Cool Communities

Identifying Climate-Friendly Developments in the Washington D.C. Region

Executive Summary

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A Coalition for Smarter Growth research report

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Executive Summary

Over the last decade, a consensus has emerged about the importance of focusing a significant share of our region's job and population growth in compact, mixed-use places around transit, particularly our Metrorail system. Doing so reduces traffic congestion, lowers household transportation costs, cuts air pollution, reduces loss of forests, farms and natural habitats, and improves health and access to jobs. The threat of climate change now looms, but smart growth policies can also contribute to the reduction of greenhouse gas emissions. This report modeled the travel characteristics and greenhouse gas emissions from eleven development projects in the Washington metropolitan region. The analysis found that compact, mixed-use development within walking distance of high frequency transit offers substantial reductions in CO_2 emissions from new housing and commercial space. Transit-oriented locations and walkable designs can reduce CO_2 emissions by anywhere from 8 to over 40 percent.

A Growing Region: Officials at the Metropolitan Council of Governments expect the Washington D.C. region to add 1.2 million people and 1 million jobs by 2030. Where and how we grow and travel is important not only for families seeking access to quality housing, jobs, services and neighborhoods, but also for regional efforts to reduce our carbon footprint. Fortunately, smart growth solutions not only provide greater housing and transportation choice and affordability, but also help meet our greenhouse gas emissions reduction goals. Vacant land at Metro stations, infill development and commercial corridor revitalization offer significant opportunities to create mixed-use walkable/bikeable and transit-accessible communities.

Regional Climate Goals: The Washington Metropolitan Council of Governments has set a goal that by 2020 we reduce CO_2 emissions by 20 percent below 2005 levels, and by 80 percent by 2050. Aggressive savings throughout the energy and transportation sectors are needed. The production and consumption of fossil-fuel-based energy – in our homes and offices, and in our travel – generate most of the CO_2 emissions in our region. Thirty percent of regional emissions come from the transportation sector – predominately the driving of passenger vehicles. Thus, more efficient transportation and land use must play a central role in reaching our climate protection goals.

Measuring CO_2 Reductions Achieved Through Smart Growth: Shrinking the emissions from transportation and land use will occur in three key ways: increased vehicle fuel economy, reduced carbon content of fuel, and decreased vehicle miles traveled (VMT). This report models the reductions in VMT and CO_2 achieved by development projects with high frequency transit and walkable community designs in regionally-accessible locations throughout the Washington metropolitan area. The results of this analysis using URBEMIS, a land use and transportation model, are consistent with recent national studies by leading academics and researchers. This model greatly improves on the Institute for Traffic Engineers (ITE) standard vehicle trip generation assumptions. Standard ITE trip projections are the most commonly used approach throughout the United States for estimating the projected vehicle traffic created by new development. ITE numbers assume conventional suburban, automobile-dependent, single-use land uses with little or no access to transit.

The URBEMIS model uses standard ITE values, but then credits traffic-reducing features by accounting for the many factors affecting to what degree residents and workers will reduce driving by considering on-site features such as local-serving retail, mix of uses and density of housing, walkability/bikeability (measured through intersection density and sidewalk availability) and amount of affordable and senior housing (which generate fewer vehicle trips than market rate housing). URBEMIS also measures regional accessibility of a development indirectly through the level of transit service, measuring the daily number of buses and trains serving the number of homes and businesses within a quarter and half mile. This "transit service index" is a key variable affecting how much residents, shoppers and workers drive.

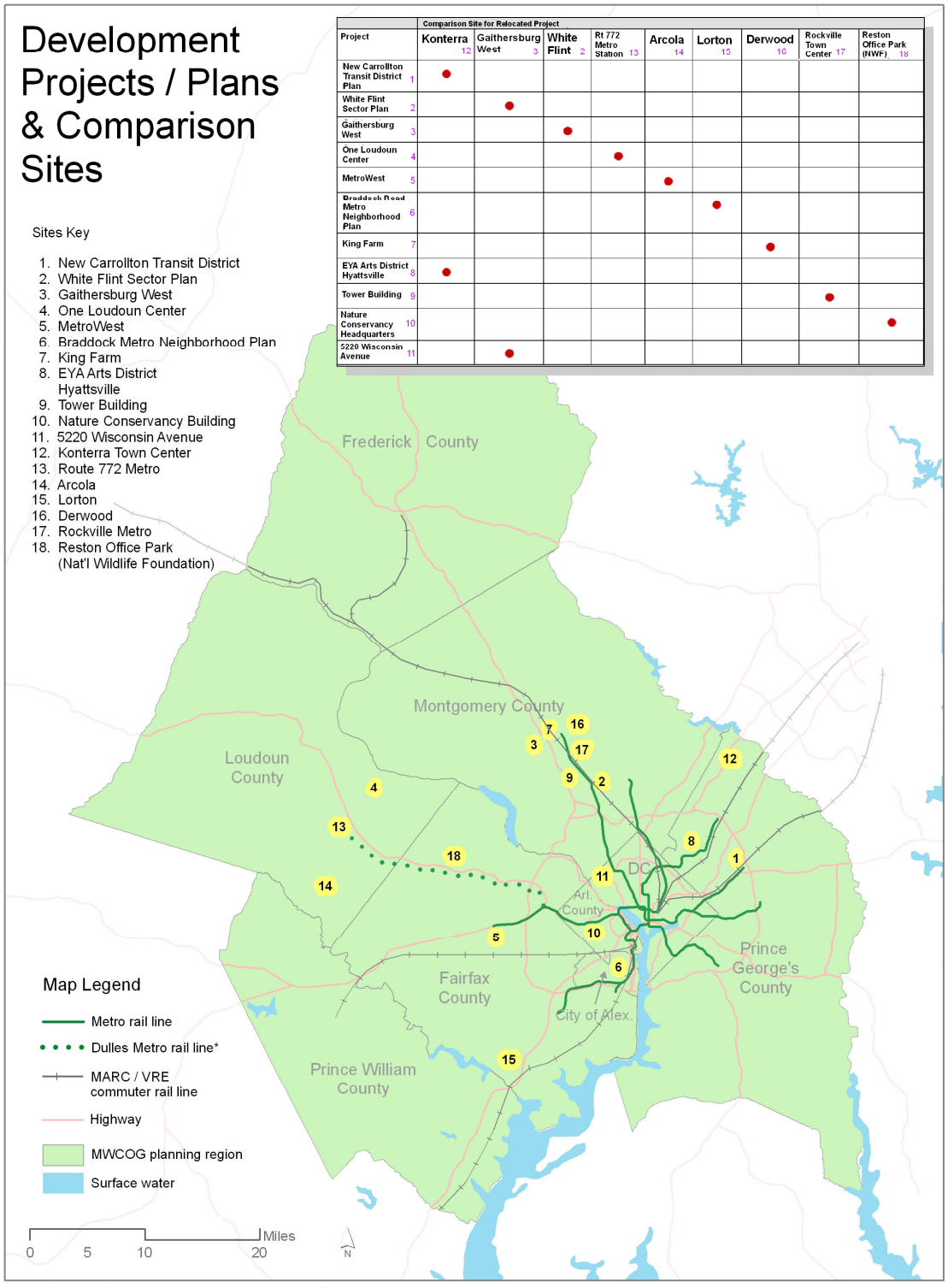
This study examined eleven projects – seven large-scale, mixed-use development plans, two mainly residential developments and two office buildings – against comparison sites (Figures i-1, i-2). The analysis first compared the project for the ITE baseline, which assumes isolated land uses, with the results of URBEMIS accounting for features that reduce driving and increase walking, bicycling and transit use. Second, the analysis compared the project to a comparison site. The comparison site was selected as a reasonable alternative site for such a project. Eight of the eleven projects were located in more transit-accessible locations (all but one at a Metrorail station), and three of the projects were in less transit-accessible locations than their comparison sites.

Figure i-1. Development Projects Analyzed for Effect on Emissions

Project /State/Status	***Comparison Site*** *(simulated relocation of project)*
New Carrollton Transit District Plan (MD)	Relocated to Konterra (MD)
White Flint Sector Plan (MD)	Relocated to Gaithersburg West area (MD)
Gaithersburg West Life Sciences Center Plan (MD)	Relocated to White Flint Metro station area (MD)
One Loudoun Center (VA) (approved)	Relocated to Route 772 (Ryan Road) Metro station (planned Dulles Rail extension) (VA)
MetroWest, Vienna-Fairfax-GMU Metro (VA)(approved)	Relocated to Arcola (VA)
Braddock Metro Neighborhood Plan (VA)	Relocated to Lorton (VA)
King Farm (MD) (built)	Relocated to Derwood (MD)
Arts District Hyattsville (MD) (partially built)	Relocated to Konterra (MD)
The Tower Building (MD) (built)	Relocated to Rockville Town Center (MD)
Nature Conservancy Building (VA) (built)	Relocated to a Reston office park - National Wildlife Federation location (VA)
5220 Wisconsin Avenue NW – (DC) (approved)	Relocated in Gaithersburg West area (MD)

Mixed-Use Centers
Urban Neighborhoods
Office Buildings
Residential Buildings

Figure i-2 Map of Study Development Projects / Plans and Comparison Sites



Note: Project locations approximated on this map.
* Under construction.

Map created on March 10, 2010 by Jake Aftergood.

Major Findings: Mixed-use walkable developments with a dense street grid and frequent transit perform much better than indicated by the standard ITE traffic estimates. These developments significantly reduce vehicle trips, vehicle miles traveled and greenhouse gas emissions compared to typical auto-oriented suburban development estimated in an ITE baseline assessment. Reductions in CO_2 range from 10 to 35 percent. The study also compared the CO_2 emissions of each project or plan to a simulated relocation. Each project was analyzed at a site that would be a plausible alternative location where potential residents would live and/or work. Total CO_2 reductions when combining on-site design and regional accessibility were substantial, ranging from 8 to over 40 percent (see Figure i-3). This assessment demonstrates that there is great potential to reduce the carbon footprint of future growth while simultaneously improving access to jobs, increasing transportation choices and offering better housing opportunities for households throughout the region.

Figure i-3 CO_2 emissions from Study Site vs. Comparison Site (%)

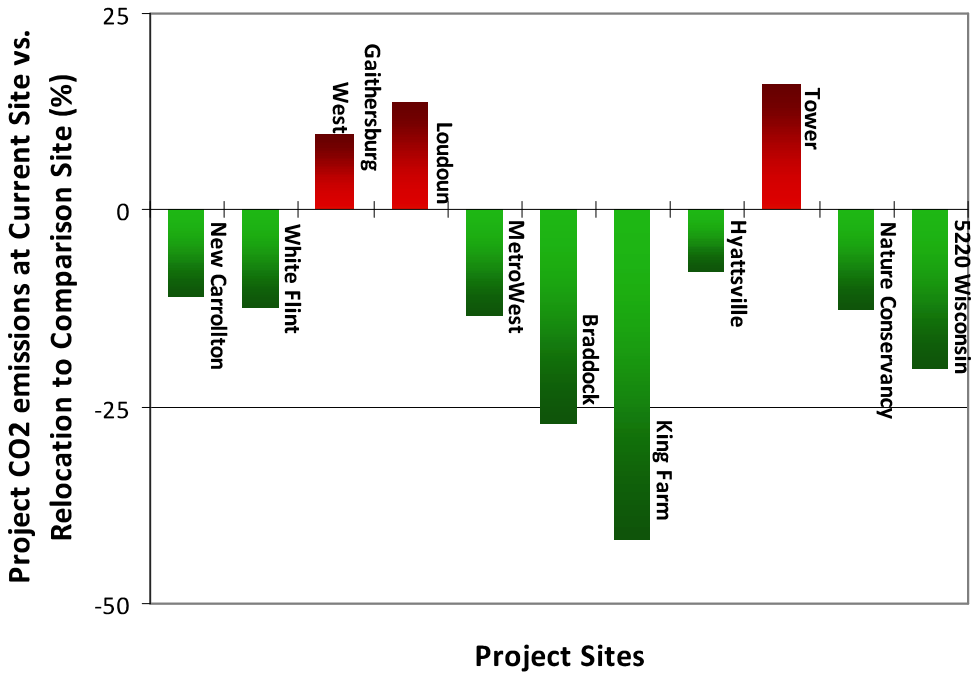


Figure i-3 shows the percent in CO_2 reduction (or increase) compared to alternative sites. Projects located at sites with lower regional accessibility show higher emissions (projects with positive values,) and projects with higher regional accessibility show savings in $C0_2$ emissions (projects with negative or reduced values).

Related Observations: Compact development, even in a regionally less accessible site, performs better than low density, single-use sprawling patterns, but large scale increases in jobs and housing at distant locations increase overall CO_2 emissions. One Loudoun Center in Virginia Gaithersburg West in Maryland performed 14 and10 percent worse, respectively, than their regionally accessible comparison sites. While this result alone is significant, it

Figure i-4 Annual Tons of CO_2 Emissions at Study Site versus Comparison Site

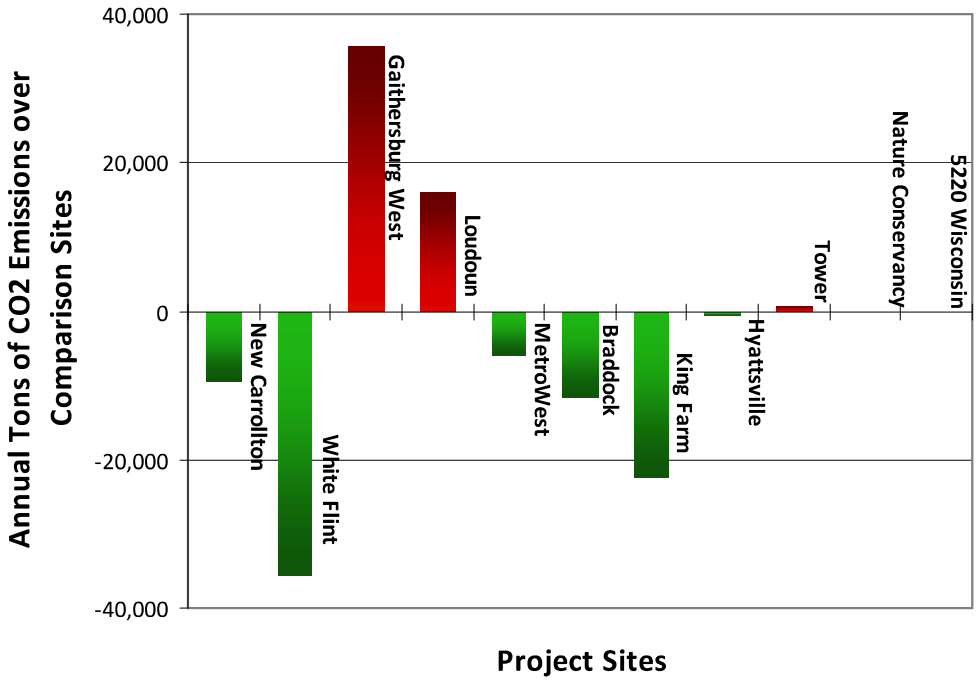


Figure i-4 shows the absolute number of tons of CO_2 reduction (or increase) compared to alternative sites. Larger projects at sites with lower regional accessibility show higher emissions (projects with positive values), and projects with higher regional accessibility show savings in CO_2 emissions (projects with negative or reduced values). Thus, larger projects in low- accessibility locations have higher impacts on the region's overall emissions.

is more important when the tons of CO_2 emissions are considered. The Gaithersburg West plan – even after accounting for high levels of transit service with the proposed but uncertain Corridor Cities Transitway – would emit over 35,000 more metric tons of carbon per year than a comparison site at the White Flint Metro station (see Figure i-4). This is equivalent to the electricity use of over 4,600 homes per year.

Most of this analysis focuses on compact, mixed use developments - both those proposed at regionally accessible locations and at more remote sites from the urban core. The residential portion of these developments, with their convenient access to services and transit, achieves dramatic reductions in VMT and CO_2 emissions when compared to low density residential-only suburban developments with little transit access. For example, the study compared the residential portion of King Farm, a compact, mixed-use development near the Shady Grove Metro station, to a nearby typical suburban lower density housing development in Derwood with a "lollipop" suburban street layout and limited bus service. The model shows that King Farm's 3,200 homes would produce 42 percent more CO_2 emissions if located at the Derwood site in a typical suburban pattern. This amounts to 22,482 metric tons of CO_2 per year, or the equivalent of annual electricity use for nearly 3,000 homes.

Comparing each of the eleven projects to the standard ITE baseline, all projects are given trip reduction credits from the URBEMIS model. The projects close to Metro stations or close to the urban core (Arts District Hyattsville) performed better than the three projects with little or no access to transit (Tower, One Loudoun, Gaithersburg West) (Figure i-5).

Figure i-5 Percent Difference in CO_2 Emissions from Study Site vs. ITE Baseline

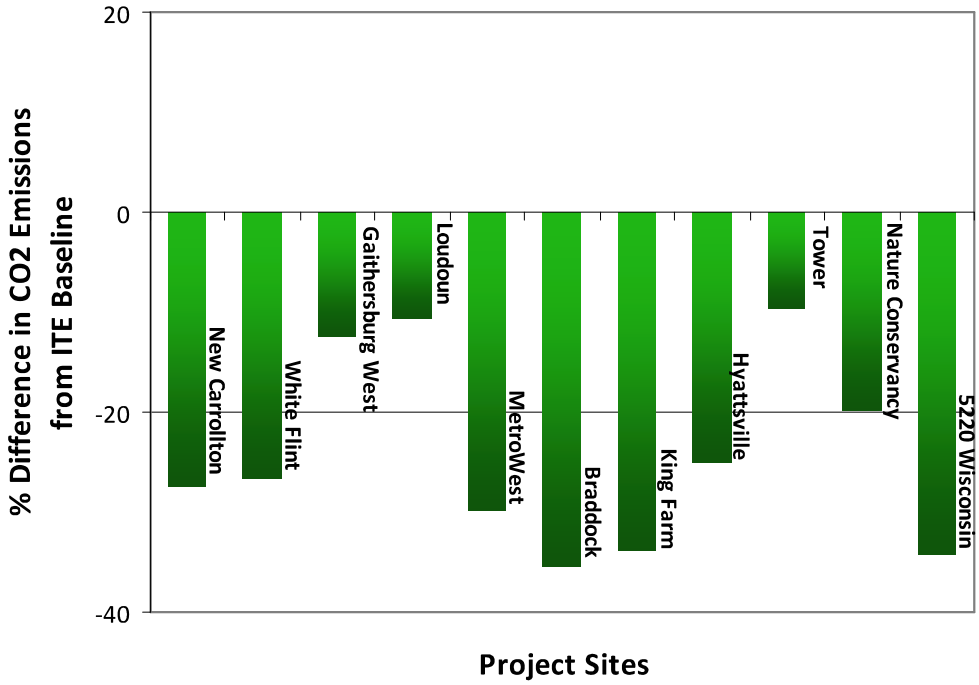


Figure i-5 shows the percent of CO_2 reduction compared to the standard Institute for Transportation Engineers (ITE) baseline, which assumes suburban automobile-dependent development patterns. While all projects receive credits by the URBEMIS land use and transportation model for trip reduction characteristics, projects with higher regional accessibility show substantially greater savings in CO_2 emissions (projects with more negative or reduced values).

Recommendations for Cool Communities in the Washington D.C. Region

Smart growth offers substantial savings in VMT and CO_2

This analysis reinforces the potential traffic and CO_2 savings from regionally-accessible, transit-rich, compact, walkable development. The findings show that VMT and CO_2 savings between 8 and over 40 percent can be achieved with mixed-use, higher density, walkable, regionally accessible development. The results summarized in Figures i-3 and i-4 illustrate the relative and absolute benefits of compact, mixed-use, regionally accessible development.

Despite some limitations to URBEMIS, our analysis demonstrates the importance of locating housing and job growth at high frequency transit nodes, in urban and inner suburban infill locations, with compact, walkable designs. The analysis also shows that higher density, mixed-use developments in outer areas perform better than standard single-use suburban development

in these areas, but the lack of regional accessibility results in much higher CO_2 emissions than more accessible locations. Based on this analysis, we recommend the following:

1. **Implement a regional vehicle miles traveled (VMT) reduction goal** as proposed in the Metropolitan Washington Council of Governments' (COG) Climate Change report to meet the CO_2 emissions reduction targets. While the new Corporate Average Fuel Economy (CAFE) fuel efficiency requirement will slow the increase in emissions compared to the business-as-usual scenario, transportation emissions will still exceed goals by 35 percent in 2020 and 80 percent in 2030. This shortfall illustrates that even with fuel economy improvements much more is needed to reach regional mobile source CO_2 reduction goals. We recommend setting an aggressive VMT reduction goal by land use decisions to help the region meet its greenhouse gas reduction goals. To achieve this, we call on all level of government and business to do the following:

    - COG should develop an evaluation tool to assess land use and transportation decisions to support this VMT reduction goal.
    - COG should revise its "Regional Activity Centers" criteria and maps to add all existing Metro stations and older inner suburban commercial corridors for redevelopment, while reevaluating the number, size and location of the distant suburban clusters.
    - All levels of governments, major employers and institutions should do their part by locating activities near transit, as recommended by the COG report.

2. **Focus large-scale development at regional Metro stations.** Despite over three decades of Metrorail service, many stations remain underutilized. Metrorail stations should receive a significant share of the region's growth in order to provide greater regional accessibility for residents and jobs, and to reduce the carbon footprint of growth. Figure i-4 illustrates this point: even a project with relatively good mixed-use design generates significantly higher emissions than a more regionally-accessible and compact site. For Metro stations not designed to serve regional-scale development, more housing and businesses can be accommodated at a moderate scale that carefully transitions into lower scale neighborhoods surrounding the station area.

3. **Make infill development and infill transit top priorities.** Increasing housing and jobs near existing transit and adding transit service to existing close-in communities will help maximize reductions in VMT and CO_2. These measures take advantage of compact, mixed-use urban neighborhoods using frequent bus service or convenient access to a Metro station. By "infill transit," we mean investing in cost-effective transit services that build on existing ridership and supportive land uses, such as components of the WMATA Bus Priority Corridors Network, streetcar plans in D.C. and Arlington, the Purple Line in inner Montgomery and Prince George's Counties, and funding for Metrorail and Metrobus to increase service. To a lesser extent, walkable, mixed-use development at commuter rail stations and greater frequency of commuter rail service, including mid-day service, will help to capture a larger share of work trips - which are the longest trips. On the other hand, outward, long distance extensions of commuter rail service and low frequency transit services can be extremely costly per rider without achieving much in

CO_2 emissions reduction. The heavy cost of long distance transit extensions can also threaten the maintenance, operating and capital improvement budgets for existing transit service.

4. **Increase employment centers on the east side of the region.** Prince George's County's 15 Metro stations are among the county's top assets, but the county has not seen the same growth in jobs as the west side of the region. Commitment by the State of Maryland and Prince George's to increased job growth in compact, walkable, mixed-use environments around these Metro stations could greatly contribute to the region's ability to reduce CO_2 emissions and improve the performance of the region's transportation system. In addition, focusing job growth at Metro stations on the east side of the region will match employment opportunities with a larger housing stock that is affordable to more of the workforce.

5. **Create urban street grids and compact, mixed-use development around high frequency transit.** This analysis demonstrates the importance of site design – urban, walkable character, mix of uses, and an interconnected street grid of small blocks – for maximizing use of high frequency transit and walking for many trips. State and local policies too often require overly wide streets and long blocks. Also they often neglect connectivity. All these characteristics severely undermine walk and bicycle access to transit and commercial centers. To build truly accessible places, we recommend that area and state governments implement complete and green streets policies, and street connectivity standards that require full integration of pedestrians and bicyclists into street layouts and more connections to surrounding neighborhoods. We also urge governments to reallocate scarce public funds to maintaining and improving existing transit services, pedestrian/bicycle facilities and "complete streets' retrofits rather than funding new road and other infrastructure capacity expansions outside existing high transit districts.

   This analysis shows that some developments promoted as "town centers" do not achieve urban block dimensions or a compact mix of uses within walking distance. Local governments need to establish more stringent criteria to create highly connected street networks and mixed-uses proximate to each other and tied to major transit stations and corridors.

6. **Support further research to refine VMT and CO_2 emissions analysis for land use and transportation projects.** While our analysis is limited, it replicates the findings of national studies and reinforces the importance of smart growth land use and transportation investments for reducing greenhouse gas emissions. The state of the art is young and requires more refinement to sharpen analytical tools and data. We urge all levels of government to provide better data and to support improved models that are accessible and usable to the public. URBEMIS could be refined by better tailoring baseline assumptions to existing characteristics in the region and important key factors such as added CO_2 emissions from conversion of natural land cover and the regional jobs/housing imbalance. A refined URBEMIS or similar land use/transportation model could be systematically applied by COG, local and state governments to assess the CO_2 emissions impact of development proposals. This tool will help officials to guide the

location and designs of development to meet climate protection goals while also creating more livable communities.

7. **Reduce development capacity outside high frequency transit districts.** Local land use plans throughout the region allow for large amounts of scattered, low density, single-use development that will generate disproportionately high levels of VMT and CO_2 emissions. This study demonstrates that low density development and poor street connectivity are the most inefficient and most polluting forms of growth. Thus, COG and local governments should commit to shifting development capacity permitted under current land use plans and zoning from areas that are not served by medium and high-levels of transit. This development capacity should be allocated to districts within half of a mile of rail transit stations or high frequency bus corridors. Local governments should also avoid high amounts of growth in "town centers" far from regionally accessible sites such as Metrorail stations or heavily served bus corridors. This analysis demonstrates that although high density, mixed-use "town centers" reduce VMT per capita, the magnitude of developments far from high frequency transit will negate the benefit of reduced vehicle trips by increasing the length of commute trips as a result of poor regional accessibility. Priorities should be build-out of current and planned Metrorail stations and redevelopment of older commercial corridors with mixed-use and increased transit service on dedicated lanes (BRT or LRT).

Faced with the challenge of climate change, rising energy prices, and an era of shrinking government budgets, we must make wise decisions about land use and transportation investments. Fortunately, smart growth solutions will help us meet these new challenges while also addressing traffic congestion; lowering household transportation costs; cutting air pollution, reducing loss of forests, farms and natural habitats; and improving health and access to jobs.

Structure of this Report: Chapter 1 outlines the climate challenge facing our region, regional greenhouse gas reduction goals, and national research on smart growth and greenhouse gas emissions. Chapter 2 discusses the URBEMIS model and the methodology applied by this study. Chapter 3 contains case studies and their results. Chapter 4 discusses how the URBEMIS model could be tailored to our region and used in modeling plans and projects. Chapter 5 outlines our recommendations for the region's decision-makers.

Cover Image: 5220 Wisconsin Avenue, Washington D.C. approved project by Akridge, adjacent to the Friendship Heights Metro station.