined that the range of the car and other operating features limited its attractiveness to the County for park patrolling and light vehicle use.

New Construction - Over the past two years, the County has rebuilt and expanded the County Public Safety Department Emergency Operations Center (EOC) in Eagleville. This new facility is constructed partially underground and utilizes energy efficient electrical and cooling systems. Additionally with solar orientation of the building and high performance window systems, the building can provide a healthy working environment, while providing savings in heating and cooling costs. The County also constructed a new fire operations training facility

burn building near Conshohocken. Rather than demolishing the old burn building, it was upgraded and incorporated into the new facility.

Household Hazardous Waste Program - Montgomery County has been offering separate household hazardous waste collection services to its residents since 1989. In 1998, Montgomery County led the effort to establish the five-county Southeastern Pennsylvania Household Hazardous Waste Collection Program which provides several collections each year in the Philadelphia area. Through this program various chemicals are collected for proper management including recycling and use of them as alternate fuel supply

In addition to activities undertaken by the county, businesses, institutions, and private residents have creatively approached the challenge poised by accelerated green house gas formation. In the past year, the county has become home to new green roofs, green construction, alternative energy systems, and hybrid vehicles.

Future Leadership Opportunities

In addition to effecting greenhouse gas reductions through changes in county government operations and through capital improvements, the County has an important opportunity in bringing about change in the county community through leadership. Though the County has little direct control over local municipalities and businesses, there are opportunities for the County to encourage and in some cases mandate greenhouse gas reduction changes. For example, the County Planning Commission has a legislative role in providing comments on all local planning decisions involving land development plans and subdivisions, ordinance changes, and comprehensive plans, as well as consistency determinations for the PADEP permit applications. This clearly can be used to advance practices that lead to greenhouse gas reduction. The County also has a significant role in transportation infrastructure decisions through its participation in the Delaware Valley Regional Planning Commission. Moreover, the County Commissioners are respected leaders throughout the county with access to various media for communicating important messages. The Commissioners are in contact with other key business and municipal leaders. Through collaborative and educational opportunities the County can clearly lead on the issue of greenhouse gas reduction.

The County can act as an educator and resource center supporting various local governments and businesses in their efforts to reduce greenhouse gas emissions. This role would also build off of the County's successes in managing its own internal affairs or be coupled with the leadership efforts discussed above. The most important ingredient to the success of any greenhouse gas reduction initiative is the willingness of people to change habits. To guide these changes, leadership and education are essential.

Overall Recommendations

There are a few fundamental recommendations that are essential to the successful implementation of any set of actions that the County chooses to undertake. These impact both greenhouse reductions in county government and throughout the county community. They generally involve the oversight, management, and review of the greenhouse gas reduction actions.

State and Regional Coordination and Cooperation: There is growing interest in greenhouse gas reduction among the other counties in the region and the City of Philadelphia. Philadelphia issued a *Local Action Plan for Climate Change* in April 2007.[19] The Delaware Valley Regional Planning Commission (DVRPC) has been actively involved in the developing efforts across the region, and they have hosted regional discussions about current greenhouse gas reduction efforts and future cooperation efforts. Montgomery County should support these or other initiatives to coordinate and cooperate on greenhouse gas reduction efforts throughout the region.

At the state level, several initiatives are underway. On June 11, the Pennsylvania Environmental Council (PEC) issued the *Pennsylvania Climate Change Road Map* which identified nearly 40 recommendations for reducing greenhouse gas across the Commonwealth.[20] In the Pennsylvania State Assembly, bipartisan legislation has to craft a climate change plan for Pennsylvania has passed in both chambers as of November 19, 2007. Montgomery County should support a statewide plan which could build from PEC's Climate Change Roadmap.

Certainly the County has a role to play in recommending legislation and new policy initiatives to be undertaken by state and federal government. Various members of the Task Force proposed excellent ideas for state and federal action. The role of the Task Force as a whole, however, was not to shape state or federal policy. Therefore this report does not contain specific recommendations for action other than efforts to be initiated by the County. Montgomery County's role in shaping state and federal policies can be accomplished through direct discussion with appropriate federal and state representatives, lobbying organizations, and institutions.

Advocacy for Action by the State and Federal Government: It is clearly recognized that the actions of Montgomery County alone will be very small when compared with the actions that also need to take place in the rest of the world. As described above, this report focuses solely upon what actions the County can bring about. It is nevertheless recognized that the County needs to encourage the state

[19] City of Philadelphia, Local Climate Action Plan, 2007.
[20] Pennsylvania Environmental Council, Pennsylvania Climate Change Roadmap, 2007.

and federal government to act diligently in addressing climate change. Exploration of appropriate lobbying efforts to complement the County actions should be undertaken. This could start with a briefing for the Montgomery County legislative delegation on this report and proposed actions to be considered in the future.

Continuing Oversight: Continuous review will be required in order to ensure that the County, its residents, businesses, and commuters are able to meet the established greenhouse gas reduction targets recommended in this report. As a result of these reviews on the effectiveness of reduction strategies, adjustments may be warranted in the reduction actions. Also, with the new research and technological changes expected in the future, different approaches, beyond those identified within the scope of this report, should be considered as reduction strategies to reach greenhouse gas reduction targets. This oversight should be provided by a committee made up of selected members of the current Greenhouse Reduction Task Force. Duties of the committee could consist of the following:

1. Prioritize and schedule recommended actions to be taken by the County to reduce greenhouse gases generated as a result of County operations.
2. Refine recommendations on countywide programs, policies, or projects that would encourage others to take action to reduce greenhouse gas emissions.
3. Recommend the use of funding or other forms of loans or grants to municipalities and other organizations for investments in energy efficiency.
4. Prepare reports or studies to evaluate energy use or develop alternatives to current practices that would reduce greenhouse gas production.
5. Provide periodic reports and updates to the Commissioners on the effectiveness of the County's greenhouse gas reduction efforts.
6. Hold various public forums to solicit ideas and suggestions about greenhouse gas reduction strategies.
7. Monitor and evaluate emissions to keep track of success.

To work effectively in advising the County Commissioners, this committee should have full access to information about the County's energy use and overall operations. Additionally, staff support should be provided to allow the committee to complete its duties. The committee members could be appointed for five-year staggered terms. Though the committee should determine its meeting schedule and further refine its role after being formed, it would be expected that the committee would meet at least on a quarterly basis.

Greenhouse Gas Strategy Coordinator: Options for greenhouse gas reduction span a wide range of activities and sectors, more than are currently addressed by any one county department. To overcome this problem, several county departments (e.g., the planning commission, parks and heritage services, prison, Parkhouse, and public property) might be involved in the implementation of recommended actions. Representatives from each affected department will need

to be involved in this process and meet regularly as a working committee. Additionally, a new county-level position or department should be established (e.g., a sustainability coordinator/office of sustainability) to provide needed coordination and program implementation. Assigning the responsibility for greenhouse gas reduction to several individual department heads would not be effective or efficient. With one individual assigned to carry out greenhouse gas reduction initiatives, clear lines of communication are established with the commissioners' office. Further, with one point person working directly with the commissioners' office, it should be clear to all county departments that they should comply with the greenhouse reduction strategies. This position does not necessarily have to be filled by hiring a new employee. There may be opportunities to reassign existing staff to fulfill this position. Also, this position could be funded through energy cost savings.

Education: All forms of education must be effectively provided to reach a wide audience. A dynamic web site with access to the latest information and opportunities for participation in shaping greenhouse reduction strategies should be at the center of the County's educational outreach. Opportunities to partner with all types of educational institutions from primary schools to universities should be explored. Also, the Montgomery County Community College curriculum could include education and training focused on greenhouse gas reduction technology to help train the workforce for new opportunities.

Bringing in Expertise: Joining the International Council for Local Environmental Initiatives (ICLEI), or some other national or international technical support organization will help the County acquire information and share greenhouse gas reduction strategies as part of the successful implementation of this report. ICLEI coordinates local climate change mitigation plans for cities and counties worldwide via its Cities for Climate Protection Program. Formally signing on to ICLEI might help Montgomery County structure its project over the long term, especially because ICLEI has extensive experience in helping local governments establish programs that work across various sectors.

Green Bonds: The County has an opportunity to raise capital funds through different financing vehicles. The County enjoys the highest bond rating for the purposes of funding various County projects and initiatives. The County could consider bond funding for municipalities or other partners to use in developing various energy reducing projects. These bond funds could be used as a loan or grant funding source. Further exploration of the types of projects that these bonds could fund and the legal limitations of such a county funding initiative needs to be undertaken. Other funding efforts from the county through existing authorities such as the Housing Authority, Redevelopment Authority, Industrial Development Authority, or the Higher Education and Health Authority could be used to provide more energy efficient homes and business facilities. Research is needed to

determine ways to emphasize energy conservation and the promotion of energy efficiency in the current funding opportunities offered by these authorities.

Energy Audits: Several recommendations listed in this report build on an understanding of current energy utilization in various facilities. In some cases, building owners do not have a clear understanding of the energy use in their building and would greatly benefit from some form of an energy audit. Such an audit would evaluate current building heating and cooling systems, lighting, and other energy use systems and make recommendations for projects or management practices for improving the energy efficiency of buildings. Generally, an auditing consultant would have electrical and mechanical engineers on staff who could estimate energy use, energy cost savings, and the cost of various energy efficiency improvements. They can provide additional services, such as preparation of project specifications or engineering and design, but they usually do not provide financial or management services. Some energy consultants also can assist in hiring the vendors, managing the contractors and reviewing bid packages, ESCO, and financial proposals. The County should undertake an audit and should also encourage municipalities through the Consortium of Montgomery County or other regional cooperatives to undergo energy audits.

Specific Recommendations

Specific recommendations listed below address three broad areas including: energy; transportation and land use; and agriculture, forestry, and waste management. These recommendations can be implemented in various ways utilizing County leadership, education, and enticements. Some actions are simple and could be implemented very swiftly, while others may require substantial investments and would be carried out over time. General tables of actions are provided for each broad area described below. More detailed implementation information on each specific recommendation is provided in Appendix C. In these tables overall community actions are displayed with recommendations about what the County should do to stimulate these actions. Other actions that the County can take directly within appropriate County facilities or through changes in management of County operations are also described. Many greenhouse gas reduction strategies listed below were first evaluated by Sarah Knuth in 2006. Additionally many of the recommendations have already been embraced by other local and state governments.

Energy Use

The largest amounts of greenhouse gas emissions produced in the county result from building energy use. These emissions occur as a result of the electrical generation process or onsite fuel combustion. Overall consideration of the method chosen to create power or electricity and the type of fuel to be used are critical in establishing reduction strategies. In addition to reducing energy use, different sources of energy can be used to reduce greenhouse gas emissions. Electricity

from various renewable and nuclear sources can be produced with little or no greenhouse gas emissions. In choosing between various clean or low greenhouse gas energy emissions or sources of energy, the County should also examine sustainability and other potential impacts such as the storage of energy production wastes.

Specific energy choices depend upon the heating furnaces, lighting systems, and appliances. Energy efficiencies can be easily built into new structures. Changes in energy use in existing buildings can be made through capital projects or can be incorporated as part of routine upgrades and replacements to heating/ cooling systems, energy efficient lighting, or improvements to the overall efficiency of a building through various forms of thermal insulation. The purchase of energy efficient equipment identified through the Energy Star system is another behavioral and operational change that can also be made to use energy more efficiently.

The County has control only over the energy use in its own buildings. It can only influence the energy use in other buildings through various types of leadership or assistance initiatives.

Goals	General Implementation Actions
Target all facilities and operations to meet higher standards for energy efficiency	Prepare and implement greenhouse gas inventory for facilities and operations
	Reduce the energy consumption in new construction by 38% over conventional new construction
	Evaluate and convert buildings for combined heat and power program, and using renewable energy where possible
	Purchase energy efficient products such as Energy Star appliances
	Promote using renewable energy for on site fuel (oil, natural gas and coal) needs
	Purchase electricity from renewable forms of energy
	Adopt the County's model green building zoning ordinance
	Fund demonstration projects of energy efficiency and green building
	Reduce the energy consumption in existing buildings by 30%
	Establish a school Incentive Program

Land Use and Transportation

Greenhouse gas reduction from transportation activities can be significant because transit is a large contributor of overall greenhouse gas emissions. The simple act of a commuter switching from their car to existing public transportation in a single day can reduce their $C0_2$ emissions by more than 20 pounds.[21]

Land use and transportation are inextricably linked. Research has shown the compactness and integration of uses in a community encourages a decrease in the amount of vehicle miles traveled[22].

The types of actions to be taken in the transportation sector fall into three categories: fuel efficiency, fuel type and vehicle miles traveled. The first way to reduce the greenhouse gas emissions produced by transportation is to improve the overall fuel efficiency of vehicles. The more fuel efficient the vehicle, the less fuel consumed and consequently the less greenhouse gas emitted. Advances have been made by the auto industry in fuel efficiency, though in the past 15 years, these advances have been offset by vehicle size and weight. Proposed actions under this category largely involve the purchase and utilization of new types of energy efficient vehicles.

The second category of transportation recommendations involves the type of fuel used to power a vehicle and the carbon content of that fuel. Modest fuel shifts can be made with current vehicles, including increased use of ethanol and biodiesel fuel mixes. However, changes to vehicle engines may be required to permit the use of some of the alternative fuel types that have the greatest greenhouse gas reduction.

The third way to reduce greenhouse gas emissions resulting from transportation is to decrease the number of vehicle miles traveled. Reduction of vehicle miles traveled can be tied closely with encouraging appropriate land use design, particularly because the amount of vehicle miles traveled is a product of lifestyle, the shape of the local community, and affluence. Montgomery County has seen a tremendous growth in vehicle miles traveled (VMT) due to increases in the number of cars on the road as well as more and longer commuting trips. Even with stringent controls on fuel efficiency and the composition of fuels, larger sources of greenhouse gas emissions will exist, unless reduction of vehicular miles traveled occurs. When reasonable assumptions about growth rates, the market share of compact development, and the relationship between $C0_2$ reduction and VMT

[21] American Public Transportation Association, APTA study: Public transportation use substantially reduces greenhouse gases, 2007.
[22] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Waters, and Don Chen, Growing Cooler: Evidence of Urban Development and Climate Change, 2007.

reduction are made, smart growth could, by itself, reduce total transportation related CO_2 from current trends by 7 to 10 percent as of 2050.[23]

Reducing greenhouse gas emissions through smart growth land use provides other benefits that will cost the economy little or nothing and will yield the following benefits: preserved open space, protected water resources, and improved health.

[23] Ibid.

Goal	General Implementation Actions
Reduce vehile miles traveled during work commutes	Establish telecommuting and flex time programs
	Offer TransitChek options to employees TransitChek is an employer-offered commuter benefit program managed by DVRPC. TransitChek vouchers can be redeemed to purchase fare materials on all regional public transit and vanpool providers Expand SEPTA service area and enhance the frequency of service
	Promote carpools
	Establish CarShare programs
	Create opportunities for biking/walking
Promote alternative fuels/improve fuel economy	Use biodiesel (B20) for diesel vehicles
	Use ethanol (B85) for gasoline vehicles
	Convert vehicles with hybrid vehicles at the time of replacement
	Adopt an anti-idling policy loading/delivery areas
Provide financial incentives for actions to reduce emissions	Provide low-interest loans to people to live near their office
Influence the number of vehicle miles traveled by managing land use and site design	Practice mixed land use design, concentrated development, redevelopment, revitalization of older communities and transit oriented design
	Plan for services to follow development patterns and avoid 'leap frog' development

Agriculture, Forestry and Waste Management

Though clearly less of a source of greenhouse gas emissions than either energy use or land use and transportation, there are opportunities to reduce greenhouse gas by the way we process our wastes and manage our land. The simple act of planting a tree is a long term investment in greenhouse gas reduction since trees act as a carbon storage location. Recycling is another easy way to reduce greenhouse gas formation. For example, one ton of recycled paper saves enough energy to power a three-bedroom house for an entire year. [24] Many of the strategies to reduce greenhouse gas formation in agriculture, forestry, and waste management build upon current work the County is already engaged in. Furthering these efforts will involve more collaboration, focusing efforts to more effectively reduce potential greenhouse gas emissions and capture atmospheric greenhouse gas.

Actions to reduce the greenhouse gas emissions resulting from agriculture pertain to the management of soil during cultivation and efforts to provide local agricultural products. Soil management is a way of capturing and sequestering carbon within soil without needlessly releasing it to the atmosphere. Preserving local farmland and providing local farm products reduce greenhouse gas formation since by providing local food sources, transportation is reduced.

The recommendations involving forestry and forms of land management are intended to create natural landscapes that are the most effective in capturing and sequestering carbon. During plant photosynthesis, carbon dioxide in the atmosphere is captured and converted to plant biomass.[25] The effect of the photosynthesis process is dependent upon environmental conditions and the overall health and type of plant. Generally large rapidly growing trees are able to capture the most carbon during photosynthesis. The types of actions that the County can take involve tree planting, encouraging natural forest succession, and forestry management. The forestry activities recommended depend upon the location attributes- suburban landscape versus open space.

Waste management activities include strategies for managing and reducing various forms of municipal waste and wastewater. Generally the most effective waste management strategies to reduce greenhouse gas formation involve waste minimization, recycling, and controlled forms of composting. Alternative energy

[24] National Recycling Coalition.

[25] Generally in accordance with this chemical equation: $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6H_2O + 6O_2$.

harvesting opportunities associated with waste processing reduce dependence upon other fuels that create larger amounts of greenhouse gases.

Goal	General Implementation Actions
Promote sustainable agriculture in Montgomery County	Promote and assist farmers markets throughout the county.
	Procure locally produced farm products, with the co-benefit of supporting local farmers and keeping dollars within the county.
	Practice no-till farming and other cultivation practices that sequester carbon in the soil
Increase vegetation, especially trees, through planting programs	Plant and maintain additional tree canopy
	Develop model urban tree landscapes at public or visible facilities
	Advocate flexible zoning to promote development that maximizes forest preservation.
	Reduce lawns and enhance naturalized area
	Install green roofs
Work to minimize GHG emissions in the waste sector by strongly advocating waste reduction and recycling	Encourage reduction and recycling of construction and demolition waste
	Adopt and enforce recycling ordinances to expand participation in local programs
	Increase recycling by diverting more waste and recycling new types of wastes
	Expand source reduction practices
Promote composting of all plant materials and organic food wastes.	Compost all forms of organic materials including different forms of yard waste, food waste and other biodegradable materials
Target Sewage Facilities Sector for GHG emissions reduction	Utilize waste digestion technology for bio-solids at waste water treatment plants
	Convert to alternative wastewater treatment technologies that produce less greenhouse gas emissions

Implementation

This report contains actions that should be undertaken to substantially reduce greenhouse gas emissions in Montgomery County. The challenge of reducing greenhouse gas emissions is huge. Success in addressing it will involve everyone to establish and nurture a new culture intolerant of waste. This will be no easy task.

In order to get started the County should adopt a proclamation signifying the intent to address greenhouse gas formation and climate change. A copy of the proclamation is contained in Appendix E. The County should also act immediately to appoint a coordinator and to establish a greenhouse gas committee to guide the implementation process. A separate web site should be established as a clearing house of information and resource to assist everyone involved in greenhouse gas reduction efforts.