Center for Regional Analysis - George Mason University

Connecting Transportation Investment and the Economy in Metropolitan Washington

Prepared for The 2030 Group

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Connecting Transportation Investment and the Economy in Metropolitan Washington

Executive Summary

- The Washington region is projected to have significant potential economic growth over the next thirty years. Of the GRP growth, almost ¾ will be in locations where autos provide the accessibility. For total GRP change in the region, $977 billion will be enabled by auto, $298 billion by transit, $67 billion bike/walk, and $77 billion for work-at-home. (These calculations are made by calculating the GRP for each transportation zone derived from employment by land use type, and the share of work trips to each zone made by each mode of travel.)

- For all economic activity in the region, the share of GRP enabled by auto travel goes from 74.3% in 2007 to 73.1% in 2040, and economic activity supported by transit changes only very slightly from 22.3% to 22.2%. The support of economic activity by mode changes very little over the 3-decade forecast period – surprising in light of the investments and focus of public policy to shift travel away from the auto and roads to transit.

- Analysis of the transportation model results from the current TPB long-range plan shows that the ability to change trends is very weak over time. From the base year to 2040, 81% of the growth in all types of trips is auto, and the overall change by purpose is close to zero. The change in Bike/Walk trips is greater than the change in trips by transit. For all purposes, change in trips 2007-2040:

	Total Trips Change	Share of Change
Drive Alone	4,302,900	52.3%
Auto Passenger	2,360,300	28.7%
Auto Total	6,663,500	81.0%
Transit	499,400	6.1%
Bike/Walk	1,062,300	12.9%

- Some Regional Activity Centers have significant changes in economic activity supported by transit – most notably along the Silver Line in the Tysons Corner-Dulles corridor. The two largest changes for Regional Activity Centers: Tysons Corner increases support by transit from 7.0% in 2007 to 17.0% in 2040, Reston area increases support by transit from 4.0% to 10.5%.

- Econometric forecasts assume that adequate infrastructure investments are made to support economic growth, and so the GRP forecasts in this report are "potential economic growth". The region's economic future will continue to rely on significant investments in transportation infrastructure – investments that will need to provide key transit support for some economic centers and major support and investments for auto access and connections for almost all economic centers.

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Acknowledgements

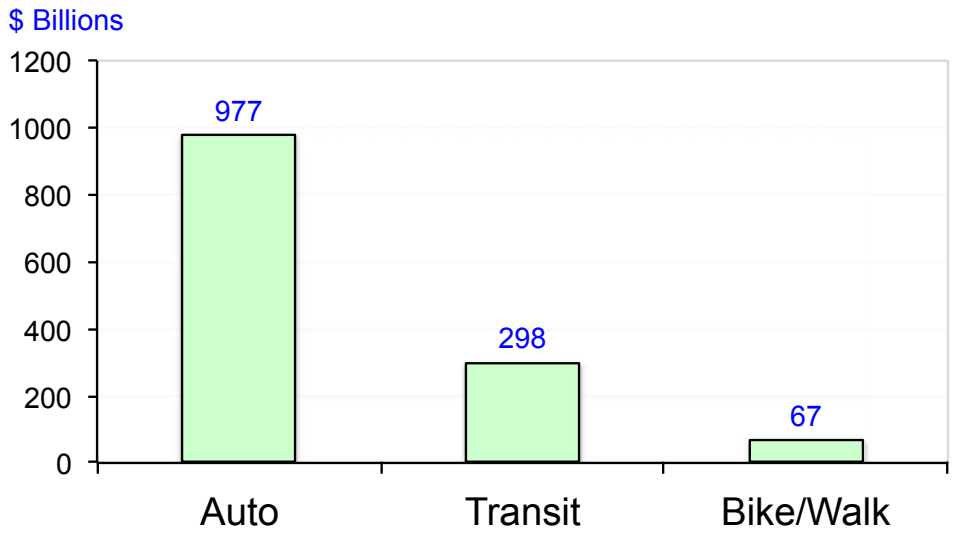
Sonia Sousa (PhD, GMU School of Public Policy) and Joanna Bernecke-Lievestro (Graduate Research Assistant) of the Center for Regional Analysis contributed to the research and preparation of this report.

Connecting Transportation Investment and the Economy in Metropolitan Washington

Key Findings

- The Washington region is projected to have significant potential economic growth over the next thirty years. GRP forecasts by Global Insight are that the Washington region's GRP will grow from $429 billion in 2010 to $1,849 billion in 2040. For the same period, COG Round 8 forecasts are that the region will grow in employment from 3.32 million to 4.66 million, and population will grow from 5.50 million to 7.27 million. Of the GRP growth, almost ¾ will be in locations where autos provide the accessibility.

Figure 1
Washington Region Gross Regional Product
Growth 2010 to 2040
Support by Transportation Mode



- The support of transportation by mode changes very little over the next thirty years:
    - for all kinds of trips, auto trips account for 81.0 percent of growth, transit 6.1% and bike/walk 12.9%.
    - for work trips only - the share of work trips by auto declines slightly – from 76.1% in the base year to 75.1% in 2040. Transit trips share of work trips remains approximately the same – 14.8% in the base year and 15.1% in 2040. Bike/walk trips for work increase slightly from 9.1% to 9.7%. (Work at home trips are not modeled).

- Some Regional Activity Centers have significant changes in economic activity supported by transit – most notably along the Silver Line in the Tysons Corner-Dulles corridor.

Economic Growth

- Washington metro's Gross Regional Product (GRP) was $429 Billion in 2010 and is projected to increase to $1849 Billion by 2040 (current $). This is an average annual growth rate of 5.0% (not adjusted for inflation). On a per capita basis, 2010 GRP is $76,300 and in 2040 it is $238,000. This growth will be concentrated in already developed economic centers and some obvious emerging ones. The 10 with the most economic growth:

Regional Activity Center	2010GRP	2040GRP	Change
Downtown DC	$57.1B	$203.3B	$146.3
Tysons Corner	$14.1	$72.5	$58.4
Fed Center/SW/Navy Yd	$17.5	$65.0	$47.5
Shady Gr./King Farm/Life SC	$5.9	$28.5	$22.5
Merrifield/Dunn Loring	$7.1	$29.0	$21.8
Rosslyn	$5.1	$24.0	$19.0
Crystal City	$3.1	$21.3	$18.2
Reston West	$6.3	$24.0	$17.7
Dulles West	$4.6	$21.1	$16.5
Dulles East	$4.2	$20.5	$16.3

- Grouping Regional Activity Centers into the I-66/Dulles/Orange Line/Silver Line Corridor, the GRP is projected to increase from $75 Billion in 2010 to $345 Billion in 2040, which will be 1/3 of the GRP in all Regional Activity Centers.

- In 2040 Fairfax County's GRP is projected to be $402B, slightly more than DC's GRP of $400B. Other major county GRP in 2040: Montgomery - $293B, Prince George's $160B, Arlington - $119B, Loudoun - $108B, and Prince William - $104B.

Transportation Changes

- Travel to work by mode in the Washington region has not changed very much over the past 20 years (data from Census and ACS):

	Travel to Work by Mode, 1990 - 2010			
	1990	2000	2010	20-Yr Change
Auto (Drivers and Passengers)	80%	81%	77%	-3%
Transit	13%	11%	14%	1%
Bike/Walk/Work at Home	7%	8%	9%	2%

(NOTE for tables below: All data from the transportation model exclude work-at-home, so only travel trips are modeled. Also, modeled trips include only internal trips, and not trips from outside the modeled region. This means that auto trips are somewhat understated.)

- Looking at similar measures from the transportation modeling, it shows that the ability to change trends is very weak over time. From the base year to 2040, 81% of the growth in all types of trips are auto, and the overall change by purpose is close to zero. The share of change in trips for all purposes, 2007 top 2040:

	Total Trips Change	Share of Change
Drive Alone	4,302,900	52.3%
Auto Passenger	2,360,600	28.7%
Auto Total	6,663,500	81.0%
Transit	499,400	6.1%
Bike/Walk	1,062,300	12.9%

- For work trips only, there are only slight changes in share of travel by mode, with a small drop in auto travel, a small increase in bike/walk, and almost no change in transit:

Mode	2007 Share	2040 Share
Auto Driver	67.8%	63.9%
Auto Total	76.1%	75.1%
Transit	14.8%	15.1%
Bike Walk	9.1%	9.7%

Gross Regional Product and Transportation Mode

- The share of economic growth supported by different modes of transportation changes very little over the next 30 years. Applying the transportation model outputs for travel by mode and the calculations of Gross Regional Product shows that economic growth is supported in approximately the same shares in 2040 as today.

	Metro Area Gross Regional Product by Travel Mode				
	($ billions, current*)				
	2010	2040	Change	% Change	Share of Growth
Auto	318.8	1352.1	1033.3	324%	73%
Transit	95.8	411.3	315.5	329%	22%
Bike/Walk	14.7	85.6	70.9	482%	5%
TOTAL	429.3	1849	1419.7	331%	100%

- In analysis of transportation modal support for Regional Activity Centers, there are higher shares of GRP by transit over the 30 years in several key centers. The Centers with the greatest change in transit share of travel reflect some of the new facilities under construction. The ten Centers with the greatest change over the next 30 years:

	Largest Transit Share Changes in Regional Activity Centers			
Regional Activity Center	2040 GRP	2007 % by Transit	2040 % by Transit	Percentage Point Change
Tysons Corner	$72.4	7.0%	17.0%	10.0%
Reston West	$24.0	3.8%	10.5%	6.7%
Reston East	$13.5	4.7%	10.5%	5.8%
Herndon	$15.3	3.5%	8.5%	5.0%
Dulles Corner	$12.8	2.4%	7.0%	4.6%
Friendship Heights	$9.3	41.1%	45.6%	4.5%
Clarendon/Court House	$14.7	40.0%	44.4%	4.4%
Downtown Alexandria	$19.4	26.7%	30.8%	4.1%
New York Avenue	$17.0	35.1%	39.0%	3.9%
Bethesda CBD	$19.1	38.4%	42.0%	3.6%

* Current dollars means as of that year and is not adjusted for inflation.

I. Methodology

The project used COG Round 8 forecasts of employment by the 3722-zone transportation modeling system, and the model (TPB version 2.3) results of the most recent run of the Constrained Long Range Plan (CLRP) (Base year 2007 and forecast year 2040). A model was developed to translate contribution to GRP by major economic sectors and COG's employment forecasts by land use type (inputs to the transportation modeling). The GRP forecasts for the region were made by Global Insight. COG's current system of Regional Activity Centers was used for sub regional analysis. The forecasts of GRP for Regional Activity Centers and by county were summed from the Transportation Analysis Zone data and forecasts. These GRP calculations by zone were then multiplied by the transportation model forecasts of work travel (attractions) by mode to attribute how much of each zone's GRP is enabled by each mode.

Econometric forecasts of Gross Regional Product developed by HIS Global Insight were used for the Washington Metropolitan Area 2010 and 2040 GRP. To develop GRP produced by subareas within the region (counties and regional activity centers), the following steps were followed:

- The US Bureau of Economic Analysis developed contributions to GRP by major NAICS sectors for 2010, and the proportional contribution to GRP by sector was assumed for 2040. The following table shows contributions by NAICS sector:

Table 1
Contributions of Specific Sectors to the Washington Area
Gross Regional Product, 2010 and 2040 (current $)

	2010	2040
Professional & Business Services & Financial	$159,620	$426,198
Retail Trade	$58,610	$156,493
Construction	$60,667	$161,986
Education and Health Services	$58,532	$156,285
Hospitality	$54,418	$145,300
Other Services	$73,093	$195,164
Manufacturing, Transp., Warehousing*	$113,738	$303,689
Government	$115,674	$308,858

Sources: BEA and GMU CRA

*For purposes of this project, includes Mfg., Transp., Warehousing, Utilities, Information

- A model was developed to translate contribution to GRP by NAICS economic sectors and COG's employment forecasts by land use type (inputs to the transportation modeling). The model was developed by summing the regional

total employment by each of the four land use types and assigning logical economic sectors to the land use types (for the 3722 transportation zones). This was an iterative process of making one set of assumptions, calculating the total GRP, and adjusting the initial assumptions to reach calculations matching the control totals. This process resulted in assigning the following sectors to land use categories:

  - Employment on Industrial Land Use = the weighted average of jobs in Manufacturing, Transportation, Warehousing, Utilities and Information sectors
  - Employment on Retail Land Use = the weighted average of jobs in Retail Trade and Hospitality sectors
  - Employment on Office Land Use = the weighted average of jobs in Professional and Business Services and Financial, 2/3 Government, and ½ Education and Health Services jobs
  - Employment on Other Land Use = the weighted average of 1/3 Government and ½ Health and Education Services jobs.

- An additional check was made to verify the above approach. This check took wages by county as calculated from 2010 ACS data and calculated each county's share of total regional wage income as compared to each county's share of GRP developed from the model of GRP contributions by land use type.

Adjustments for Work-At-Home Economic Activity

Workers who do not travel to a workplace also contribute to the economy. These are consultants, farmers, and others whose occupations or employers enable them to work at home and not travel to a place of work. GRP totals by county and RAC were adjusted to account for this part of the economy. According to ACS 5-yr estimates (Table BO8519) 4.2% of workers in the time period worked at home. That data source also provided estimates of earnings by mode, including work-at-home. The contribution to total earnings in the region by work-at-home workers was 3.7% in 2005-2010 using these figures from ACS. Then, GRP by mode for each RAC was adjusted to indicate how much of its GRP could be attributable to the region-wide figure of 3.7%. For 2040 it was assumed that work-at-home would increase to 5.0% of GRP, and analogous adjustments were made to GRP by mode. As these measures of income by workers working at home were not available at reasonable cost and accuracy for smaller geographies, the regional measures were applied for sub regional calculations of GRP by mode.

Data Notes:

- Modeled trips include only internal trips, and not trips from outside the modeled region. This means total auto trips are somewhat understated.
- Work trips counted by the job location (attraction end) are assigned the mode of the final segment of the trip; e.g., a trip from home by auto to get to a transit station for the last part of the trip is counted as a transit trip. This means there is likely some undercount of auto trips.
- The GRP forecasts are for the Washington MSA as defined in 2003 by the US Office of Management and Budget. The TPB model region also includes Anne Arundel, Howard, St. Marys and Carroll counties in Maryland and King George county in Virginia.

II. Gross Regional Product

The Washington region's GRP (GRP includes all incomes: personal wages, corporate income, et al) in 2010 was $429.8 billion, ranking it the fourth largest economy in the U.S. Over the 30-year period from 2010 to 2040, the region's GRP is projected to grow at an average annual growth rate of 5.0% in current dollars for the Washington MSA. The District of Columbia leads the region's jurisdictions in GRP with $107.3 billion in 2010, although by 2040 Fairfax overtakes the District as the jurisdiction with the largest GRP. Over the 30-year period, Northern Virginia increases its GRP share from 43.1% to 47.3%, while the District's share declines from 25.0% to 21.6% and Suburban Maryland declines slightly from 31.4% to 30.5%. The following table summarizes GRP by jurisdiction for 2010-2040.

Table 2
Washington Gross Regional Product, 2010-2040
(billions of current $)

					Share of Region GRP		
	2010	2040	Change	% Change	2010	2040	Share of Change
District of Columbia	107.3	400.2	292.8	273%	25.0%	21.6%	20.6%
Calvert County	4.3	18.2	13.9	324%	1.0%	1.0%	1.0%
Charles County	7.4	29.7	22.3	304%	1.7%	1.6%	1.6%
Frederick County	17.0	62.8	45.7	269%	4.0%	3.4%	3.2%
Montgomery County	65.4	292.9	227.5	348%	15.2%	15.8%	16.0%
Prince George's County	40.8	159.8	119.0	292%	9.5%	8.6%	8.4%
Maryland Suburbs	134.9	563.5	428.6	318%	31.4%	30.5%	30.2%
Arlington County	27.0	119.3	92.4	343%	6.3%	6.5%	6.5%
Clarke County	0.4	1.8	1.4	319%	0.1%	0.1%	0.1%
Fairfax County*	95.0	401.5	306.6	323%	22.1%	21.7%	21.6%
Fauquier County	2.3	13.2	10.9	479%	0.5%	0.7%	0.8%
Loudoun County	17.2	107.5	90.3	524%	4.0%	5.8%	6.4%
Prince William County*	17.3	104.4	87.1	503%	4.0%	5.6%	6.1%
Spotsylvania County	3.8	19.7	15.9	417%	0.9%	1.1%	1.1%
Stafford County	4.9	24.1	19.2	396%	1.1%	1.3%	1.4%
Alexandria city	14.0	68.2	54.2	387%	3.3%	3.7%	3.8%
Fredericksburg city	3.2	15.0	11.8	367%	0.7%	0.8%	0.8%
Northern Virginia	185.1	874.8	689.7	373%	43.1%	47.3%	48.6%
Jefferson County WV	2.1	10.5	8.4	410%	0.5%	0.6%	0.6%
Washington MSA	429.4	1848.9	1419.5	331%	100.0%	100.0%	100.0%

Source: GRP for the MSA is Global Insight.

* Includes Independent Cities

Figure 2
2010 GRP By Jurisdiction
(billions current $)

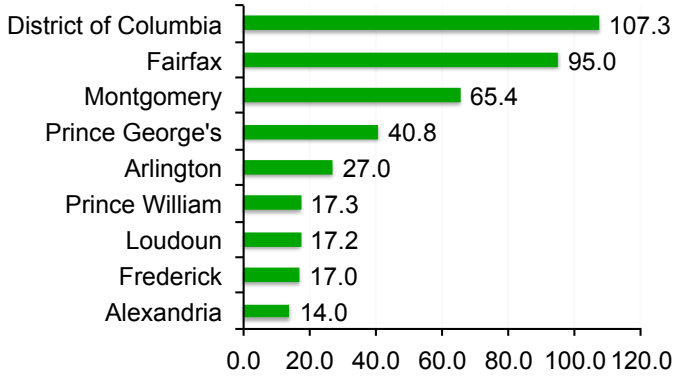
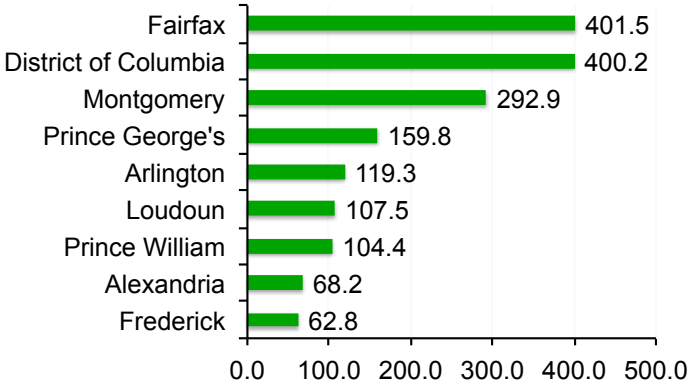


Figure 3
2040 GRP By Jurisdiction
(billions current $)



Calculations of GRP by Regional Activity Center show that the growth rate for all centers combined is approximately equal to the region's total growth rate, meaning that over the next thirty years there is not an increasing concentration of economic activity in Regional Activity Centers as exists in 2010. There are significant changes in certain Centers, and the following Tables 3 and 4 show the ranks of the top 30 Centers in absolute dollar growth and in percentage growth.

Table 3
Top 30 Regional Activity Centers in GRP Growth 2010-40
(billions current $)

Regional Activity Center Name	2010-2040 Change	Rank
Downtown Washington	146.25	1
Tysons Corner	58.43	2
Federal Center/SW/Navy Yard	47.50	3
Shady Grove/King Farm/Life Sciences	22.54	4
Merrifield/Dunn Loring	21.84	5
Rosslyn	18.98	6
Crystal City	18.21	7
Reston West	17.67	8
Dulles West	16.51	9
Dulles East	16.33	10
Fairfax Center	16.00	11
White Flint	15.37	12
Ballston/Virginia Square	14.70	13
New York Avenue	14.42	14
Bethesda CBD	13.80	15
Downtown Alexandria	13.45	16
City of Fairfax-GMU	13.25	17
US 1/ Greenline	13.21	18
Konterra	12.97	19
Silver Spring CBD	12.93	20
Monumental Core	12.92	21
Corporate Dulles	12.81	22
Germantown	12.52	23
Herndon	12.12	24
Eisenhower Avenue	12.10	25
Clarendon/Court House	11.53	26
Dulles Corner	10.90	27
Rock Spring Park	10.35	28
Reston East	10.02	29
Bull Run - Sudley Area	9.06	30

The largest absolute increases in GRP are projected to be in the largest Centers as of 2010, but there are significant amounts of growth where there are major changes in infrastructure and planning focus. Most notably, Tysons Corner has the 2nd greatest growth in GRP and overtakes DC's Federal Center/SW/Navy Yard Center to become second only to Downtown DC in economic activity in 2040. Shady Grove/King Farm/Life Sciences RAC is the 8th largest Center in 2010 and has the fourth greatest growth from 2010-2040.

There is significant growth in the Tysons-Dulles Corridor. Grouping the RACs in that Corridor indicates a growth from $51.1B to $242.2B, representing a growth rate 8% higher than the region and a total GMP in 2040 greater than Downtown Washington ($203.3B). Other high-growth Regional Activity Centers (+$10B and higher growth rate than the region) inside the Beltway include Rosslyn, Crystal City, New York Avenue, Clarendon/Court House and Eisenhower Avenue. Other high-growth Centers outside the Beltway include Shady Grove/King Farm/Life Sciences, White Flint, US 1/Greenline, Konterra, and Germantown.

Sorting the Regional Activity Centers by rate of growth, the fastest growing Center is Innovation in Prince William County with a rate of 1213% over the 30 years, followed by Germantown at 890% and Konterra at 828%. Significantly, 7 of the top 10 fastest growing Centers in GMP are located outside the Beltway.

Table 4 shows the 30 Regional Activity Centers ranked by percent growth from 2010 to 2040.

Table 4
Top 30 Regional Activity Centers in % GRP Growth 2010-40

Regional Activity Center Name	2010-2040 % Change	Rank
Innovation	1213%	1
Germantown	890%	2
Konterra	828%	3
Gainesville	665%	4
Springfield	638%	5
Crystal City	584%	6
Dulles Corner	578%	7
Potomac Mills	574%	8
Beauregard Street	572%	9
New York Avenue	569%	10
Woodbridge	528%	11
Corporate Dulles	511%	12
Pentagon City	506%	13
Eisenhower Avenue	504%	14
Bull Run - Sudley Area	485%	15
White Flint	442%	16
I-95 Corridor/Engineer Proving Ground	415%	17
Largo Center	414%	18
Tysons Corner	414%	19
New Carrollton	411%	20
Dulles Airport	409%	21
White Oak	406%	22
Rockville Town Center	399%	23
North Frederick Avenue	395%	24
Route 28 North	392%	25
Dulles East	388%	26
National Harbor	386%	27
Herndon	381%	28
Shady Grove/King Farm/Life Sciences	381%	29
Rosslyn	375%	30

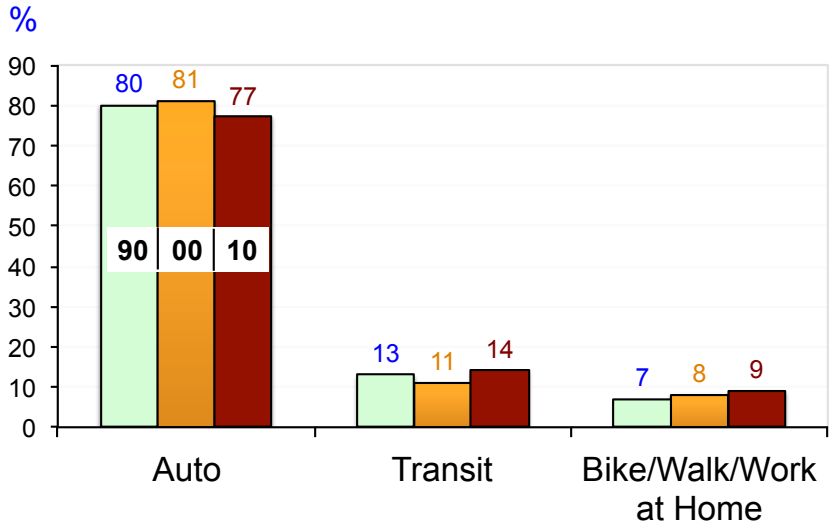
(Rate of growth for the Metro Area = 331%)

III. Commuting Trends and Forecasts

Travel to work by mode in the Washington metropolitan area has changed very little over the past 20 years. Much infrastructure has been built in that time, significantly the bulk of the 103-mile Metro system which was completed in the early 2000 and is now a staple for commuting to work, especially to DC and inside-the-beltway employment centers. Major road improvements have also occurred – the new Wilson Bridge, Intercounty Connector, Fairfax Parkway, Dulles Toll Road, Route 28.

In spite of all the investments, however, the region continues to rank very high on all congestion measures compared to other regions. One of the reasons is the good performance of the region's economy, as the metro area has out performed most metro areas over the past twenty years. There has also been a lot of public policy focus on efforts to reduce auto driving to work, and to increase use of transit and bike/walk through more compact and mixed use development. The trends in commuting patterns, investments by mode, and the transportation policies have, in sum, done little to change region-wide commuting patterns and congestion measures.

Figure 4
Washington Commuting to Work
1990-2000-2010



Source: US Census

The metropolitan transportation planning process as carried out by the National Capital Transportation Planning Board includes the regular development of a long-range transportation plan out to 2040. A very sophisticated modeling process develops forecasts of future trips throughout the region based on demographic and economic forecast inputs and specific transportation network improvements that will be developed during the forecast period. The region is divided into 3722 transportation analysis zones, which are connected through the transportation network. Results from the most current version (October 2011) of this modeling process show trips by purpose by mode for the Base Year (2007 was used) and the Forecast Year (2040). These results indicate what changes are likely to occur in trip making over the next 30 years. (NOTE: Work-At-Home jobs are not modeled in the transportation planning models and have been treated separately.)

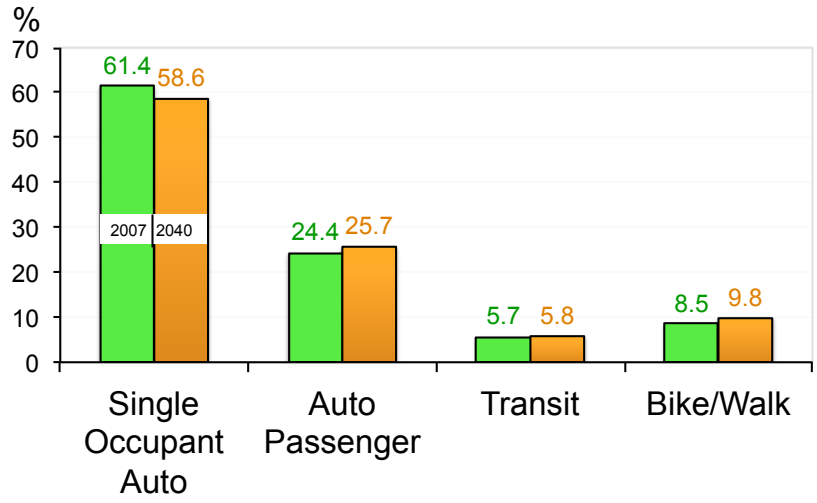
The planned transportation improvements are available from TPB (http://www.mwcog.org/clrp/) and a list of the major facilities (costing $100 million +) is included in the appendix.

An analysis of the model outputs for the 2011 CLRP indicates that – like the travel trends for the past 20+ years – changes in trends are extremely modest. The region's economy continues out to 2040 to rely heavily on travel by auto, with support from transit and bike/walk. Viewing the travel trends in the region as a whole, mode share changes very little.

For all kinds of trips – work, shopping, et al – there is a slight decline in auto driver trips, with slight increases in the other three mode types, with an overall very light decline in total auto trips.

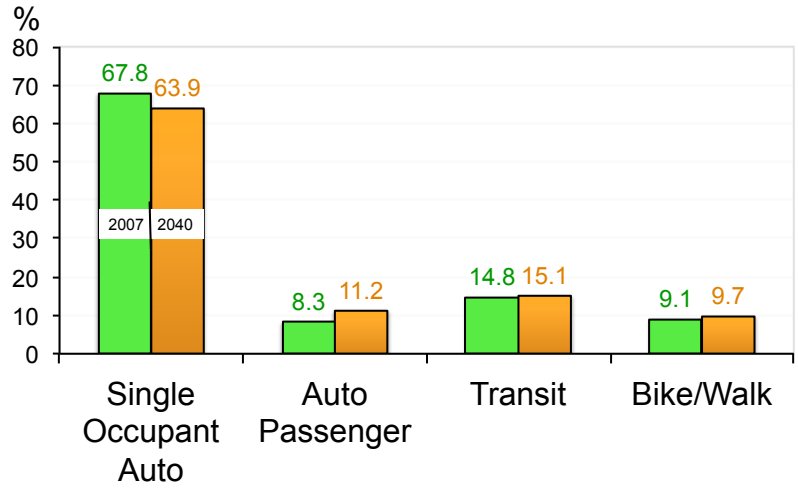
For work trips, which is the focus of economic activity generation, there is a drop in auto driver trips with an almost corresponding increase in auto passenger trips, and a modest increases in transit and bike/walk trips.

Figure 5
Washington Travel Trends
2007-2040 Total Trips – Share by Mode



Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

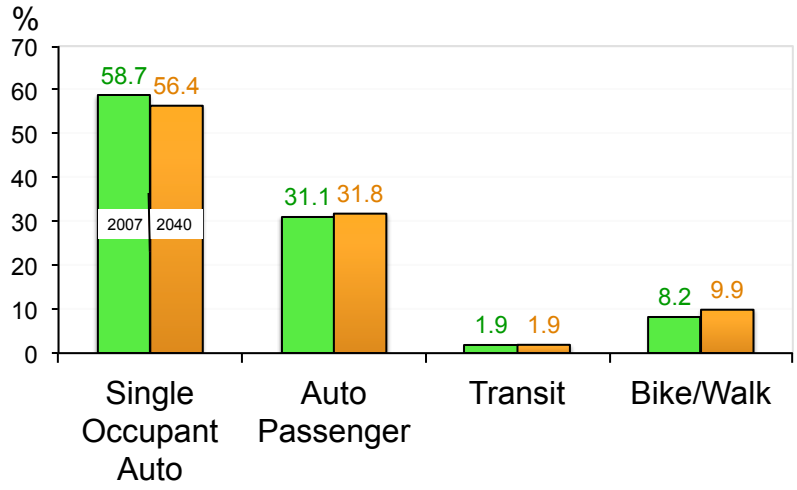
Figure 6
Washington Travel Trends
2007-2040 Work Trips – Share by Mode



Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

And as might be expected for all other trips (Figure 7) – shopping, recreation, et.al. – there is little change in mode share and a continued reliance on auto travel.

Figure 7
Washington Travel Trends
2007-2040 Non-Work Trips – Share by Mode



Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

The share for bike/walk in the base and forecast years and its growth in trips over the forecast period shows significant strength, and suggests that increasing densities and land use mixed developments are supporting the economy and are supplying some of the connections needed for economic growth. Region-wide for all types of trips, bike/walk trips grow by 1.06 million while transit trips grow by .49 million. Transit trip growth exceeds bike/walk growth only for home-based work trips. For all other trip types (non-home based work, shopping, and other non-work trips), growth in bike/walk trips exceeds growth in transit.

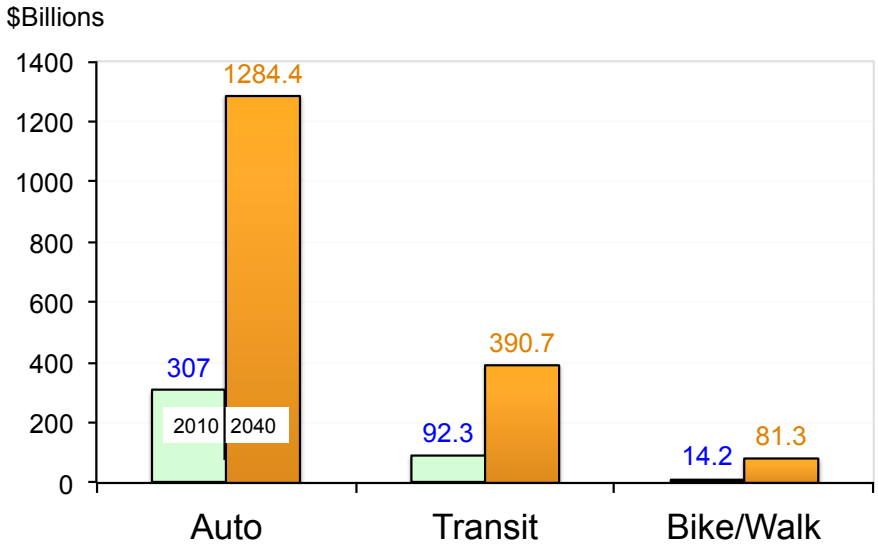
IV. Gross Regional Product by Transportation Mode

Economic activity within the Washington region is enabled by transportation connections. The transportation system enables economic activity and economic growth over time. Where, how much, and what types of transportation infrastructure improvements are made enable economic activity in different locations and centers in the metro area.

The outputs of the transportation model for commuting by mode and the Gross Regional Product for all transportation analysis zones were summed by jurisdiction and by Regional Activity Center (RAC). These calculations provide estimates of how much economic activity is supported by each mode.

For the region as a whole, GRP growth connected to transportation from 2010 to 2040 is projected to rely 72.8% on auto travel, 22.2% on transit, and 5.0% on bike/walk. Auto and transit have approximately the same rate of growth over the forecast period while bike/walk grows at a faster rate.

Figure 8
Washington GRP, 2010 and 2040
(Current $)



Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011 and GMU Center for Regional Analysis

Central jurisdictions with more transit service have a greater portion of their GRP connected via transit, while the more suburban jurisdictions continue to rely on auto travel for economic growth. The following tables show the share of GRP growth (excluding work-at-home) by mode. The District of Columbia is the only jurisdiction with less than half of its GRP connected by auto. Arlington County declines to almost half by 2040, Alexandria declines to less than ¾ by 2040, while Montgomery has the lowest among suburban jurisdictions in 2040 at 77.8% auto. All other jurisdictions are above 80% auto reliant. The Maryland suburbs decline by 2.1 percentage points from 2010 to 2040 and Northern Virginia by 3.2 percentage points, although both sub regions are above 80% auto reliant in 2040. Fairfax County had the largest percentage point drop in auto connection with a 5.5 percentage point drop from 92.5% in 2010 to 87.1% in 2040, reflecting the new Metro service to Tysons Corner and Reston/Dulles.

Table 5
Share of GRP Connected by Auto by Jurisdiction, 2010 - 2040

	2010	2040	Growth
District of Columbia	46.0%	42.9%	41.7%
Calvert County	98.6%	98.4%	98.3%
Charles County	97.7%	97.2%	97.1%
Frederick County	97.0%	96.3%	96.1%
Montgomery County	79.6%	77.8%	77.2%
Prince George's County	88.7%	86.1%	85.1%
Maryland Suburbs	86.0%	83.9%	83.2%
Arlington County	57.1%	52.3%	50.9%
Clarke County	98.8%	98.7%	98.6%
Fairfax County	92.5%	87.1%	85.3%
Fauquier County	98.3%	97.1%	96.8%
Loudoun County	97.9%	96.7%	96.4%
Prince William County	97.3%	95.8%	95.5%
Spotsylvania County	98.6%	98.2%	98.1%
Stafford County	98.6%	98.2%	98.1%
Alexandria city	74.3%	71.2%	70.4%
Fredericksburg city	98.3%	96.7%	96.2%
Northern Virginia	86.1%	82.9%	82.0%
Jefferson County	98.5%	98.6%	98.6%
Washington MSA Total	74.3%	73.1%	72.8%

Table 6
Share of GRP Connected by Transit by Jurisdiction, 2010 - 2040

	2010	2040	Growth
District of Columbia	48.9%	50.9%	51.7%
Calvert County	0.1%	0.1%	0.1%
Charles County	0.8%	1.0%	1.0%
Frederick County	1.0%	0.8%	0.7%
Montgomery County	17.3%	17.5%	17.6%
Prince George's County	9.2%	10.9%	11.4%
Maryland Suburbs	11.5%	12.3%	12.6%
Arlington County	38.5%	41.4%	42.3%
Clarke County	0.0%	0.0%	0.0%
Fairfax County	4.6%	8.3%	9.5%
Fauquier County	0.0%	0.0%	0.0%
Loudoun County	0.6%	0.7%	0.8%
Prince William County	1.1%	1.2%	1.2%
Spotsylvania County	0.0%	0.0%	0.0%
Stafford County	0.0%	0.0%	0.0%
Alexandria city	21.4%	23.3%	23.8%
Fredericksburg city	0.1%	0.1%	0.1%
Northern Virginia	11.0%	12.8%	13.3%
Jefferson County	0.0%	0.0%	0.0%
Washington MSA Total	22.3%	22.2%	22.2%

Table 7
Share of GRP Connected by Bike/Walk by Jurisdiction, 2010 - 2040

	2010	2040	Growth
District of Columbia	5.1%	6.2%	6.6%
Calvert County	1.3%	1.5%	1.6%
Charles County	1.5%	1.8%	1.9%
Frederick County	2.0%	2.9%	3.2%
Montgomery County	3.1%	4.7%	5.2%
Prince George's County	2.1%	3.1%	3.4%
Maryland Suburbs	2.5%	3.8%	4.2%
Arlington County	4.3%	6.3%	6.8%
Clarke County	1.2%	1.3%	1.4%
Fairfax County	2.9%	4.6%	5.1%
Fauquier County	1.7%	2.9%	3.2%
Loudoun County	1.6%	2.6%	2.8%
Prince William County	1.6%	3.0%	3.3%
Spotsylvania County	1.3%	1.8%	1.9%
Stafford County	1.4%	1.8%	1.9%
Alexandria city	4.3%	5.5%	5.8%
Fredericksburg city	1.6%	3.3%	3.7%
Northern Virginia	2.9%	4.3%	4.7%
Jefferson County	1.5%	1.4%	1.4%
Washington MSA Total	3.4%	4.6%	5.0%

GRP by Mode for Regional Activity Centers

Modal split for Regional Activity Centers shows slightly more balance than travel in the region as a whole. For the Base Year, GRP in Regional Activity Centers had a modal split of 64.1% connected by auto, 31.8% by transit, and 4.1% via bike/walk. Similarly to the overall travel forecast patterns, however, the forecasts for 2040 for GRP in Regional Activity Centers show very little change in support by modes over time. Auto and transit have very slight declines will Bike/Walk increases. The increase in Bike/Walk suggests that it is the development of more mixed use centers that helps more trips to be made by Bike/Walk.

The forecasts do show shifts in mode share support for major changes in transportation infrastructure. Detailed tables are given in the appendix for all Regional Activity Centers. On the following page are tables that show the rank of top ten activity centers for transit share: Base Year (2010), 2040, and then by change in transit share. For the base year, the highest transit shares are in the region's core, with Downtown Washington, Monumental Core, and Federal Center/SW/Navy Yard Centers having over 50% transit. For 2040, the top three Centers are the same, with The Pentagon and Rosslyn moving into the top five, although not reaching the 50% level.

The largest changes in mode support for GRP would occur along the new Silver Line: the top five with largest increases in shift to transit are projected to be Tysons Corner (+10 percentage points), Reston West, Reston East, Herndon, and Dulles Corner.
Support by auto, however, continues to be the primary infrastructure support to those growth centers. In 2040 the support by auto travel is 76.5% for Tysons Corner, 84.8% for Reston East, 83.2% for Reston West, 86.2% for Herndon, and 87.9% for Dulles Corner.

	TABLE 8 Ranked by Transit Share Regional Activity Centers	GRP By Mode - 2010 Auto	Transit	Bike/Walk
1	Downtown Washington	40.0%	54.5%	5.5%
2	Monumental Core	41.1%	53.5%	5.5%
3	Federal Center/SW/Navy Yard	43.4%	51.2%	5.4%
4	The Pentagon	49.6%	48.6%	1.8%
5	Rosslyn	49.0%	45.5%	5.5%
6	Crystal City	52.1%	43.6%	4.3%
7	Pentagon City	52.3%	42.2%	5.5%
8	Silver Spring CBD	54.7%	41.5%	3.8%
9	Friendship Heights	55.1%	41.1%	3.8%
10	Clarendon/Court House	54.7%	40.0%	5.2%

	TABLE 9 Ranked by Transit Share Regional Activity Centers	GRP By Mode - 2040 Auto	Transit	Bike/Walk
1	Downtown Washington	35.8%	57.6%	6.5%
2	Monumental Core	36.9%	56.6%	6.5%
3	Federal Center/SW/Navy Yard	39.9%	53.6%	6.5%
4	Rosslyn	45.2%	48.3%	6.5%
5	The Pentagon	45.6%	47.8%	6.5%
6	Friendship Heights	49.8%	45.6%	4.5%
7	Pentagon City	48.1%	45.4%	6.5%
8	Crystal City	48.4%	45.0%	6.5%
9	Silver Spring CBD	49.9%	44.5%	5.6%
10	Clarendon/Court House	49.1%	44.4%	6.5%

	TABLE 10 Ranked by Transit Share Change Regional Activity Centers	Change By Mode 2007-2040 Auto	Transit	Bike/Walk
1	Tysons Corner	-12.2%	10.0%	2.2%
2	Reston West	-9.1%	6.7%	2.4%
3	Reston East	-7.9%	5.8%	2.1%
4	Herndon	-6.5%	5.0%	1.5%
5	Dulles Corner	-6.6%	4.6%	2.0%
6	Friendship Heights	-5.2%	4.5%	0.7%
7	Clarendon/Court House	-5.7%	4.4%	1.3%
8	Downtown Alexandria	-5.6%	4.2%	1.4%
9	New York Avenue	-6.1%	4.0%	2.2%
10	Bethesda CBD	-4.6%	3.7%	0.9%

V. Summary of Findings

The purpose of this research was to measure the relationships between transportation system use and economic growth in the Washington Metropolitan Area. The method for doing this was to project Gross Regional Product (economic activity/income) by small areas within the region and calculate how much of the economic activity was connected to and enabled by use of the transportation system. This was done for the base year (2010) and forecasts to 2040 using the GRP estimates and forecasts for COG's Regional Activity Centers and transportation system uses as forecast by the COG/TPB transportation models (2011 Conformity Run)

Economic growth in activity centers in the region will be strongly enabled by all modes of future transportation investment: highway, transit, and bike/walk. The forecasts indicate that all modes have a role in enabling economic growth. This means that investment in all modes will be needed for enabling economic, at levels corresponding to the amount of economic growth forecast for each mode.

The measures and calculations from the research show that for all economic activity centers, auto use will continue to be the dominant mode to support almost all activity centers. Even centers with significant transit use and significant growth in transit use will depend significantly on highway access, and centers outside the region's core and especially outside the Beltway will depend almost entirely on highway access – meaning continuing and enhancing investments in highway capacity.

The research shows that Metro's expansion to Tysons and the Reston/Dulles Corridor will be a key factor in enabling future economic growth in that regional corridor. By 2040, the corridor will contain approximately one-third of GRP in all activity centers. This means that placing of Metro rail in strategic areas can have a large impact in stimulating and enabling future economic growth. However, the calculations show that the stimulus provided by Metro expansion is not sufficient for enabling all the growth. In the Tysons and Reston activity centers in which a significant amount of economic growth is enabled by the new Metro line, approximately 80 percent of economic activity in the corridor's activity centers in 2040 will be enabled by auto use.

The importance of bike/walk use in economic activity centers is shown in the calculations: there is a greater increase in bike/walk trips for the forecast period than in transit trips across the region as a whole. This implies that land use policies to increase densities and mix of uses will improve growth in economic activity centers, and that further implementation of such land use policies will benefit and encourage economic growth.

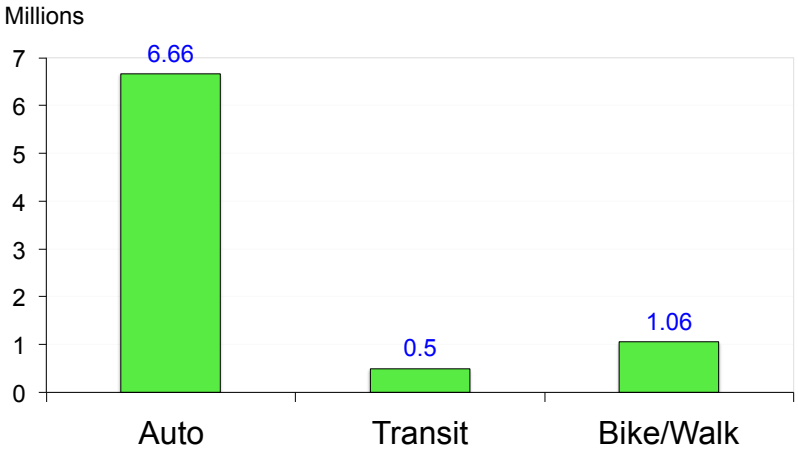
Appendix

Table A-1

Major Projects in the Constrained Long-Range Plan Projects

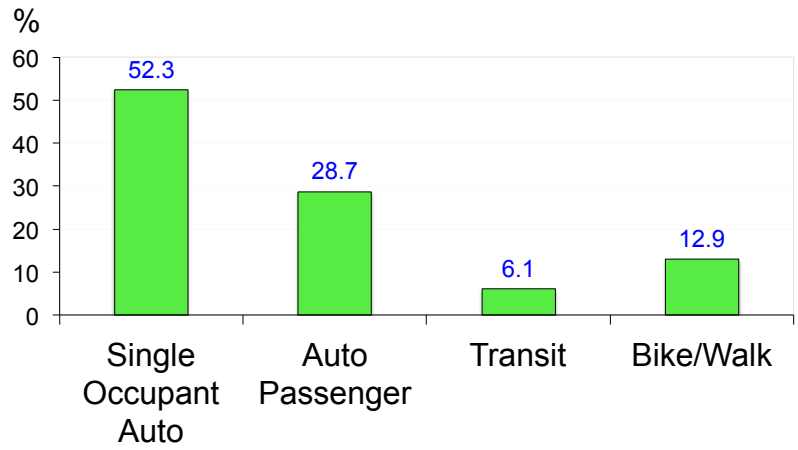
Facility	Cost	Year To Be Completed
Dulles Rail	$5.63B	2016
I-270/Shady Grove Highway/Transit	$3.40B	2030
InterCounty Connector	$2.53B	2012
MD Route 5 Upgrade	$1.12B	2025
I-495 HOT Lanes	$0.90B	2030
Woodrow Wilson Bridge	$0.79B	2011
MD 210 Multi-modal	$0.61B	2030
MD 201 Extension	$0.56B	2030
MD US29 Upgrade	$0.53B	2040
MD Highway 4 Upgrade	$0.46B	2035
MD Route 3 Upgrade	$0.40B	2030
MD US301 Upgrade	$0.38B	2030
VA Transit Improvements Rt 7 Corridor	$0.37B	2020
MD 28 Alternative Improvements	$0.35B	2025
VA Fairfax County Parkway Upgrade	$0.30B	2035
MD I-95 Improvements	$0.27B	2020
VA I-66/Rt 29 Interchange Imporvements	$0.26B	2014
VA I-395-95/HOT Lanes	$0.25B	2014
MD Rt 85 Widen	$0.25B	2020
VA VRE Improvements	$0.23B	2030
VA VRE Stock Acquisition	$0.23B	2030
MD Route 27 Improvements	$0.20B	2020
MD I-80/351 Improvements	$0.20B	2025
MD Route 223 Improvements	$0.19B	2025
VA VRE Extension to Haymarket	$0.19B	2018
MD I-270 Improvements	$0.18B	2016
MD I-95/495 Access Improvements to U of M	$0.17B	2020
MD Route 124 Improvements	$0.15B	2020
VA Route 235 Widen	$0.14B	2030
VA US 50 Widen	$0.14B	2015
MD Route 97 Improvements	$0.14B	2030
MD Route 355 Improvements	$0.14B	2020
MD US-1 Improvements	$0.14B	2020
VA Columbia Pike Streetcar	$0.14B	2016
VA I-66 and Route 15 Interchange	$0.13B	2018
VA US 29 Improvements	$0.13B	2025
VA I-495 Interchange Improvements	$0.13B	2013
MD I-495 Improvements	$0.13B	2020
VA Route 611 Widen	$0.13B	2030
MD Route 197 Improvements	$0.10B	2025
VA Route 28 Improvements	$0.10B	2025
Total for Projects of $100 million +	$22.79B	

Figure A-1
Washington Travel Trends
2007 to 2040 Change – Total Trips



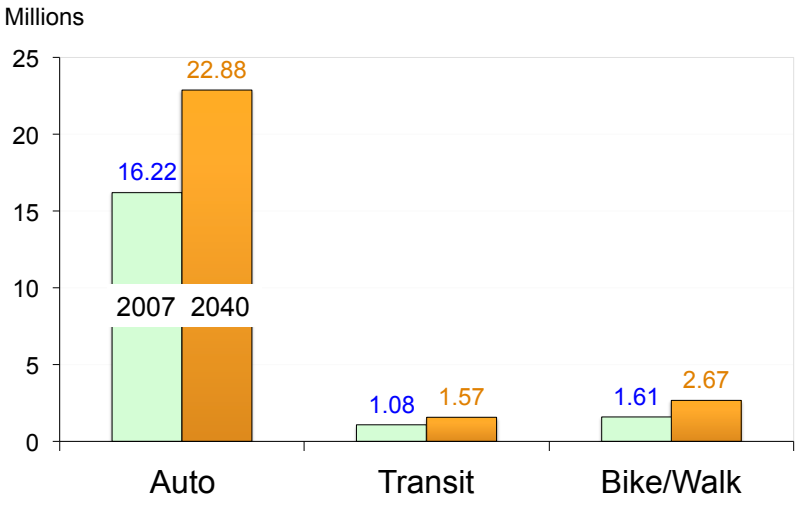
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-2
Washington Travel Trends
2007 to 2040 Share of Change – Total Trips



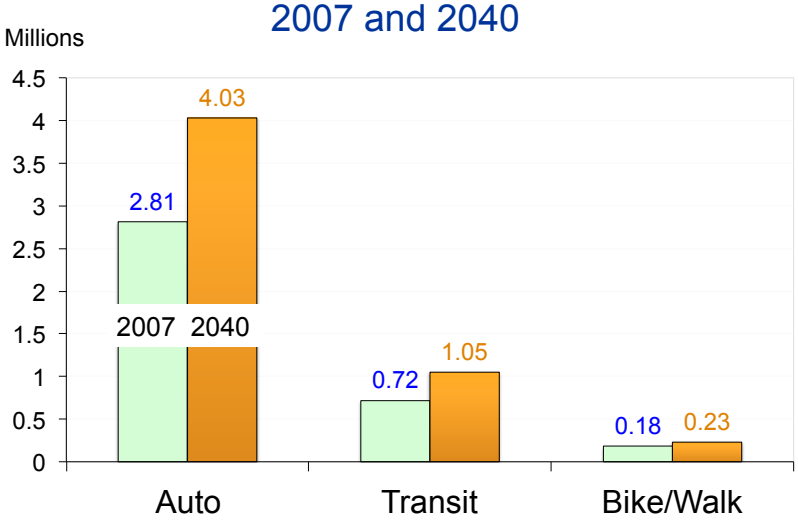
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-3
Washington Travel Trends
Total Trips by Mode, 2007 and 2040



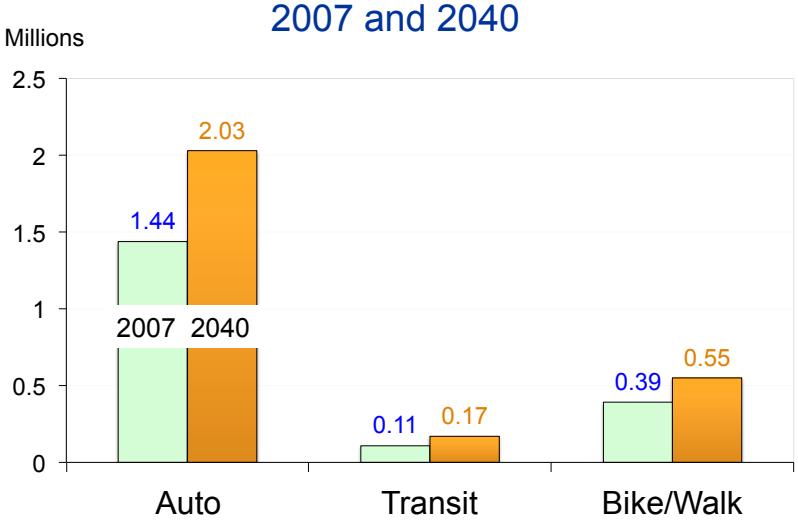
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-4
Washington Travel Trends
Home-Based Work Trips by Mode, 2007 and 2040



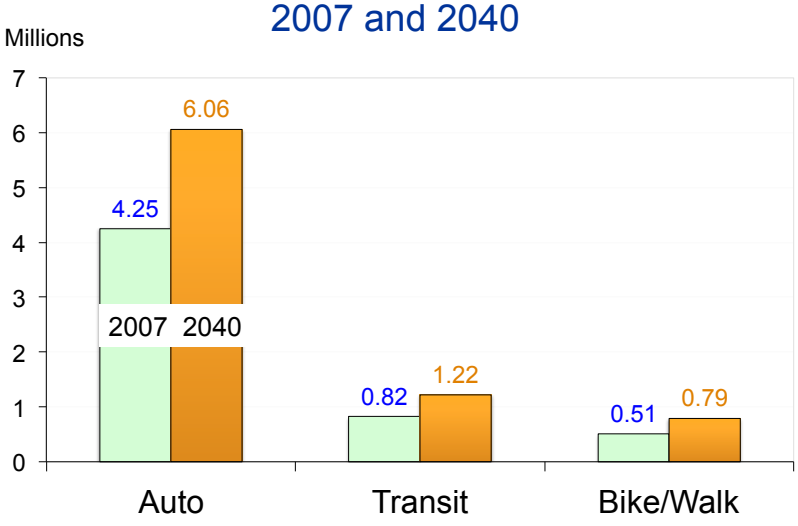
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-5
Washington Travel Trends
Non Home-Based Work Trips by Mode, 2007 and 2040



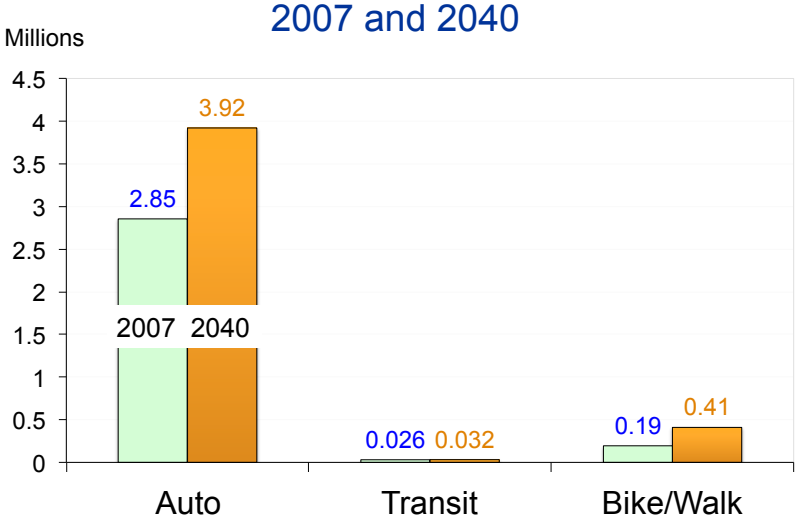
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-6
Washington Travel Trends
All Work Trips by Mode, 2007 and 2040



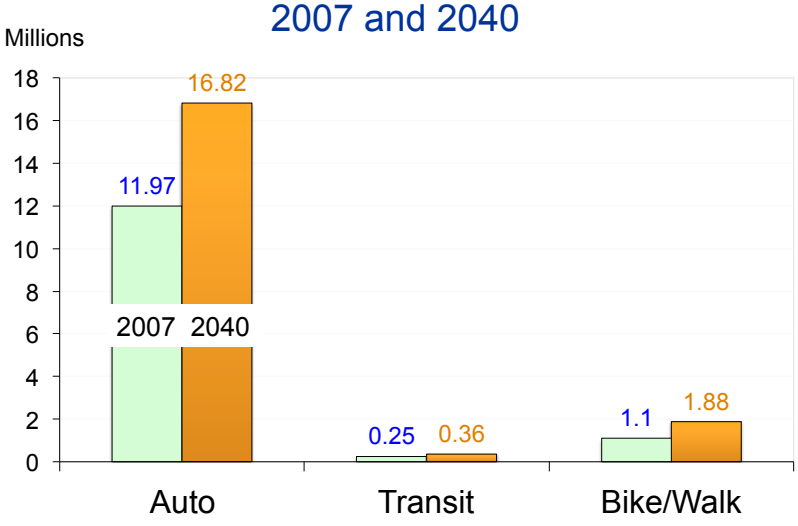
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-7
Washington Travel Trends
Home-Based Shopping Trips by Mode, 2007 and 2040



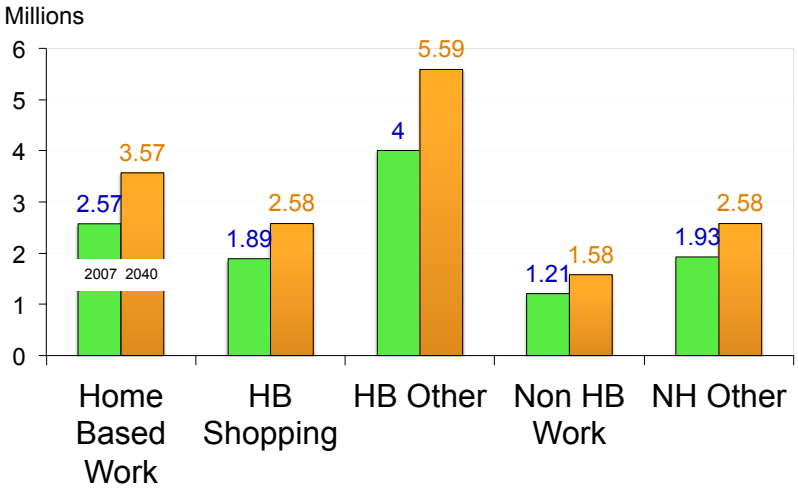
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-8
Washington Travel Trends
Other Non-Work Trips by Mode, 2007 and 2040



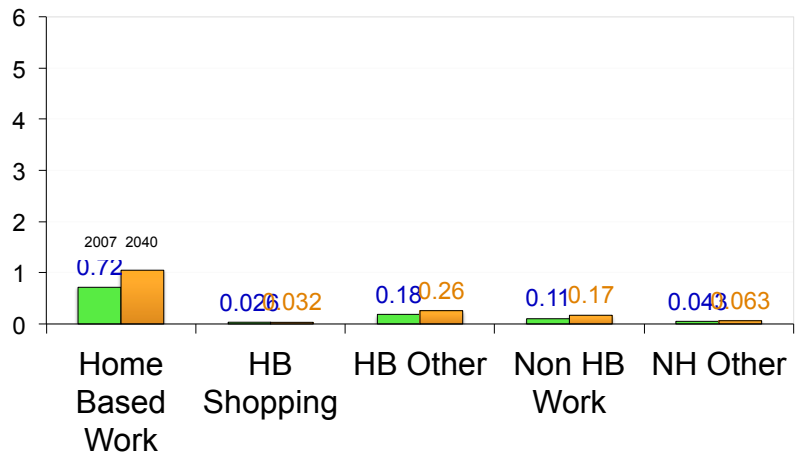
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-9
Washington Travel Trends
2007 to 2040 Auto Driver Trips by Purpose



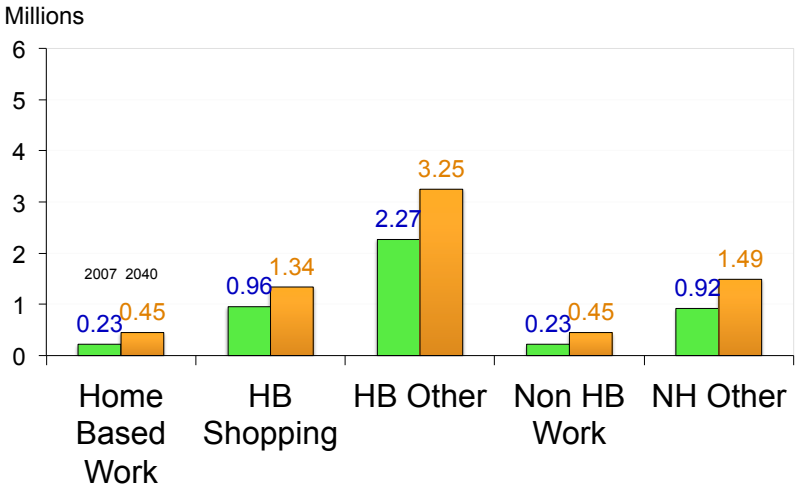
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-10
Washington Travel Trends
2007 to 2040 Transit Trips by Purpose



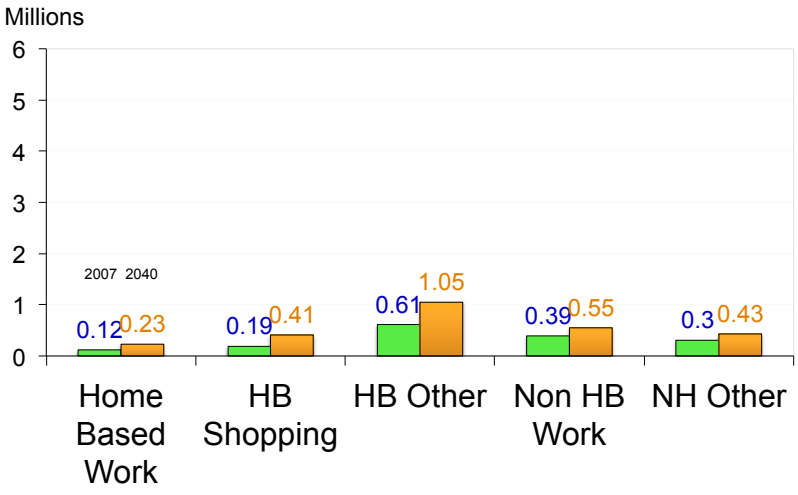
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-11
Washington Travel Trends
2007 to 2040 Auto Passenger Trips by Purpose



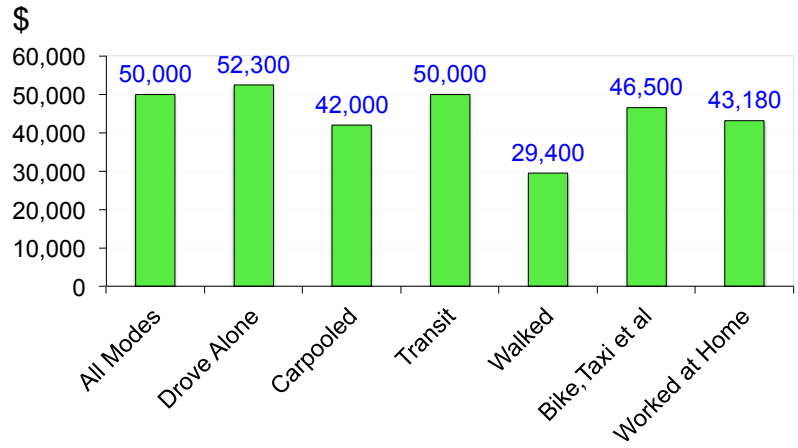
Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-12
Washington Travel Trends
2007 to 2040 Bike/Walk Trips by Purpose



Source: TPB Version 2.3 Travel Model, Air Quality Conformity Determination of the 2011 Constrained Long Range Plan for the Washington Metropolitan Region, Nov. 16, 2011

Figure A-13
Washington Travel Trends
Median Wage by Means of Travel to Work
(ACS 2006-2010 Estimates)



Source: American Community Survey, 5-year estimates, Table B08519

	TABLE A-2															
	GRP AND MODE DATA	GROSS REGIONAL PRODUCT ($B)		GROSS REGIONAL PRODUCT ($B) Non Work At Home		2007 Mode Split to Work					2040 Mode Split to Work				
		2010	2040	2010 (96.3%)	2040 (95%)	Auto Driver	Transit	Auto Person	Motorized Person	Non-Motorized Person	Auto Driver	Transit	Auto Person	Motorized Person	Non-Motorized Person
Regional Activity Centers															
1	Downtown Washington	57.06	203.32	54.95	193.15	33.3%	54.5%	40.0%	94.5%	5.5%	27.3%	57.6%	35.8%	93.5%	6.5%
2	Federal Center/SW/Navy Yard	17.49	64.99	16.84	61.74	37.2%	51.2%	43.4%	94.6%	5.4%	31.8%	53.6%	39.9%	93.5%	6.5%
3	Georgetown	2.01	6.17	1.93	5.86	49.8%	37.8%	57.3%	95.2%	4.8%	44.2%	38.5%	54.9%	93.5%	6.5%
4	Monumental Core	5.97	18.88	5.75	17.94	34.2%	53.5%	41.1%	94.5%	5.5%	28.0%	56.6%	36.9%	93.5%	6.5%
5	New York Avenue	2.54	16.95	2.44	16.10	55.1%	35.1%	61.1%	96.1%	3.9%	47.0%	39.0%	54.9%	93.9%	6.1%
6	Eisenhower Avenue	2.40	14.51	2.31	13.78	60.7%	30.4%	65.8%	96.2%	3.8%	54.8%	31.0%	63.2%	94.2%	5.8%
7	Downtown Alexandria	5.93	19.38	5.71	18.41	62.6%	26.7%	68.2%	94.9%	5.1%	53.3%	30.8%	62.6%	93.5%	6.5%
8	Ballston/Virginia Square	5.18	19.88	4.99	18.88	51.6%	39.2%	57.0%	96.2%	3.8%	42.0%	42.4%	51.1%	93.5%	6.5%
9	Clarendon/Court House	3.20	14.73	3.08	14.00	49.2%	40.0%	54.7%	94.8%	5.2%	39.8%	44.4%	49.1%	93.5%	6.5%
10	Crystal City	3.12	21.32	3.00	20.26	44.9%	43.6%	52.1%	95.7%	4.3%	37.0%	45.0%	48.4%	93.5%	6.5%
11	Pentagon City	1.38	8.38	1.33	7.96	45.9%	42.2%	52.3%	94.5%	5.5%	36.9%	45.4%	48.1%	93.5%	6.5%
12	Rosslyn	5.06	24.04	4.88	22.84	41.8%	45.5%	49.0%	94.5%	5.5%	33.6%	48.3%	45.2%	93.5%	6.5%
13	Friendship Heights	2.39	9.27	2.30	8.81	49.9%	41.1%	55.1%	96.2%	3.8%	42.8%	45.6%	49.8%	95.5%	4.5%
14	Baileys Crossroads/Skyline	2.58	8.89	2.49	8.44	80.9%	7.8%	88.4%	96.2%	3.8%	73.3%	8.8%	86.6%	95.4%	4.6%
15	Bethesda CBD	5.28	19.08	5.08	18.13	51.1%	38.4%	56.5%	94.9%	5.1%	44.4%	42.0%	51.9%	93.9%	6.1%
16	Silver Spring CBD	4.49	17.42	4.32	16.54	49.5%	41.5%	54.7%	96.2%	3.8%	43.3%	44.5%	49.9%	94.4%	5.6%
17	White Flint	3.47	18.84	3.35	17.90	72.6%	17.1%	79.1%	96.2%	3.8%	65.4%	19.4%	74.6%	93.9%	6.1%
18	Twinbrook	2.41	10.48	2.32	9.96	70.6%	19.3%	76.9%	96.2%	3.8%	64.5%	22.3%	73.0%	95.3%	4.7%
19	The Pentagon	2.56	7.14	2.46	6.78	42.7%	48.6%	49.6%	98.2%	1.8%	34.7%	47.8%	45.6%	93.5%	6.5%
20	Herndon	3.18	15.30	3.06	14.54	86.2%	3.5%	92.7%	96.2%	3.8%	77.2%	8.5%	86.2%	94.7%	5.3%
21	Merrifield/Dunn Loring	7.11	28.95	6.85	27.50	82.9%	6.8%	89.9%	96.7%	3.3%	74.4%	8.0%	86.1%	94.2%	5.8%
22	Reston East	3.44	13.46	3.32	12.79	85.8%	4.7%	92.7%	97.3%	2.7%	75.2%	10.5%	84.8%	95.3%	4.7%
23	Reston West	6.34	24.01	6.10	22.81	85.4%	3.8%	92.2%	96.1%	3.9%	73.9%	10.5%	83.2%	93.7%	6.3%
24	Tysons Corner	14.11	72.54	13.59	68.92	81.2%	7.0%	88.8%	95.8%	4.2%	63.2%	17.0%	76.5%	93.6%	6.4%
25	National Institutes of Health	2.99	10.07	2.88	9.57	56.8%	33.5%	62.7%	96.2%	3.8%	50.9%	36.3%	59.2%	95.5%	4.5%
26	Rock Spring Park	3.37	13.73	3.25	13.04	77.5%	13.6%	84.6%	98.2%	1.8%	70.8%	13.8%	81.6%	95.5%	4.5%
27	Beauregard Street	1.44	9.65	1.38	9.17	80.6%	8.7%	87.4%	96.2%	3.8%	73.9%	9.5%	85.9%	95.5%	4.5%
28	Waldorf Commercial	2.49	9.75	2.40	9.26	89.5%	1.8%	96.5%	98.3%	1.7%	88.4%	2.1%	95.8%	97.9%	2.1%
29	Beltway South	1.39	4.57	1.34	4.34	86.3%	4.7%	93.5%	98.2%	1.8%	79.7%	7.1%	90.8%	97.9%	2.1%
30	Dulles Corner	1.89	12.79	1.82	12.15	88.1%	2.4%	94.5%	96.9%	3.1%	78.9%	7.0%	87.9%	94.9%	5.1%
31	Dulles East	4.21	20.54	4.05	19.51	90.5%	1.6%	96.7%	98.3%	1.7%	85.0%	2.8%	93.5%	96.4%	3.6%
32	Dulles West	4.57	21.08	4.40	20.03	90.4%	1.2%	97.0%	98.2%	1.8%	86.1%	2.2%	95.5%	97.7%	2.3%
33	Fairfax Center	5.13	21.13	4.94	20.08	87.9%	2.7%	94.2%	96.9%	3.1%	82.6%	3.3%	92.1%	95.5%	4.5%
34	I-95 Corridor/Engineer Proving Ground	2.08	10.70	2.00	10.16	87.7%	4.0%	94.3%	98.3%	1.7%	82.5%	3.9%	93.9%	97.9%	2.1%
35	Springfield	1.17	8.62	1.13	8.19	83.5%	7.5%	90.4%	97.8%	2.2%	75.4%	9.4%	86.0%	95.5%	4.5%
36	City of Fairfax-GMU	4.18	17.43	4.02	16.56	87.8%	3.3%	94.1%	97.4%	2.6%	81.5%	4.1%	91.4%	95.5%	4.5%
37	MD 85/355 Evergreen Point	2.98	10.62	2.87	10.09	89.7%	1.4%	96.7%	98.1%	1.9%	87.5%	1.4%	94.4%	95.8%	4.2%
38	Downtown Leesburg	1.26	5.58	1.22	5.30	91.2%	1.3%	96.9%	98.2%	1.8%	87.4%	0.9%	94.7%	95.6%	4.4%
39	Corporate Dulles	2.51	15.32	2.41	14.55	91.5%	0.3%	97.9%	98.2%	1.8%	87.8%	1.3%	96.1%	97.5%	2.5%
40	Germantown	1.41	13.93	1.36	13.23	83.4%	7.5%	90.3%	97.8%	2.2%	78.5%	6.7%	88.8%	95.5%	4.5%
41	North Frederick Avenue	2.17	10.76	2.09	10.22	80.8%	8.8%	87.7%	96.5%	3.5%	76.0%	9.8%	85.7%	95.5%	4.5%
42	Rockville Town Center	1.98	9.88	1.91	9.39	73.3%	16.8%	79.6%	96.3%	3.7%	67.2%	19.6%	75.8%	95.5%	4.5%
43	Shady Grove/King Farm/Life Sciences	5.92	28.46	5.70	27.04	79.9%	9.7%	87.4%	97.0%	3.0%	72.4%	11.2%	82.6%	93.8%	6.2%
44	White Oak	1.82	9.23	1.76	8.77	86.0%	5.3%	92.9%	98.2%	1.8%	79.8%	7.1%	88.4%	95.5%	4.5%
45	US 1/ Greenline	3.88	17.09	3.73	16.23	71.7%	18.6%	78.2%	96.8%	3.2%	65.7%	22.0%	73.5%	95.5%	4.5%
46	Greenbelt	2.10	5.72	2.02	5.43	86.3%	5.1%	93.1%	98.2%	1.8%	82.4%	7.6%	90.2%	97.8%	2.2%
47	New Carrollton	1.17	5.96	1.12	5.66	74.8%	15.9%	81.0%	96.9%	3.1%	70.4%	17.2%	78.3%	95.5%	4.5%
48	Route 1	2.68	8.14	2.58	7.74	86.0%	5.3%	93.0%	98.2%	1.8%	81.2%	8.4%	89.3%	97.7%	2.3%
49	Konterra	1.57	14.54	1.51	13.81	87.5%	3.8%	94.5%	98.3%	1.7%	82.0%	7.1%	90.6%	97.6%	2.4%
50	Potomac Mills	1.15	7.73	1.10	7.34	88.4%	4.4%	93.8%	98.2%	1.8%	84.2%	4.0%	91.5%	95.5%	4.5%
51	Airport/Monocacy Boulevard	1.28	4.52	1.23	4.29	90.8%	1.1%	97.2%	98.4%	1.6%	90.3%	0.9%	96.6%	97.5%	2.5%
52	Urbana	0.19	0.78	0.18	0.74	92.5%	0.1%	99.0%	99.1%	0.9%	92.1%	0.0%	99.0%	99.0%	1.0%
53	Route 28 North	2.26	11.11	2.18	10.56	91.1%	0.9%	97.3%	98.2%	1.8%	87.4%	1.1%	95.9%	97.0%	3.0%
54	Largo Center	1.03	5.30	0.99	5.03	81.6%	10.2%	88.0%	98.3%	1.7%	80.0%	10.1%	87.8%	97.9%	2.1%
55	National Harbor	0.72	3.49	0.69	3.31	88.3%	4.0%	95.1%	99.1%	0.9%	82.6%	4.5%	91.7%	96.2%	3.8%
56	Bull Run - Sudley Area	1.87	10.93	1.80	10.38	91.6%	0.9%	97.2%	98.2%	1.8%	88.6%	1.1%	95.3%	96.4%	3.6%
57	Innovation	0.62	8.18	0.60	7.77	93.2%	0.0%	98.7%	98.7%	1.3%	91.3%	0.0%	97.9%	97.9%	2.1%
58	Gainesville	0.57	4.40	0.55	4.18	93.6%	0.0%	99.1%	99.1%	0.9%	91.9%	0.0%	97.7%	97.7%	2.3%
59	Woodbridge	0.96	6.02	0.92	5.72	90.6%	2.2%	95.7%	97.9%	2.1%	85.2%	2.1%	93.3%	95.5%	4.5%
60	Reagan National Airport	0.34	0.94	0.33	0.89	55.4%	33.7%	64.4%	98.2%	1.8%	45.3%	34.3%	59.2%	93.4%	6.6%
61	Dulles Airport	1.44	7.32	1.39	6.96	93.0%	0.0%	99.1%	99.1%	0.9%	88.1%	0.0%	97.9%	97.9%	2.1%
	TOTAL ALL CENTERS	**247.90**	**1063.93**	**238.73**	**1010.73**	**57.9%**	**32.4%**	**65.4%**	**95.8%**	**4.2%**	**54.5%**	**31.8%**	**64.8%**	**94.5%**	**5.5%**
	Share of MSA	57.7%	57.5%	55.6%	54.7%										

TABLE A-2															
GRP AND MODE DATA	GROSS REGIONAL PRODUCT ($B)		GROSS REGIONAL PRODUCT ($B) Non Work At Home		2007 Mode Split to Work					2040 Mode Split to Work				
	2010	2040	2010 (96.3%)	2040 (95%)	Auto Driver	Transit	Auto Person	Motorized Person	Non-Motorized Person	Auto Driver	Transit	Auto Person	Motorized Person	Non-Motorized Person
Balance of Jurisdiction - Not in Regional Activity Centers														
District of Columbia	21.08	86.01	20.30	81.71	56.0%	33.9%	62.1%	96.1%	3.9%	49.6%	37.0%	57.8%	94.8%	5.2%
Calvert	4.30	18.23	4.14	17.32	92.1%	0.1%	98.6%	98.7%	1.3%	91.8%	0.1%	98.4%	98.5%	1.5%
Charles	4.86	19.94	4.68	18.94	91.7%	0.3%	98.2%	98.6%	1.4%	91.5%	0.3%	98.0%	98.3%	1.7%
Frederick	12.59	46.87	12.12	44.52	90.3%	0.9%	97.0%	97.9%	2.1%	90.2%	0.6%	96.7%	97.4%	2.6%
Montgomery	28.88	125.65	27.82	119.37	80.7%	10.1%	87.4%	97.4%	2.6%	76.2%	10.7%	85.3%	96.0%	4.0%
Pr George's	27.68	99.59	26.66	94.61	83.1%	8.5%	89.6%	98.1%	1.9%	79.8%	9.5%	87.6%	97.1%	2.9%
SUBURBAN MD	78.32	310.27	75.42	294.76	84.1%	7.1%	90.7%	97.9%	2.1%	81.1%	7.7%	89.1%	96.9%	3.1%
Arlington	6.12	22.90	5.89	21.76	68.3%	21.4%	74.9%	96.3%	3.7%	60.0%	23.8%	71.3%	95.1%	4.9%
Alexandria	4.24	24.66	4.09	23.42	76.4%	13.6%	82.7%	96.3%	3.7%	68.2%	16.5%	78.8%	95.4%	4.6%
Fairfax	33.54	121.31	32.30	115.25	87.2%	4.1%	93.5%	97.7%	2.3%	80.9%	5.5%	91.2%	96.7%	3.3%
Loudoun	9.81	68.43	9.45	65.01	92.2%	0.6%	97.9%	98.5%	1.5%	89.6%	0.6%	96.9%	97.5%	2.5%
Pr William	12.13	67.09	11.68	63.74	92.2%	0.7%	97.7%	98.4%	1.6%	90.0%	0.8%	96.6%	97.4%	2.6%
Fauquier	2.28	13.23	2.20	12.56	92.5%	0.0%	98.3%	98.3%	1.7%	91.8%	0.0%	97.1%	97.1%	2.9%
Spotsylvania	3.81	19.69	3.67	18.71	93.7%	0.0%	98.6%	98.7%	1.3%	93.2%	0.0%	98.2%	98.2%	1.8%
Stafford	4.86	24.10	4.68	22.90	93.5%	0.0%	98.6%	98.6%	1.4%	93.1%	0.0%	98.2%	98.2%	1.8%
Fredericksburg	3.21	14.98	3.09	14.23	93.0%	0.1%	98.3%	98.4%	1.6%	91.3%	0.1%	96.7%	96.7%	3.3%
Clarke	0.44	1.84	0.42	1.74	93.5%	0.0%	98.8%	98.8%	1.2%	93.5%	0.0%	98.7%	98.7%	1.3%
NORTHERN VA	80.44	378.23	77.47	359.32	87.5%	4.4%	93.4%	97.9%	2.1%	84.2%	4.6%	92.4%	97.0%	3.0%
Jefferson	2.06	10.50	1.98	9.98	93.3%	0.0%	98.5%	98.5%	1.5%	93.7%	0.0%	98.6%	98.6%	1.4%
MSA - Not in Regional Activity Centers - Subtotal	180.43	778.16	173.75	739.25	81.7%	9.7%	87.9%	97.6%	2.4%	78.5%	10.2%	86.5%	96.7%	3.4%
MSA TOTALS														
District of Columbia	107.34	400.17	103.37	380.16	39.5%	48.9%	46.0%	94.9%	5.1%	34.5%	50.9%	42.9%	93.8%	6.2%
Calvert County	4.30	18.23	4.14	17.32	92.1%	0.1%	98.6%	98.7%	1.3%	91.8%	0.1%	98.4%	98.5%	1.5%
Charles County	7.35	29.69	7.08	28.20	91.0%	0.8%	97.7%	98.5%	1.5%	90.4%	1.0%	97.2%	98.2%	1.8%
Frederick County	17.04	62.78	16.41	59.64	90.3%	1.0%	97.0%	98.0%	2.0%	89.7%	0.8%	96.3%	97.1%	2.9%
Montgomery County	65.40	292.93	62.98	278.29	73.1%	17.3%	79.6%	96.9%	3.1%	68.8%	17.5%	77.8%	95.3%	4.7%
Prince George's County	40.82	159.84	39.31	151.85	82.2%	9.2%	88.7%	97.9%	2.1%	78.2%	10.9%	86.1%	96.9%	3.1%
Maryland Suburbs	134.92	563.47	129.93	535.30	79.5%	11.5%	86.0%	97.5%	2.5%	75.7%	12.3%	83.9%	96.2%	3.8%
Arlington County	26.97	119.35	25.97	113.38	50.6%	38.5%	57.1%	95.7%	4.3%	41.6%	41.4%	52.3%	93.7%	6.3%
Clarke County	0.44	1.84	0.42	1.74	93.5%	0.0%	98.8%	98.8%	1.2%	93.5%	0.0%	98.7%	98.7%	1.3%
Fairfax County	94.95	401.50	91.44	381.43	85.8%	4.6%	92.5%	97.1%	2.9%	76.3%	8.3%	87.1%	95.4%	4.6%
Fauquier County	2.28	13.23	2.20	12.56	92.5%	0.0%	98.3%	98.3%	1.7%	91.8%	0.0%	97.1%	97.1%	2.9%
Loudoun County	17.24	107.53	16.60	102.15	91.9%	0.6%	97.9%	98.4%	1.6%	88.9%	0.7%	96.7%	97.4%	2.6%
Prince William County	17.31	104.40	16.67	99.18	91.8%	1.1%	97.3%	98.4%	1.6%	89.1%	1.2%	95.8%	97.0%	3.0%
Spotsylvania County	3.81	19.69	3.67	18.71	93.7%	0.0%	98.6%	98.7%	1.3%	93.2%	0.0%	98.2%	98.2%	1.8%
Stafford County	4.86	24.10	4.68	22.90	93.5%	0.0%	98.6%	98.6%	1.4%	93.1%	0.0%	98.2%	98.2%	1.8%
Alexandria city	14.01	68.19	13.49	64.78	68.5%	21.4%	74.3%	95.7%	4.3%	61.3%	23.3%	71.2%	94.5%	5.5%
Fredericksburg city	3.21	14.98	3.09	14.23	93.0%	0.1%	98.3%	98.4%	1.6%	91.3%	0.1%	96.7%	96.7%	3.3%
Northern Virginia	185.08	874.80	178.23	831.06	79.8%	11.0%	86.1%	97.1%	2.9%	73.5%	12.8%	82.9%	95.7%	4.3%
Jefferson County	2.06	10.50	1.98	9.98	93.3%	0.0%	98.5%	98.5%	1.5%	93.7%	0.0%	98.6%	98.6%	1.4%
Washington MSA Total	429.40	1848.94	413.51	1756.49	67.8%	22.3%	74.3%	96.6%	3.4%	64.4%	22.2%	73.1%	95.4%	4.6%
Howard	23.79	98.88	22.91	93.94	90.7%	0.6%	97.6%	98.2%	1.8%	89.9%	0.6%	97.1%	97.7%	2.3%
Ann Arundel	40.13	152.36	38.64	144.74	91.2%	0.1%	98.0%	98.1%	1.9%	90.4%	0.1%	97.5%	97.6%	2.4%
Carroll	10.01	32.37	9.64	30.76	92.8%	0.0%	98.9%	98.9%	1.1%	92.5%	0.0%	98.6%	98.6%	1.4%
St Marys	7.92	30.59	7.63	29.06	91.9%	0.1%	98.3%	98.5%	1.5%	91.7%	0.2%	97.8%	98.0%	2.0%
King George	1.01	5.80	0.98	5.51	93.4%	0.0%	98.5%	98.5%	1.5%	93.7%	0.0%	98.8%	98.8%	1.2%
TPB Model Region	512.25	2168.95	493.30	2060.50	70.6%	19.7%	77.1%	96.8%	3.2%	67.3%	19.8%	75.8%	95.6%	4.4%

Table A-3

WASHINGTON METRO GROSS REGIONAL PRODUCT (billions current$)
Regional Activity Centers

RAC #	Regional Activity Center Name	2010	2040	Change	% Change	Share 2010	Share 2040	Change in Share
1	Downtown Washington	57.06	203.32	146.25	256%	13.29%	11.00%	-2.29%
2	Federal Center/SW/Navy Yard	17.49	64.99	47.50	272%	4.07%	3.52%	-0.56%
3	Georgetown	2.01	6.17	4.17	208%	0.47%	0.33%	-0.13%
4	Monumental Core	5.97	18.88	12.92	216%	1.39%	1.02%	-0.37%
5	New York Avenue	2.54	16.95	14.42	569%	0.59%	0.92%	0.33%
6	Eisenhower Avenue	2.40	14.51	12.10	504%	0.56%	0.78%	0.23%
7	Downtown Alexandria	5.93	19.38	13.45	227%	1.38%	1.05%	-0.33%
8	Ballston/Virginia Square	5.18	19.88	14.70	284%	1.21%	1.08%	-0.13%
9	Clarendon/Court House	3.20	14.73	11.53	360%	0.75%	0.80%	0.05%
10	Crystal City	3.12	21.32	18.21	584%	0.73%	1.15%	0.43%
11	Pentagon City	1.38	8.38	7.00	506%	0.32%	0.45%	0.13%
12	Rosslyn	5.06	24.04	18.98	375%	1.18%	1.30%	0.12%
13	Friendship Heights	2.39	9.27	6.88	288%	0.56%	0.50%	-0.06%
14	Baileys Crossroads/Skyline	2.58	8.89	6.30	244%	0.60%	0.48%	-0.12%
15	Bethesda CBD	5.28	19.08	13.80	261%	1.23%	1.03%	-0.20%
16	Silver Spring CBD	4.49	17.42	12.93	288%	1.05%	0.94%	-0.10%
17	White Flint	3.47	18.84	15.37	442%	0.81%	1.02%	0.21%
18	Twinbrook	2.41	10.48	8.07	334%	0.56%	0.57%	0.00%
19	The Pentagon	2.56	7.14	4.58	179%	0.60%	0.39%	-0.21%
20	Herndon	3.18	15.30	12.12	381%	0.74%	0.83%	0.09%
21	Merrifield/Dunn Loring	7.11	28.95	21.84	307%	1.66%	1.57%	-0.09%
22	Reston East	3.44	13.46	10.02	291%	0.80%	0.73%	-0.07%
23	Reston West	6.34	24.01	17.67	279%	1.48%	1.30%	-0.18%
24	Tysons Corner	14.11	72.54	58.43	414%	3.29%	3.92%	0.64%
25	National Institutes of Health	2.99	10.07	7.08	237%	0.70%	0.54%	-0.15%
26	Rock Spring Park	3.37	13.73	10.35	307%	0.79%	0.74%	-0.04%
27	Beauregard Street	1.44	9.65	8.21	572%	0.33%	0.52%	0.19%
28	Waldorf Commercial	2.49	9.75	7.26	291%	0.58%	0.53%	-0.05%
29	Beltway South	1.39	4.57	3.18	229%	0.32%	0.25%	-0.08%
30	Dulles Corner	1.89	12.79	10.90	578%	0.44%	0.69%	0.25%
31	Dulles East	4.21	20.54	16.33	388%	0.98%	1.11%	0.13%
32	Dulles West	4.57	21.08	16.51	361%	1.07%	1.14%	0.08%
33	Fairfax Center	5.13	21.13	16.00	312%	1.20%	1.14%	-0.05%
34	I-95 Corridor/Engineer Proving Ground	2.08	10.70	8.62	415%	0.48%	0.58%	0.10%
35	Springfield	1.17	8.62	7.46	638%	0.27%	0.47%	0.19%
36	City of Fairfax-GMU	4.18	17.43	13.25	317%	0.97%	0.94%	-0.03%
37	MD 85/355 Evergreen Point	2.98	10.62	7.64	256%	0.69%	0.57%	-0.12%
38	Downtown Leesburg	1.26	5.58	4.32	342%	0.29%	0.30%	0.01%
39	Corporate Dulles	2.51	15.32	12.81	511%	0.58%	0.83%	0.24%
40	Germantown	1.41	13.93	12.52	890%	0.33%	0.75%	0.43%
41	North Frederick Avenue	2.17	10.76	8.58	395%	0.51%	0.58%	0.08%
42	Rockville Town Center	1.98	9.88	7.90	399%	0.46%	0.53%	0.07%
43	Shady Grove/King Farm/Life Sciences	5.92	28.46	22.54	381%	1.38%	1.54%	0.16%
44	White Oak	1.82	9.23	7.41	406%	0.42%	0.50%	0.07%
45	US 1/ Greenline	3.88	17.09	13.21	341%	0.90%	0.92%	0.02%
46	Greenbelt	2.10	5.72	3.62	173%	0.49%	0.31%	-0.18%
47	New Carrollton	1.17	5.96	4.79	411%	0.27%	0.32%	0.05%
48	Route 1	2.68	8.14	5.46	204%	0.62%	0.44%	-0.18%
49	Konterra	1.57	14.54	12.97	828%	0.36%	0.79%	0.42%
50	Potomac Mills	1.15	7.73	6.58	574%	0.27%	0.42%	0.15%
51	Airport/Monocacy Boulevard	1.28	4.52	3.24	254%	0.30%	0.24%	-0.05%
52	Urbana	0.19	0.78	0.59	311%	0.04%	0.04%	0.00%
53	Route 28 North	2.26	11.11	8.85	392%	0.53%	0.60%	0.07%
54	Largo Center	1.03	5.30	4.27	414%	0.24%	0.29%	0.05%
55	National Harbor	0.72	3.49	2.77	386%	0.17%	0.19%	0.02%
56	Bull Run - Sudley Area	1.87	10.93	9.06	485%	0.44%	0.59%	0.16%
57	Innovation	0.62	8.18	7.56	1213%	0.15%	0.44%	0.30%
58	Gainesville	0.57	4.40	3.82	665%	0.13%	0.24%	0.10%
59	Woodbridge	0.96	6.02	5.06	528%	0.22%	0.33%	0.10%
60	Reagan National Airport	0.34	0.94	0.60	175%	0.08%	0.05%	-0.03%
61	Dulles Airport	1.44	7.32	5.88	409%	0.33%	0.40%	0.06%
	TOTAL ALL CENTERS	**247.90**	**1063.93**	**816.03**	**329%**	57.73%	57.54%	-0.19%

Table A-4

WASHINGTON GROSS REGIONAL PRODUCT (billions current$)
Ranked by GRP Size in 2010

RAC #	Regional Activity Center Name	2010	2040	Change	% Change
1	Downtown Washington	57.06	203.32	146.25	256%
2	Federal Center/SW/Navy Yard	17.49	64.99	47.50	272%
24	Tysons Corner	14.11	72.54	58.43	414%
21	Merrifield/Dunn Loring	7.11	28.95	21.84	307%
23	Reston West	6.34	24.01	17.67	279%
4	Monumental Core	5.97	18.88	12.92	216%
7	Downtown Alexandria	5.93	19.38	13.45	227%
43	Shady Grove/King Farm/Life Sciences	5.92	28.46	22.54	381%
15	Bethesda CBD	5.28	19.08	13.80	261%
8	Ballston/Virginia Square	5.18	19.88	14.70	284%
33	Fairfax Center	5.13	21.13	16.00	312%
12	Rosslyn	5.06	24.04	18.98	375%
32	Dulles West	4.57	21.08	16.51	361%
16	Silver Spring CBD	4.49	17.42	12.93	288%
31	Dulles East	4.21	20.54	16.33	388%
36	City of Fairfax-GMU	4.18	17.43	13.25	317%
45	US 1/ Greenline	3.88	17.09	13.21	341%
17	White Flint	3.47	18.84	15.37	442%
22	Reston East	3.44	13.46	10.02	291%
26	Rock Spring Park	3.37	13.73	10.35	307%
9	Clarendon/Court House	3.20	14.73	11.53	360%
20	Herndon	3.18	15.30	12.12	381%
10	Crystal City	3.12	21.32	18.21	584%
25	National Institutes of Health	2.99	10.07	7.08	237%
37	MD 85/355 Evergreen Point	2.98	10.62	7.64	256%
48	Route 1	2.68	8.14	5.46	204%
14	Baileys Crossroads/Skyline	2.58	8.89	6.30	244%
19	The Pentagon	2.56	7.14	4.58	179%
5	New York Avenue	2.54	16.95	14.42	569%
39	Corporate Dulles	2.51	15.32	12.81	511%
28	Waldorf Commercial	2.49	9.75	7.26	291%
18	Twinbrook	2.41	10.48	8.07	334%
6	Eisenhower Avenue	2.40	14.51	12.10	504%
13	Friendship Heights	2.39	9.27	6.88	288%
53	Route 28 North	2.26	11.11	8.85	392%
41	North Frederick Avenue	2.17	10.76	8.58	395%
46	Greenbelt	2.10	5.72	3.62	173%
34	I-95 Corridor/Engineer Proving Ground	2.08	10.70	8.62	415%
3	Georgetown	2.01	6.17	4.17	208%
42	Rockville Town Center	1.98	9.88	7.90	399%
30	Dulles Corner	1.89	12.79	10.90	578%
56	Bull Run - Sudley Area	1.87	10.93	9.06	485%
44	White Oak	1.82	9.23	7.41	406%
49	Konterra	1.57	14.54	12.97	828%
61	Dulles Airport	1.44	7.32	5.88	409%
27	Beauregard Street	1.44	9.65	8.21	572%
40	Germantown	1.41	13.93	12.52	890%
29	Beltway South	1.39	4.57	3.18	229%
11	Pentagon City	1.38	8.38	7.00	506%
51	Airport/Monocacy Boulevard	1.28	4.52	3.24	254%
38	Downtown Leesburg	1.26	5.58	4.32	342%
35	Springfield	1.17	8.62	7.46	638%
47	New Carrollton	1.17	5.96	4.79	411%
50	Potomac Mills	1.15	7.73	6.58	574%
54	Largo Center	1.03	5.30	4.27	414%
59	Woodbridge	0.96	6.02	5.06	528%
55	National Harbor	0.72	3.49	2.77	386%
57	Innovation	0.62	8.18	7.56	1213%
58	Gainesville	0.57	4.40	3.82	665%
60	Reagan National Airport	0.34	0.94	0.60	175%
52	Urbana	0.19	0.78	0.59	311%
	TOTAL ALL CENTERS	**247.90**	**1063.93**	**816.03**	**329%**

Table A-5

WASHINGTON GROSS REGIONAL PRODUCT (billions current$)
Ranked by GRP Size in 2040

RAC #	Regional Activity Center Name	2010	2040	Change	% Change
1	Downtown Washington	57.06	203.32	146.25	256%
24	Tysons Corner	14.11	72.54	58.43	414%
2	Federal Center/SW/Navy Yard	17.49	64.99	47.50	272%
21	Merrifield/Dunn Loring	7.11	28.95	21.84	307%
43	Shady Grove/King Farm/Life Sciences	5.92	28.46	22.54	381%
12	Rosslyn	5.06	24.04	18.98	375%
23	Reston West	6.34	24.01	17.67	279%
10	Crystal City	3.12	21.32	18.21	584%
33	Fairfax Center	5.13	21.13	16.00	312%
32	Dulles West	4.57	21.08	16.51	361%
31	Dulles East	4.21	20.54	16.33	388%
8	Ballston/Virginia Square	5.18	19.88	14.70	284%
7	Downtown Alexandria	5.93	19.38	13.45	227%
15	Bethesda CBD	5.28	19.08	13.80	261%
4	Monumental Core	5.97	18.88	12.92	216%
17	White Flint	3.47	18.84	15.37	442%
36	City of Fairfax-GMU	4.18	17.43	13.25	317%
16	Silver Spring CBD	4.49	17.42	12.93	288%
45	US 1/ Greenline	3.88	17.09	13.21	341%
5	New York Avenue	2.54	16.95	14.42	569%
39	Corporate Dulles	2.51	15.32	12.81	511%
20	Herndon	3.18	15.30	12.12	381%
9	Clarendon/Court House	3.20	14.73	11.53	360%
49	Konterra	1.57	14.54	12.97	828%
6	Eisenhower Avenue	2.40	14.51	12.10	504%
40	Germantown	1.41	13.93	12.52	890%
26	Rock Spring Park	3.37	13.73	10.35	307%
22	Reston East	3.44	13.46	10.02	291%
30	Dulles Corner	1.89	12.79	10.90	578%
53	Route 28 North	2.26	11.11	8.85	392%
56	Bull Run - Sudley Area	1.87	10.93	9.06	485%
41	North Frederick Avenue	2.17	10.76	8.58	395%
34	I-95 Corridor/Engineer Proving Ground	2.08	10.70	8.62	415%
37	MD 85/355 Evergreen Point	2.98	10.62	7.64	256%
18	Twinbrook	2.41	10.48	8.07	334%
25	National Institutes of Health	2.99	10.07	7.08	237%
42	Rockville Town Center	1.98	9.88	7.90	399%
28	Waldorf Commercial	2.49	9.75	7.26	291%
27	Beauregard Street	1.44	9.65	8.21	572%
13	Friendship Heights	2.39	9.27	6.88	288%
44	White Oak	1.82	9.23	7.41	406%
14	Baileys Crossroads/Skyline	2.58	8.89	6.30	244%
35	Springfield	1.17	8.62	7.46	638%
11	Pentagon City	1.38	8.38	7.00	506%
57	Innovation	0.62	8.18	7.56	1213%
48	Route 1	2.68	8.14	5.46	204%
50	Potomac Mills	1.15	7.73	6.58	574%
61	Dulles Airport	1.44	7.32	5.88	409%
19	The Pentagon	2.56	7.14	4.58	179%
3	Georgetown	2.01	6.17	4.17	208%
59	Woodbridge	0.96	6.02	5.06	528%
47	New Carrollton	1.17	5.96	4.79	411%
46	Greenbelt	2.10	5.72	3.62	173%
38	Downtown Leesburg	1.26	5.58	4.32	342%
54	Largo Center	1.03	5.30	4.27	414%
29	Beltway South	1.39	4.57	3.18	229%
51	Airport/Monocacy Boulevard	1.28	4.52	3.24	254%
58	Gainesville	0.57	4.40	3.82	665%
55	National Harbor	0.72	3.49	2.77	386%
60	Reagan National Airport	0.34	0.94	0.60	175%
52	Urbana	0.19	0.78	0.59	311%
	TOTAL ALL CENTERS	**247.90**	**1063.93**	**816.03**	**329%**

Table A-6

Gross Regional Product by Mode for Regional Activity Centers

		GRP By Mode - 2010			GRP By Mode - 2040			2007-2040			2007-2040		
		Auto	Transit	Bike/Walk	Auto	Transit	Bike/Walk	Auto	Transit	Bike/Walk	Auto	Transit	Bike/Walk
	Regional Activity Centers												
1	Downtown Washington	40.0%	54.5%	5.5%	35.8%	57.6%	6.5%	34.2%	58.9%	7.0%	-4.2%	3.1%	1.1%
2	Federal Center/SW/Navy Yard	43.4%	51.2%	5.4%	39.9%	53.6%	6.5%	38.6%	54.4%	7.0%	-3.5%	2.4%	1.2%
3	Georgetown	57.3%	37.8%	4.8%	54.9%	38.5%	6.5%	53.7%	38.9%	7.4%	-2.4%	0.7%	1.7%
4	Monumental Core	41.1%	53.5%	5.5%	36.9%	56.6%	6.5%	34.9%	58.0%	7.0%	-4.2%	3.1%	1.1%
5	New York Avenue	61.1%	35.1%	3.9%	54.9%	39.0%	6.1%	53.8%	39.7%	6.5%	-6.1%	4.0%	2.2%
6	Eisenhower Avenue	65.8%	30.4%	3.8%	63.2%	31.0%	5.8%	62.7%	31.1%	6.2%	-2.6%	0.6%	2.0%
7	Downtown Alexandria	68.2%	26.7%	5.1%	62.6%	30.8%	6.5%	60.1%	32.7%	7.2%	-5.6%	4.2%	1.4%
8	Ballston/Virginia Square	57.0%	39.2%	3.8%	51.1%	42.4%	6.5%	48.9%	43.6%	7.5%	-5.9%	3.2%	2.7%
9	Clarendon/Court House	54.7%	40.0%	5.2%	49.1%	44.4%	6.5%	47.5%	45.6%	6.9%	-5.7%	4.4%	1.3%
10	Crystal City	52.1%	43.6%	4.3%	48.4%	45.0%	6.5%	47.8%	45.3%	6.9%	-3.6%	1.4%	2.2%
11	Pentagon City	52.3%	42.2%	5.5%	48.1%	45.4%	6.5%	47.2%	46.0%	6.8%	-4.2%	3.2%	1.1%
12	Rosslyn	49.0%	45.5%	5.5%	45.2%	48.3%	6.5%	44.1%	49.1%	6.8%	-3.9%	2.8%	1.1%
13	Friendship Heights	55.1%	41.1%	3.8%	49.8%	45.6%	4.5%	48.0%	47.2%	4.8%	-5.2%	4.5%	0.7%
14	Baileys Crossroads/Skyline	88.4%	7.8%	3.8%	86.6%	8.8%	4.6%	85.9%	9.2%	4.9%	-1.7%	1.0%	0.7%
15	Bethesda CBD	56.5%	38.4%	5.1%	51.9%	42.0%	6.1%	50.1%	43.5%	6.5%	-4.6%	3.7%	0.9%
16	Silver Spring CBD	54.7%	41.5%	3.8%	49.9%	44.5%	5.6%	48.2%	45.6%	6.2%	-4.8%	3.0%	1.8%
17	White Flint	79.1%	17.1%	3.8%	74.6%	19.4%	6.1%	73.5%	19.9%	6.6%	-4.5%	2.3%	2.2%
18	Twinbrook	76.9%	19.3%	3.8%	73.0%	22.3%	4.7%	71.8%	23.2%	5.0%	-3.9%	3.0%	0.9%
19	The Pentagon	49.6%	48.6%	1.8%	45.6%	47.8%	6.5%	43.3%	47.4%	9.2%	-4.0%	-0.7%	4.7%
20	Herndon	92.7%	3.5%	3.8%	86.2%	8.5%	5.3%	84.5%	9.8%	5.7%	-6.5%	5.0%	1.5%
21	Merrifield/Dunn Loring	89.9%	6.8%	3.3%	86.1%	8.0%	5.8%	84.9%	8.5%	6.7%	-3.8%	1.3%	2.5%
22	Reston East	92.7%	4.7%	2.7%	84.8%	10.5%	4.7%	82.0%	12.6%	5.5%	-7.9%	5.8%	2.1%
23	Reston West	92.2%	3.8%	3.9%	83.2%	10.5%	6.3%	79.9%	12.9%	7.2%	-9.1%	6.7%	2.4%
24	Tysons Corner	88.8%	7.0%	4.2%	76.5%	17.0%	6.4%	73.5%	19.5%	7.0%	-12.2%	10.0%	2.2%
25	National Institutes of Health	62.7%	33.5%	3.8%	59.2%	36.3%	4.5%	57.7%	37.5%	4.8%	-3.5%	2.8%	0.7%
26	Rock Spring Park	84.6%	13.6%	1.8%	81.6%	13.8%	4.5%	80.7%	13.9%	5.4%	-3.0%	0.3%	2.7%
27	Beauregard Street	87.4%	8.7%	3.8%	85.9%	9.5%	4.5%	85.6%	9.7%	4.7%	-1.5%	0.8%	0.7%
28	Waldorf Commercial	96.5%	1.8%	1.7%	95.8%	2.1%	2.1%	95.6%	2.2%	2.2%	-0.6%	0.3%	0.3%
29	Beltway South	93.5%	4.7%	1.8%	90.8%	7.1%	2.1%	89.5%	8.2%	2.3%	-2.7%	2.4%	0.3%
30	Dulles Corner	94.5%	2.4%	3.1%	87.9%	7.0%	5.1%	86.8%	7.8%	5.4%	-6.6%	4.6%	2.0%
31	Dulles East	96.7%	1.6%	1.7%	93.5%	2.8%	3.6%	92.7%	3.1%	4.2%	-3.2%	1.2%	2.0%
32	Dulles West	97.0%	1.2%	1.8%	95.5%	2.2%	2.3%	95.1%	2.5%	2.4%	-1.5%	1.0%	0.5%
33	Fairfax Center	94.2%	2.7%	3.1%	92.1%	3.3%	4.5%	91.4%	3.6%	5.0%	-2.1%	0.7%	1.4%
34	I-95 Corridor/Engineer Proving G	94.3%	4.0%	1.7%	93.9%	3.9%	2.1%	93.8%	3.9%	2.2%	-0.4%	-0.1%	0.5%
35	Springfield	90.4%	7.5%	2.2%	86.0%	9.4%	4.5%	85.4%	9.7%	4.9%	-4.3%	1.9%	2.4%
36	City of Fairfax-GMU	94.1%	3.3%	2.6%	91.4%	4.1%	4.5%	90.5%	4.3%	5.2%	-2.8%	0.8%	2.0%
37	MD 85/355 Evergreen Point	96.7%	1.4%	1.9%	94.4%	1.4%	4.2%	93.5%	1.4%	5.1%	-2.3%	0.0%	2.3%
38	Downtown Leesburg	96.9%	1.3%	1.8%	94.7%	0.9%	4.4%	94.1%	0.8%	5.1%	-2.1%	-0.4%	2.6%
39	Corporate Dulles	97.9%	0.3%	1.8%	96.1%	1.3%	2.5%	95.8%	1.5%	2.7%	-1.7%	1.0%	0.7%
40	Germantown	90.3%	7.5%	2.2%	88.8%	6.7%	4.5%	88.6%	6.6%	4.8%	-1.5%	-0.8%	2.3%
41	North Frederick Avenue	87.7%	8.8%	3.5%	85.7%	9.8%	4.5%	85.2%	10.0%	4.8%	-2.0%	1.0%	1.0%
42	Rockville Town Center	79.6%	16.8%	3.7%	75.8%	19.6%	4.5%	74.9%	20.3%	4.8%	-3.7%	2.8%	0.9%
43	Shady Grove/King Farm/Life Scie	87.4%	9.7%	3.0%	82.6%	11.2%	6.2%	81.3%	11.6%	7.1%	-4.8%	1.5%	3.3%
44	White Oak	92.9%	5.3%	1.8%	88.4%	7.1%	4.5%	87.2%	7.6%	5.2%	-4.6%	1.8%	2.7%
45	US 1/ Greenline	78.2%	18.6%	3.2%	73.5%	22.0%	4.5%	72.1%	23.1%	4.9%	-4.7%	3.4%	1.3%
46	Greenbelt	93.1%	5.1%	1.8%	90.2%	7.6%	2.2%	88.5%	9.1%	2.5%	-2.9%	2.5%	0.4%
47	New Carrollton	81.0%	15.9%	3.1%	78.3%	17.2%	4.5%	77.6%	17.5%	4.9%	-2.7%	1.3%	1.4%
48	Route 1	93.0%	5.3%	1.8%	89.3%	8.4%	2.3%	87.5%	9.9%	2.6%	-3.7%	3.1%	0.6%
49	Konterra	94.5%	3.8%	1.7%	90.6%	7.1%	2.4%	90.1%	7.5%	2.4%	-3.9%	3.2%	0.7%
50	Potomac Mills	93.8%	4.4%	1.8%	91.5%	4.0%	4.5%	91.0%	4.0%	5.0%	-2.4%	-0.3%	2.7%
51	Airport/Monocacy Boulevard	97.2%	1.1%	1.6%	96.6%	0.9%	2.5%	96.4%	0.8%	2.8%	-0.6%	-0.2%	0.8%
52	Urbana	99.0%	0.1%	0.9%	99.0%	0.0%	1.0%	99.0%	0.0%	1.0%	0.0%	-0.1%	0.1%
53	Route 28 North	97.3%	0.9%	1.8%	95.9%	1.1%	3.0%	95.6%	1.2%	3.3%	-1.4%	0.2%	1.2%
54	Largo Center	88.0%	10.2%	1.7%	87.8%	10.1%	2.1%	87.7%	10.0%	2.2%	-0.2%	-0.2%	0.4%
55	National Harbor	95.1%	4.0%	0.9%	91.7%	4.5%	3.8%	90.9%	4.6%	4.5%	-3.4%	0.5%	2.9%
56	Bull Run - Sudley Area	97.2%	0.9%	1.8%	95.3%	1.1%	3.6%	94.9%	1.1%	4.0%	-1.9%	0.1%	1.8%
57	Innovation	98.7%	0.0%	1.3%	97.9%	0.0%	2.1%	97.8%	0.0%	2.2%	-0.8%	0.0%	0.8%
58	Gainesville	99.1%	0.0%	0.9%	97.7%	0.0%	2.3%	97.4%	0.0%	2.5%	-1.4%	0.0%	1.4%
59	Woodbridge	95.7%	2.2%	2.1%	93.3%	2.1%	4.5%	92.9%	2.1%	5.0%	-2.3%	-0.1%	2.5%
60	Reagan National Airport	64.4%	33.7%	1.8%	59.2%	34.3%	6.6%	56.1%	34.6%	9.3%	-5.3%	0.5%	4.8%
61	Dulles Airport	99.1%	0.0%	0.9%	97.9%	0.0%	2.1%	97.5%	0.0%	2.4%	-1.3%	0.0%	1.3%
	TOTAL ALL CENTERS	64.1%	31.8%	4.1%	63.5%	31.1%	5.4%	63.2%	30.9%	5.8%	-0.7%	-0.6%	1.3%

	Table A -7						
	Median Wage by Means of Transportation						
Geography	All modes	Car, truck, or van - drove alone:	Car, truck, or van - carpooled:	Public transportation (excluding taxicab):	Walked:	Taxicab, motorcycle, bicycle, or other means:	Worked at home:
District of Columbia, District of Columbia	$61,538	$65,000	$61,786	$56,923	$45,714	$67,222	$40,455
Calvert County, Maryland	$26,538	$34,999	$26,765	$10,556	$20,185	$37,400	$33,333
Charles County, Maryland	$34,999	$38,333	$26,429	$15,741	$16,250	$17,000	$31,429
Frederick County, Maryland	$38,947	$40,526	$33,235	$22,200	$12,857	$29,615	$41,250
Montgomery County, Maryland	$47,000	$53,214	$37,000	$28,333	$24,286	$38,158	$41,000
Prince George's County, Maryland	$40,000	$48,333	$32,143	$23,421	$9,614	$24,524	$38,750
Arlington County, Virginia	$63,846	$63,846	$68,333	$64,999	$60,000	$74,999	$49,999
Clarke County, Virginia	$30,909	$30,833	$27,000	$56,176	$8,771	$24,630	$67,308
Fairfax County, Virginia	$55,769	$59,643	$41,000	$30,833	$21,471	$48,750	$48,500
Fauquier County, Virginia	$34,286	$34,999	$30,385	$26,765	$27,273	$43,478	$44,000
Loudoun County, Virginia	$44,375	$45,833	$32,333	$20,385	$26,429	$40,455	$59,545
Prince William County, Virginia	$36,765	$40,294	$28,333	$23,571	$21,970	$23,889	$41,923
Spotsylvania County, Virginia	$30,882	$32,647	$26,154	$17,286	$17,093	$9,614	$34,231
Stafford County, Virginia	$36,429	$38,409	$30,238	$31,250	$27,000	$13,000	$31,471
Warren County, Virginia	$29,118	$28,750	$28,889	$29,510	$11,500	$22,941	$38,750
Alexandria city, Virginia	$52,143	$53,600	$43,824	$42,500	$37,250	$47,000	$57,000
Fairfax city, Virginia	$39,688	$44,167	$30,714	$16,250	$7,575	$22,000	$56,000
Falls Church city, Virginia	$41,563	$45,000	$35,714	$21,364	$30,417	$43,182	$63,750
Fredericksburg city, Virginia	$31,250	$33,000	$25,588	$22,907	$18,750	$16,154	$67,857
Manassas city, Virginia	$42,500	$46,250	$35,652	$20,745	$12,000	$27,059	$29,211
Manassas Park city, Virginia	$41,875	$42,222	$41,522	-	$12,841	-	$55,000
Jefferson County, West Virginia	$29,211	$30,500	$27,105	$7,352	$11,774	$57,500	$35,882
Suburban Maryland	$43,438	$48,235	$38,000	$26,429	$15,667	$30,833	$39,615
Northern Virginia	$49,000	$51,154	$39,000	$47,500	$26,000	$41,250	$47,273
MSA	$49,999	$52,308	$42,000	$49,999	$29,444	$46,538	$43,182
Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-year estimates, Table B08519							

Worker Distribution by Place of Residence and Commute Mode: 2006-2010

TABLE A-8-1

Population by Place or Residence and Commute Mode

Unit: Percentage	Commute Mode:						
	Drive Alone	Carpool	Public Transportation	Walk	Taxicab and Others	Work from Home	All Modes
District of Columbia	**35.9**	**6.5**	**37.6**	**11.9**	**3.4**	**4.6**	**100.0**
Arlington	52.8	7.4	27.4	5.5	2.1	4.8	100.0
Clarke	82.6	9.7	0.6	1.6	0.8	4.7	100.0
Fairfax	72.5	10.8	8.9	1.8	1.2	4.7	100.0
Fauquier	78.9	11.8	1.2	2.0	1.1	5.1	100.0
Loudoun	78.6	9.7	2.5	1.6	1.1	6.5	100.0
Prince William	70.8	16.6	5.3	2.1	1.3	3.9	100.0
Spotsylvania	77.7	13.3	3.9	0.4	1.5	3.3	100.0
Stafford	73.6	14.3	3.5	2.5	1.1	4.9	100.0
Warren	76.8	14.0	0.7	1.8	1.2	5.5	100.0
Alexandria	60.6	8.6	22.3	3.1	1.8	3.6	100.0
Fairfax city	69.5	14.0	9.0	2.0	0.7	4.7	100.0
Falls Church	64.0	7.2	17.3	3.2	1.5	6.7	100.0
Fredericksburg	69.8	16.5	3.7	5.0	2.3	2.6	100.0
Manassas	76.6	13.5	3.7	3.1	1.1	2.1	100.0
Manassas Park	70.1	20.9	4.4	1.0	1.3	2.2	100.0
Northern Virginia Total	**70.9**	**11.6**	**9.3**	**2.3**	**1.3**	**4.6**	**100.0**
Calvert	78.1	12.2	2.7	0.7	0.8	5.4	100.0
Charles	77.7	11.7	6.5	0.7	0.8	2.7	100.0
Frederick	78.5	11.5	2.2	2.0	0.9	4.9	100.0
Montgomery	66.1	10.3	15.0	2.1	1.1	5.3	100.0
Prince George's	64.1	12.6	17.4	2.2	1.0	2.7	100.0
Suburban Maryland Total	**67.8**	**11.5**	**13.6**	**2.0**	**1.0**	**4.2**	**100.0**
Jefferson County, WV	73.3	13.0	3.7	3.3	1.7	4.9	100.0
Washington Metro Area	**66.0**	**11.0**	**13.9**	**3.2**	**1.4**	**4.4**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-2

Worker Distribution by Place of Residence, Wages, and Commute Mode: 2006-2010

Figure 2 – All Modes of Transportation

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**24.9**	**28.2**	**18.2**	**28.7**	**100.0**
Arlington	19.2	21.0	21.2	38.5	100.0
Clarke	29.5	29.0	18.5	23.0	100.0
Fairfax	23.5	22.1	17.2	37.2	100.0
Fauquier	28.3	27.7	19.4	24.6	100.0
Loudoun	21.3	21.0	18.1	39.5	100.0
Prince William	25.5	28.9	18.4	27.3	100.0
Spotsylvania	28.3	29.4	19.7	22.6	100.0
Stafford	25.1	26.3	19.6	28.9	100.0
Warren	33.5	32.1	19.7	14.7	100.0
Alexandria	20.7	25.4	21.0	32.9	100.0
Fairfax city	22.8	27.0	15.8	34.4	100.0
Falls Church	15.8	21.4	18.1	44.7	100.0
Fredericksburg	38.6	34.4	11.6	15.3	100.0
Manassas	34.7	30.3	18.7	16.3	100.0
Manassas Park	27.2	40.2	15.4	17.1	100.0
Northern Virginia Total	**23.8**	**24.2**	**18.4**	**33.6**	**100.0**
Calvert	26.2	25.3	21.9	26.7	100.0
Charles	22.2	27.2	24.0	26.5	100.0
Frederick	26.3	28.7	21.0	24.0	100.0
Montgomery	25.3	24.1	17.6	32.9	100.0
Prince George's	28.3	31.8	20.6	19.3	100.0
Suburban Maryland Total	**26.4**	**27.7**	**19.6**	**26.3**	**100.0**
Jefferson County, WV	31.5	31.4	18.3	18.8	100.0
Washington Metro Area	**25.0**	**26.1**	**18.9**	**30.0**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-3

Drive Alone

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**16.6**	**28.3**	**21.1**	**34.1**	**100.0**
Arlington	15.5	21.7	22.9	39.9	100.0
Clarke	26.4	32.6	17.8	23.2	100.0
Fairfax	21.0	22.9	18.2	37.9	100.0
Fauquier	27.9	27.2	20.0	25.0	100.0
Loudoun	19.0	21.7	19.0	40.3	100.0
Prince William	23.5	30.2	19.7	26.6	100.0
Spotsylvania	28.7	31.1	20.1	20.1	100.0
Stafford	24.7	27.7	21.3	26.3	100.0
Warren	33.9	33.2	19.3	13.7	100.0
Alexandria	16.1	26.4	22.1	35.5	100.0
Fairfax city	22.8	25.8	17.4	34.0	100.0
Falls Church	15.2	21.7	19.4	43.7	100.0
Fredericksburg	35.4	39.2	12.4	13.0	100.0
Manassas	30.4	32.3	21.0	16.3	100.0
Manassas Park	25.0	41.5	17.8	15.7	100.0
Northern Virginia Total	**21.7**	**25.2**	**19.4**	**33.8**	**100.0**
Calvert	25.1	25.5	22.5	26.8	100.0
Charles	21.5	27.2	25.1	26.1	100.0
Frederick	24.3	29.1	22.0	24.7	100.0
Montgomery	21.4	24.7	18.8	35.1	100.0
Prince George's	22.3	32.7	23.2	21.8	100.0
Suburban Maryland Total	**22.3**	**28.3**	**21.3**	**28.1**	**100.0**
Jefferson County, WV	29.9	33.0	19.9	17.1	100.0
Washington Metro Area	**21.7**	**26.8**	**20.3**	**31.2**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-4

Carpool

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**25.9**	**28.3**	**19.1**	**26.7**	**100.0**
Arlington	22.2	18.8	19.6	39.4	100.0
Clarke	46.6	11.2	28.5	13.7	100.0
Fairfax	29.5	23.5	16.1	30.9	100.0
Fauquier	31.3	33.6	18.8	16.3	100.0
Loudoun	30.3	24.6	14.4	30.8	100.0
Prince William	27.3	30.4	16.5	25.7	100.0
Spotsylvania	24.6	29.0	19.2	27.2	100.0
Stafford	21.4	21.4	16.7	40.5	100.0
Warren	26.9	29.5	24.5	19.1	100.0
Alexandria	31.7	28.4	17.3	22.6	100.0
Fairfax city	27.8	31.6	13.6	26.9	100.0
Falls Church	19.9	22.8	6.5	50.8	100.0
Fredericksburg	46.1	33.6	9.9	10.4	100.0
Manassas	50.6	32.2	11.1	6.1	100.0
Manassas Park	29.9	49.4	6.9	13.8	100.0
Northern Virginia Total	**28.6**	**26.0**	**16.5**	**28.9**	**100.0**
Calvert	26.3	25.0	24.3	24.4	100.0
Charles	23.8	28.7	17.8	29.7	100.0
Frederick	29.5	33.1	19.6	17.8	100.0
Montgomery	33.5	26.8	17.0	22.8	100.0
Prince George's	41.3	33.4	14.5	10.7	100.0
Suburban Maryland Total	**35.4**	**30.2**	**16.6**	**17.8**	**100.0**
Jefferson County, WV	29.0	34.8	20.4	15.8	100.0
Washington Metro Area	**31.4**	**28.1**	**16.7**	**23.9**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-5

Public Transportation

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**29.9**	**30.6**	**16.6**	**22.9**	**100.0**
Arlington	21.2	21.4	22.2	35.2	100.0
Clarke	0.0	0.0	22.0	78.0	100.0
Fairfax	23.1	16.8	15.1	45.0	100.0
Fauquier	11.1	10.5	10.3	68.1	100.0
Loudoun	13.0	10.5	17.9	58.5	100.0
Prince William	16.4	16.8	16.0	50.8	100.0
Spotsylvania	10.3	9.6	24.4	55.6	100.0
Stafford	11.7	11.6	23.1	53.6	100.0
Warren	37.6	11.2	24.0	27.2	100.0
Alexandria	25.6	23.4	19.7	31.3	100.0
Fairfax city	13.4	22.8	11.7	52.2	100.0
Falls Church	10.0	20.0	17.2	52.8	100.0
Fredericksburg	27.2	6.9	13.4	52.4	100.0
Manassas	21.5	5.1	9.9	63.5	100.0
Manassas Park	11.8	8.5	30.1	49.7	100.0
Northern Virginia Total	**21.4**	**18.6**	**18.2**	**41.9**	**100.0**
Calvert	19.3	21.6	18.9	40.3	100.0
Charles	13.2	21.2	30.0	35.5	100.0
Frederick	25.0	14.1	21.2	39.6	100.0
Montgomery	28.6	22.3	15.7	33.4	100.0
Prince George's	32.3	30.9	18.8	18.0	100.0
Suburban Maryland Total	**29.8**	**26.2**	**17.7**	**26.3**	**100.0**
Jefferson County, WV	22.4	14.9	10.3	52.4	100.0
Washington Metro Area	**27.1**	**25.0**	**17.5**	**30.4**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-6

Walk

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**30.8**	**24.0**	**16.5**	**28.7**	**100.0**
Arlington	29.7	18.4	13.9	38.0	100.0
Clarke	71.2	28.8	0.0	0.0	100.0
Fairfax	56.9	18.5	9.4	15.2	100.0
Fauquier	42.9	32.2	8.4	16.5	100.0
Loudoun	50.4	22.1	7.3	20.3	100.0
Prince William	66.3	25.4	3.5	4.9	100.0
Spotsylvania	69.2	11.8	0.0	19.0	100.0
Stafford	49.3	36.0	3.0	11.7	100.0
Warren	62.0	9.0	25.0	4.0	100.0
Alexandria	36.8	26.5	19.0	17.7	100.0
Fairfax city	47.9	42.7	5.1	4.3	100.0
Falls Church	36.2	27.0	18.4	18.4	100.0
Fredericksburg	56.7	20.8	6.3	16.2	100.0
Manassas	72.4	9.9	17.7	0.0	100.0
Manassas Park	89.0	0.0	0.0	11.0	100.0
Northern Virginia Total	**49.4**	**21.4**	**10.1**	**19.0**	**100.0**
Calvert	67.4	14.2	6.5	12.0	100.0
Charles	67.1	24.4	6.7	1.8	100.0
Frederick	59.7	23.9	8.1	8.3	100.0
Montgomery	54.0	18.4	11.4	16.2	100.0
Prince George's	78.0	12.6	4.2	5.1	100.0
Suburban Maryland Total	**64.8**	**16.7**	**8.0**	**10.5**	**100.0**
Jefferson County, WV	81.8	10.0	0.0	8.2	100.0
Washington Metro Area	**46.6**	**21.1**	**11.9**	**20.5**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-8-7

Taxicab, Motorcycle, Bicycle, or Other Means

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**18.9**	**27.5**	**17.6**	**36.1**	**100.0**
Arlington	23.9	13.6	20.1	42.4	100.0
Clarke	77.6	0.0	0.0	22.4	100.0
Fairfax	32.2	19.9	11.0	36.9	100.0
Fauquier	15.4	25.6	25.9	33.1	100.0
Loudoun	32.4	15.3	8.5	43.8	100.0
Prince William	38.8	22.0	15.7	23.5	100.0
Spotsylvania	51.7	12.0	11.8	24.4	100.0
Stafford	24.5	16.4	17.9	41.2	100.0
Warren	55.5	29.1	15.5	0.0	100.0
Alexandria	21.6	21.5	19.0	37.9	100.0
Fairfax city	49.4	11.7	31.2	7.8	100.0
Falls Church	16.8	23.2	17.9	42.1	100.0
Fredericksburg	62.1	9.9	0.0	28.0	100.0
Manassas	59.4	34.7	5.9	0.0	100.0
Manassas Park	100.0	0.0	0.0	0.0	100.0
Northern Virginia Total	**32.8**	**18.6**	**14.0**	**34.6**	**100.0**
Calvert	25.1	14.9	20.8	39.2	100.0
Charles	41.6	35.6	14.5	8.3	100.0
Frederick	33.9	27.0	18.2	21.0	100.0
Montgomery	28.5	25.7	12.0	33.8	100.0
Prince George's	47.6	26.5	12.7	13.1	100.0
Suburban Maryland Total	**36.4**	**26.2**	**13.2**	**24.1**	**100.0**
Jefferson County, WV	29.6	15.0	6.2	49.2	100.0
Washington Metro Area	**30.4**	**23.0**	**14.6**	**32.1**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

Table A-8-8

Work from Home

Unit: Percentage	Wages: < $25K	$25-$50K	$50-$65K	$75K+	Total
District of Columbia	**36.0**	**20.8**	**12.8**	**30.5**	**100.0**
Arlington	30.3	20.1	9.1	40.4	100.0
Clarke	30.1	10.4	19.6	39.9	100.0
Fairfax	32.7	18.7	13.3	35.3	100.0
Fauquier	29.8	24.2	16.9	29.2	100.0
Loudoun	30.3	12.7	17.6	39.4	100.0
Prince William	38.5	19.0	15.7	26.9	100.0
Spotsylvania	38.4	24.6	12.6	24.4	100.0
Stafford	39.1	27.8	9.8	23.3	100.0
Warren	30.3	34.5	12.2	22.9	100.0
Alexandria	26.7	16.1	21.9	35.3	100.0
Fairfax city	10.4	35.7	10.0	44.0	100.0
Falls Church	21.7	17.3	20.9	40.1	100.0
Fredericksburg	38.3	0.0	19.3	42.3	100.0
Manassas	41.7	19.4	7.2	31.7	100.0
Manassas Park	29.4	18.3	9.2	43.1	100.0
Northern Virginia Total	**32.7**	**18.8**	**14.2**	**34.3**	**100.0**
Calvert	39.6	26.7	10.8	22.9	100.0
Charles	41.0	33.7	12.5	12.7	100.0
Frederick	36.2	21.1	14.9	27.8	100.0
Montgomery	36.6	19.3	13.3	30.8	100.0
Prince George's	35.3	26.2	17.3	21.2	100.0
Suburban Maryland Total	**36.6**	**22.2**	**14.3**	**27.0**	**100.0**
Jefferson County, WV	36.0	30.1	10.5	23.4	100.0
Washington Metro Area	**34.6**	**20.4**	**14.0**	**31.0**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

Worker Distribution by Workplace and Commute Mode: 2006-2010

TABLE A-9-1

Figure 1 – Population by Workplace and Commute Mode

Unit: Percentage	Commute Mode:						
	Drive Alone	Carpool	Public Transportation	Walk	Taxicab and Others	Work from Home	All Modes
District of Columbia	**43.6**	**11.0**	**36.7**	**4.7**	**2.2**	**1.8**	**100.0**
Arlington	56.2	12.8	22.2	3.8	1.6	3.4	100.0
Clarke	79.6	9.1	0.9	2.5	1.0	6.9	100.0
Fairfax	80.1	9.5	3.0	1.7	1.0	4.7	100.0
Fauquier	77.5	11.7	0.3	2.6	0.8	7.0	100.0
Loudoun	76.6	11.1	1.3	1.9	1.4	7.8	100.0
Prince William	73.5	12.7	1.7	4.4	1.2	6.5	100.0
Spotsylvania	79.5	11.4	0.5	0.9	1.7	6.0	100.0
Stafford	78.5	10.5	0.5	1.5	0.7	8.4	100.0
Warren	76.4	11.1	0.8	2.3	2.0	7.5	100.0
Alexandria	69.0	10.4	12.7	3.3	1.5	3.2	100.0
Fairfax city	80.4	10.9	3.8	1.9	1.4	1.6	100.0
Falls Church	71.7	12.7	7.2	2.2	2.1	4.1	100.0
Fredericksburg	84.7	9.9	0.8	2.3	1.1	1.2	100.0
Manassas	80.4	12.8	1.8	2.0	1.4	1.7	100.0
Manassas Park	72.8	19.6	0.0	2.3	0.0	5.3	100.0
Northern Virginia Total	**74.9**	**10.8**	**5.8**	**2.4**	**1.2**	**4.9**	**100.0**
Calvert	75.9	10.6	0.9	1.4	0.9	10.3	100.0
Charles	81.0	10.5	1.4	1.2	0.9	4.9	100.0
Frederick	78.8	11.5	0.8	2.3	0.9	5.7	100.0
Montgomery	71.0	10.9	9.3	2.3	0.9	5.7	100.0
Prince George's	72.8	12.4	6.8	3.0	1.3	3.7	100.0
Suburban Maryland Total	**73.0**	**11.4**	**7.0**	**2.5**	**1.0**	**5.1**	**100.0**
Jefferson County, WV	76.3	9.2	1.4	4.5	1.8	6.8	100.0
Washington Metro Area	**66.5**	**11.0**	**13.9**	**3.0**	**1.4**	**4.2**	**100.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

Worker Distribution by Workplace, Wages, and Commute Mode: 2006-2010

TABLE A-9-2

All Modes of Transportation

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**16.6**	**23.6**	**20.2**	**39.6**
Arlington	100.0	17.8	20.6	18.7	42.8
Clarke	100.0	37.5	39.6	11.5	11.4
Fairfax	100.0	21.4	23.4	19.5	35.7
Fauquier	100.0	37.0	31.3	15.6	16.2
Loudoun	100.0	28.3	28.1	18.9	24.7
Prince William	100.0	34.5	30.6	17.6	17.3
Spotsylvania	100.0	39.7	33.6	16.1	10.6
Stafford	100.0	33.8	35.0	16.1	15.1
Warren	100.0	43.4	34.2	15.0	7.4
Alexandria	100.0	21.8	26.5	20.9	30.9
Fairfax city	100.0	30.8	30.1	18.0	21.1
Falls Church	100.0	29.5	29.4	19.9	21.2
Fredericksburg	100.0	39.9	33.4	15.3	11.4
Manassas	100.0	28.6	29.3	20.6	21.5
Manassas Park	100.0	27.3	36.0	18.2	18.5
Northern Virginia Total	**100.0**	**25.0**	**25.8**	**18.8**	**30.4**
Calvert	100.0	39.3	28.2	15.7	16.8
Charles	100.0	35.6	32.0	17.1	15.3
Frederick	100.0	30.7	33.5	18.9	17.0
Montgomery	100.0	26.7	26.0	19.1	28.1
Prince George's	100.0	28.8	29.6	19.8	21.9
Suburban Maryland Total	**100.0**	**28.5**	**28.3**	**19.2**	**24.0**
Jefferson County, WV	100.0	41.7	35.0	11.9	11.4
Washington Metro Area	**100.0**	**24.1**	**26.1**	**19.2**	**30.5**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-3

Drive Alone

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**12.1**	**23.4**	**21.3**	**43.2**
Arlington	100.0	15.9	21.9	20.3	42.0
Clarke	100.0	35.9	45.0	8.8	10.3
Fairfax	100.0	17.9	23.3	20.5	38.3
Fauquier	100.0	36.5	31.4	15.6	16.5
Loudoun	100.0	25.5	29.4	20.0	25.2
Prince William	100.0	30.3	30.9	19.6	19.1
Spotsylvania	100.0	37.4	35.1	17.0	10.5
Stafford	100.0	31.9	35.4	17.4	15.2
Warren	100.0	43.9	34.8	14.6	6.7
Alexandria	100.0	18.9	25.6	21.8	33.8
Fairfax city	100.0	26.3	30.4	19.6	23.6
Falls Church	100.0	26.0	28.9	22.8	22.2
Fredericksburg	100.0	37.8	34.9	15.6	11.7
Manassas	100.0	24.9	29.0	22.6	23.6
Manassas Park	100.0	24.4	39.3	18.5	17.9
Northern Virginia Total	**100.0**	**22.1**	**26.2**	**20.0**	**31.7**
Calvert	100.0	37.5	28.4	17.1	17.0
Charles	100.0	32.3	32.0	19.0	16.7
Frederick	100.0	28.1	33.9	20.4	17.6
Montgomery	100.0	21.4	26.0	20.9	31.7
Prince George's	100.0	21.8	30.6	22.6	25.0
Suburban Maryland Total	**100.0**	**23.2**	**28.8**	**21.2**	**26.7**
Jefferson County, WV	100.0	39.0	37.8	12.8	10.4
Washington Metro Area	**100.0**	**21.0**	**26.7**	**20.6**	**31.7**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-4

Carpool

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**16.1**	**23.4**	**20.7**	**39.8**
Arlington	100.0	15.8	19.9	18.1	46.2
Clarke	100.0	47.0	27.8	20.8	4.4
Fairfax	100.0	31.1	27.6	17.9	23.3
Fauquier	100.0	43.2	32.8	15.8	8.2
Loudoun	100.0	39.0	30.7	16.7	13.6
Prince William	100.0	43.7	36.2	12.3	7.9
Spotsylvania	100.0	46.6	34.7	13.5	5.2
Stafford	100.0	39.5	40.0	13.5	6.9
Warren	100.0	42.9	34.8	19.5	2.8
Alexandria	100.0	26.8	30.6	18.8	23.8
Fairfax city	100.0	41.8	34.6	12.9	10.7
Falls Church	100.0	34.0	35.9	14.1	16.0
Fredericksburg	100.0	49.1	30.0	15.2	5.7
Manassas	100.0	36.1	35.5	16.4	11.9
Manassas Park	100.0	30.3	33.0	21.7	15.0
Northern Virginia Total	**100.0**	**32.2**	**29.0**	**16.8**	**22.0**
Calvert	100.0	46.7	27.3	13.2	12.8
Charles	100.0	46.8	34.2	9.1	9.8
Frederick	100.0	36.4	37.9	14.7	11.0
Montgomery	100.0	34.4	28.7	18.4	18.4
Prince George's	100.0	40.1	29.6	15.3	15.0
Suburban Maryland Total	**100.0**	**37.5**	**30.2**	**16.4**	**15.9**
Jefferson County, WV	100.0	46.3	34.6	11.7	7.4
Washington Metro Area	**100.0**	**30.0**	**28.0**	**17.6**	**24.3**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-5

Public Transportation

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**19.3**	**24.3**	**19.8**	**36.7**
Arlington	100.0	20.4	18.5	18.1	43.1
Clarke	100.0	15.0	0.0	85.0	0.0
Fairfax	100.0	43.4	25.4	13.3	17.9
Fauquier	100.0	47.4	26.3	26.3	0.0
Loudoun	100.0	55.6	28.6	6.4	9.4
Prince William	100.0	52.1	25.1	12.4	10.4
Spotsylvania	100.0	77.1	16.3	0.0	6.6
Stafford	100.0	44.8	44.8	10.3	0.0
Warren	100.0	27.4	66.4	6.2	0.0
Alexandria	100.0	28.3	29.5	19.2	23.0
Fairfax city	100.0	63.5	17.4	14.7	4.4
Falls Church	100.0	53.8	31.5	7.1	7.7
Fredericksburg	100.0	59.2	11.0	16.2	13.6
Manassas	100.0	69.6	13.5	6.6	10.3
Manassas Park	0.0	0.0	0.0	0.0	0.0
Northern Virginia Total	**100.0**	**30.0**	**22.4**	**16.5**	**31.1**
Calvert	100.0	59.1	40.9	0.0	0.0
Charles	100.0	75.3	16.2	8.5	0.0
Frederick	100.0	56.6	34.7	2.2	6.6
Montgomery	100.0	45.6	27.6	12.3	14.4
Prince George's	100.0	52.9	28.6	7.7	10.9
Suburban Maryland Total	**100.0**	**48.5**	**28.0**	**10.6**	**13.0**
Jefferson County, WV	100.0	88.1	0.0	5.9	5.9
Washington Metro Area	**100.0**	**26.0**	**24.5**	**17.7**	**31.8**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-6

Walk

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**30.8**	**23.1**	**16.4**	**29.7**
Arlington	100.0	26.7	17.4	13.8	42.0
Clarke	100.0	75.4	24.6	0.0	0.0
Fairfax	100.0	55.8	18.4	9.7	16.1
Fauquier	100.0	45.0	37.1	8.8	9.1
Loudoun	100.0	48.5	24.8	8.5	18.3
Prince William	100.0	60.1	31.1	6.0	2.9
Spotsylvania	100.0	84.2	4.2	0.0	11.6
Stafford	100.0	45.1	28.5	6.2	20.2
Warren	100.0	64.6	9.3	26.0	0.0
Alexandria	100.0	37.3	30.1	16.9	15.7
Fairfax city	100.0	82.0	16.5	0.0	1.5
Falls Church	100.0	37.3	40.5	9.1	13.2
Fredericksburg	100.0	55.4	28.8	6.1	9.7
Manassas	100.0	72.7	17.8	0.0	9.5
Manassas Park	100.0	87.9	0.0	0.0	12.1
Northern Virginia Total	**100.0**	**48.5**	**22.5**	**10.1**	**18.8**
Calvert	100.0	62.7	24.2	6.4	6.7
Charles	100.0	71.4	24.5	2.2	1.8
Frederick	100.0	62.0	25.6	7.5	4.9
Montgomery	100.0	51.3	19.9	12.7	16.0
Prince George's	100.0	78.9	13.1	4.2	3.8
Suburban Maryland Total	**100.0**	**64.5**	**17.8**	**8.3**	**9.4**
Jefferson County, WV	100.0	82.3	8.9	0.0	8.9
Washington Metro Area	**100.0**	**46.1**	**21.4**	**12.0**	**20.5**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-7

Taxicab, Motorcycle, Bicycle, or Other Means

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**15.4**	**22.9**	**18.4**	**43.2**
Arlington	100.0	20.0	18.6	11.9	49.6
Clarke	100.0	51.0	0.0	49.0	0.0
Fairfax	100.0	32.2	18.7	14.4	34.7
Fauquier	100.0	23.8	46.6	15.9	13.8
Loudoun	100.0	34.0	29.6	11.7	24.7
Prince William	100.0	52.4	24.7	11.0	12.0
Spotsylvania	100.0	74.0	11.5	13.8	0.8
Stafford	100.0	60.0	12.6	9.6	17.8
Warren	100.0	56.9	21.7	7.9	13.5
Alexandria	100.0	23.2	29.3	12.3	35.2
Fairfax city	100.0	62.4	25.3	5.2	7.0
Falls Church	100.0	44.1	11.4	6.6	37.9
Fredericksburg	100.0	73.3	10.2	9.0	7.5
Manassas	100.0	43.0	39.2	11.5	6.4
Manassas Park	0.0	0.0	0.0	0.0	0.0
Northern Virginia Total	**100.0**	**35.4**	**21.7**	**12.5**	**30.3**
Calvert	100.0	45.6	25.8	10.6	18.0
Charles	100.0	55.8	37.3	2.7	4.3
Frederick	100.0	43.7	32.2	10.6	13.6
Montgomery	100.0	34.0	30.5	12.5	23.0
Prince George's	100.0	51.0	22.5	10.7	15.7
Suburban Maryland Total	**100.0**	**42.9**	**27.6**	**11.2**	**18.3**
Jefferson County, WV	100.0	18.1	28.4	11.5	42.0
Washington Metro Area	**100.0**	**29.4**	**23.6**	**14.5**	**32.5**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

TABLE A-9-8

Work from Home

Unit: Percentage	Total	Wages: < $25K	$25-$50K	$50-$65K	$75K+
District of Columbia	**100.0**	**36.0**	**20.8**	**12.8**	**30.5**
Arlington	100.0	30.3	20.1	9.1	40.4
Clarke	100.0	30.1	10.4	19.6	39.9
Fairfax	100.0	32.7	18.7	13.3	35.3
Fauquier	100.0	29.8	24.2	16.9	29.2
Loudoun	100.0	30.3	12.7	17.6	39.4
Prince William	100.0	38.5	19.0	15.7	26.9
Spotsylvania	100.0	38.4	24.6	12.6	24.4
Stafford	100.0	39.1	27.8	9.8	23.3
Warren	100.0	30.3	34.5	12.2	22.9
Alexandria	100.0	26.7	16.1	21.9	35.3
Fairfax city	100.0	10.4	35.7	10.0	44.0
Falls Church	100.0	21.7	17.3	20.9	40.1
Fredericksburg	100.0	38.3	0.0	19.3	42.3
Manassas	100.0	41.7	19.4	7.2	31.7
Manassas Park	100.0	29.4	18.3	9.2	43.1
Northern Virginia Total	**100.0**	**32.7**	**18.8**	**14.2**	**34.3**
Calvert	100.0	39.6	26.7	10.8	22.9
Charles	100.0	41.0	33.7	12.5	12.7
Frederick	100.0	36.2	21.1	14.9	27.8
Montgomery	100.0	36.6	19.3	13.3	30.8
Prince George's	100.0	35.3	26.2	17.3	21.2
Suburban Maryland Total	**100.0**	**36.6**	**22.2**	**14.3**	**27.0**
Jefferson County, WV	100.0	36.0	30.1	10.5	23.4
Washington Metro Area	**100.0**	**34.6**	**20.4**	**14.0**	**31.0**

Source: U.S. Census Bureau, 2006-2010 American Community Survey, 5-Year Estimates

Illustrative Literature Findings

Transportation Investment in Nonspecific Regions

Empirical evidence shows that a high-performing transportation system is a crucial enabler of economic prosperity (Eddington 2006, Norwood and Casey 2002). In order to bring best economic results, investment in infrastructure should cover not single projects, but the whole network levels (Banister and Berechman 2001). Investment in transportation may be allocated twofold. First, as the capital expansion - new projects expanding capacity, reducing congestion and improving accessibility, such as construction of new roads, bridges, or transit development. Second, funds can be spent on the capital enhancement - maintaining the existing infrastructure which contributes to extending the life-span of the investments, or on new technologies increasing the efficiency of existing networks, such as congestion pricing and intelligent highway systems (Eberts 2000, Cambridge Systematics 2002, Rodrigue 2009).

There are also two types of impacts of investments in infrastructure. Direct impacts affect the accessibility, time and costs savings in the immediate location of an investment, such as neighborhoods near new streets or highways. Indirect impacts regard multiplier effects in larger proximity from new projects (Boarnet 1996, Rodrigue 2009). Overall, investment in modern transport infrastructure affects various regions and can benefit all sectors of economy providing general mobility (Mamuneas and Nadiri 2006).

There are locations, especially cities, where inefficient transport significantly holds back economic growth, while in rural areas, transport constraints are less distressing (Eddington 2006). It is useful to know not only what geographical locations will benefit most from additional investment (Norwood, Casey 2002), but also what kind of projects and modes across the priority areas will be best receivers of the funds (Eddington 2006).

In some instances, investment in infrastructure may bear only negligible effects on the local economy. To begin with, in the United States, the transportation system is mature and the dollars spent on it these days do not bring as significant effects as they did in the peak investment period in the 1950s and 1960s (Eberts 2000). Additionally, large projects characterized by speculative benefits and based on untested technology are prone to generating counterproductive investment returns (Eddington 2006). Last, a location with new transportation investments may be enjoying economic growth at the expense of another, often neighboring location. The competitive advantage of the area with high transportation investment and improved network may draw the resources, jobs and productivity from its neighbors (Banister and Berechman 2001, Wachs 2011).

Nonetheless, in most cases the interest of research focuses on the benefits of transportation investments. It is advantageous to know the general categories of their positive impacts; a 2002 Cambridge Systematics, Inc. provides an insight to the matter. According to the analysis, investment in strong transport network:

- boosts industry competitiveness, because it reduces costs of production and distribution;
- enhances household welfare, as it "gives households access to a broader range of higher-paying jobs, a wider selection of competitively priced consumer goods and housing options, and a convenient selection of health and human services; well-maintained roads reduce personal vehicle repair costs, while efficient public transport networks reduce costs associated with driving and automobile ownership;"
- strengthens local, regional, and state economies by energizing city centers, breaking the isolation of rural areas, and boosting state employment and tax revenues;
- boosts business and leisure travel, providing access to activities and destinations such as everyday business meetings and social events;
- reduces economic losses associated with accidents by improving the safety of the transport infrastructure;
- reduces economic losses caused by congestion, decreasing traffic delays, hence benefiting both businesses and households;
- creates jobs in the transportation sector.

Transportation Investment in Urban Areas

The types of investments in transport infrastructure are not geographically uniform, but rather location specific. In case of metropolitan areas, there is a strong relationship between economic development and transportation investment. The role of transportation in metro cities is mostly focused on "releasing constraints on the economy" (Eddington 2006). Researchers show that effective urban transport systems support the accessibility, labor market, productivity and allow for taking advantage of the benefits of agglomerations (Banister and Berechman 2001, OECD 2002, Eddington 2006, EDRG 2006, Weisbrod and Reno 2009). However, transportation network alone is unlikely to bring these results, nor is it a guarantee of economic growth.

Emerging trends in transportation demand will contribute to the shift in the structure of transport solutions; Pisarski and Reno (2009) present some of the foreseeable patterns.

The society is aging and slowly entering post-productive age, hence the demand for non-work related trips and transport will increase. At the same time, in the cities, the new labor force will be increasingly diverse in regard to age, sex, race, ethnicity, work time pattern and geographical distribution. While the distribution of population in the country is likely to be dispersed, the highest population growth is, and will be, in cities; therefore transport planning will have to focus on intercity and suburban projects.

Although urban sprawl will increase, the design of communities and neighborhoods in some regions is likely to be more clustered allowing people to use more public transit, bike or even walk within the "edge cities." On the other hand, matching employers' needs and skilled workers may require further distances between the two. If workers will not tele-work, the congestion will worsen by additional volume of commuters. The dispersion of workers may also impact the geographical location of businesses, many of which will be "footloose" and willing to move where the workers are and where they prefer to be (Pisarski, Reno 2009). The transportation planning in urban areas will also have to answer the needs of population with increasing time value, as people will continue to become wealthier.

Researchers agree that an effective transportation network in urban areas induces economic growth through providing access to wider labor markets; an effective labor market significantly contributes to the realization of the potential of megacities to be the engine of regional growth. Providing "as many people as possible with access to as many jobs as possible in the area" modern transportation systems support the employment growth and the total earnings (Prud'homme 1997, Ozbay et al. 2003, Rodrigue 2009).

The benefits of urbanization are greater when accompanied by efficient transportation. Transport contributes to the increase in urban productivity because of the access to a broad and diverse base of inputs, such as raw materials, and outputs, like intermediate and finished goods (Bannister and Berechman 2001, Rodrigue 2009). According to one hypothesis, metropolitan areas are also more productive because they have larger labor markets than smaller areas (Prud'homme 1997, Cervero 2006). A research based on French and Korean cities found that, with other things being equal, an increase in average speed leads to a greater labor market size, which in turn results in a boost in productivity and output. (Prud'homme and Lee 1998).

Moreover, Banister and Berechman (2001) and Aschauer (1991) point out that dependable and modern transport infrastructure raises the image and the perceptions of an area, attracting additional private investment. Furthermore, metropolitan cities contribute the most to the nation's tax revenue. Since transportation projects in urban areas most often have high economic rate of

return, there is a strong basis for the argument in favor of transportation investment in metropolitan areas (Prud'homme 1997).

In metropolitan cities, future transportation investments will focus not only on traditional systems, but also on more innovative solutions to changing transportation demand.

The support of economic growth in large cities is often linked with support of transit services providing an alternative to automobiles, a starting point for development around transit (i.e. housing, public parking, pedestrian amenities), and a new perspective on the local land-use. The transit network modes popular in cities include heavy-rail systems, light-rail systems, bus rapid transit, buses and more (the urban land institute). Investment in the BART heavy-rail system in San Francisco, which overcame the bridge capacity limitations, allowed for thousands of white-collar jobs to locate in the downtown area. Although the positive impacts were generally experienced by the entire Bay Area, the construction and operation of the system has been excessive in price, and the ridership fell short of expectations (Cervero and Landis 1997).

In increasingly suburbanized cities, the public transit commuters often face a problem of so-called the "last mile." Several edge cities are advocating for automated group transit (AGT) and people-mover investments that would deal with the issue in locations where public transport does not provide access for workers from their drop-off stations to final destinations.

Aside from public transit, the importance of highways in metropolitan areas does not diminish. Even if the public transit within the cities became more developed and would assist in individuals' general mobility, it will be long until it will be developed enough to transport commuters from suburbs to their destinations, especially workplaces in city centers and other locations as the structure of metro areas is steadily becoming more decentralized. The RESI study states that developed highway infrastructure reduces congestion and increases personal mobility (RESI 1998). This conclusion may seem debatable, as more space on highways may result in induced demand. Those who otherwise would not make a trip, knowing about expanded highway capacity may drive and ultimately the congestion would not decrease. On the other hand, Prud'homme (1997) claims that the relief of the bottled-up demand is most likely to contribute to expansion of more effective labor market, which in turn means higher productivity and economic growth. Therefore, he argues, even if the decline of congestion is hardly noticeable, it does not mean that further investment in highway infrastructure is unfeasible.

Highway networks are necessary not only for individual mobility, but also for businesses, for transport of goods. An efficient highway system results in firm's higher performance, as they can get products faster and relatively inexpensively compared to other modes. Moreover, highway

infrastructure is beneficial because firms have vast location choice, and can keep less inventory but of more variety (DOTFHA 1996).

Car-sharing has been present in the U.S. cities for decades. The option is most attractive in highly dense cities with pricy parking and mixed land-use characteristics, such as Boston, Seattle, or San Francisco (Cervero 2006). The development of HOV (high occupancy vehicle) lanes in urban areas was designed to increase the efficiency of automobile transport; but carpooling did not become as successful as it would be desired and mostly include family members traveling together (Poole and Orski, 2003, Pisarski 2006). Metropolitan Washington, D.C., used to have a high share of vanpooling. It changed because of the shift in employment from government based to high-tech based. Nowadays, many of the workers have irregular hours and use own vehicles to travel in different times of day making ridesharing close to impossible (Poole 2006).

The transportation investment will have to adjust to the shifts in transportation demand. Many jobs in metropolitan areas already do not require spatial proximity, and the trend is growing. New communities and neighborhoods are designed in a way to serve the needs of employees working predominantly from home. One example of a telecommunity is in La Plata, MD, where a satellite location is E-connected to a main government office. The local telecommunity consists of "a workforce serving head-offices in metropolitan Washington D.C. via the internet from home offices and neighborhood telework centers" (Cervero 2006).

To match the demand and supply strategies, the transportation solution may also combine the intelligent transportation systems, like cellular, WiFi, and automated telephony and TDM, creating so called "automated hitch-hiking". Moreover, "some envisage a 'wireless carpool assistant' wherein GPS-enabled cell phones communicate with application servers for tracking the whereabouts of carpool participants, and special software optimizes ride matching and vehicle routing. A wireless carpool assistant could also promote ridesharing to edge cities by providing a security blanket for those whose schedules get thrown off" (Cervero 2006).

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