

KEY DRIVERS OF FUTURE TRANSPORTATION SYSTEM PERFORMANCE CHALLENGES

Land Use and Commuting Patterns

Robert E. Griffiths
Staff Consultant

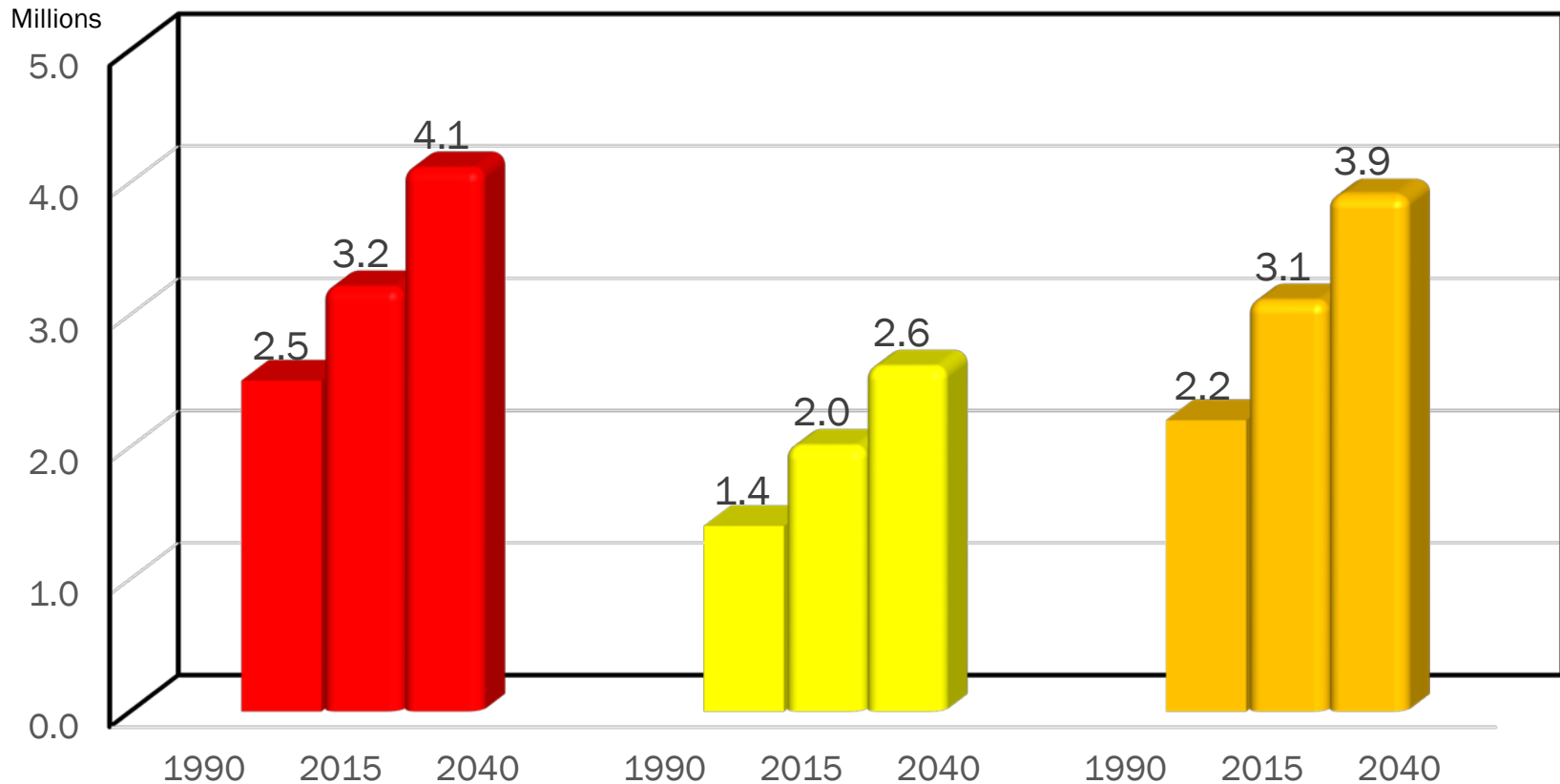
TPB Long-Range Plan Task Force
May 17, 2017



Presentation Outline

- Past and Anticipated Growth in Jobs, Households & Workers
- Balance Between Workers & Jobs in the Region and by Geographic Subareas
- In-Commuting and Out-Commuting
- Current Commuting Patterns
- Summary

Past and Anticipated Growth in Jobs, Households & Workers in TPB Planning Region

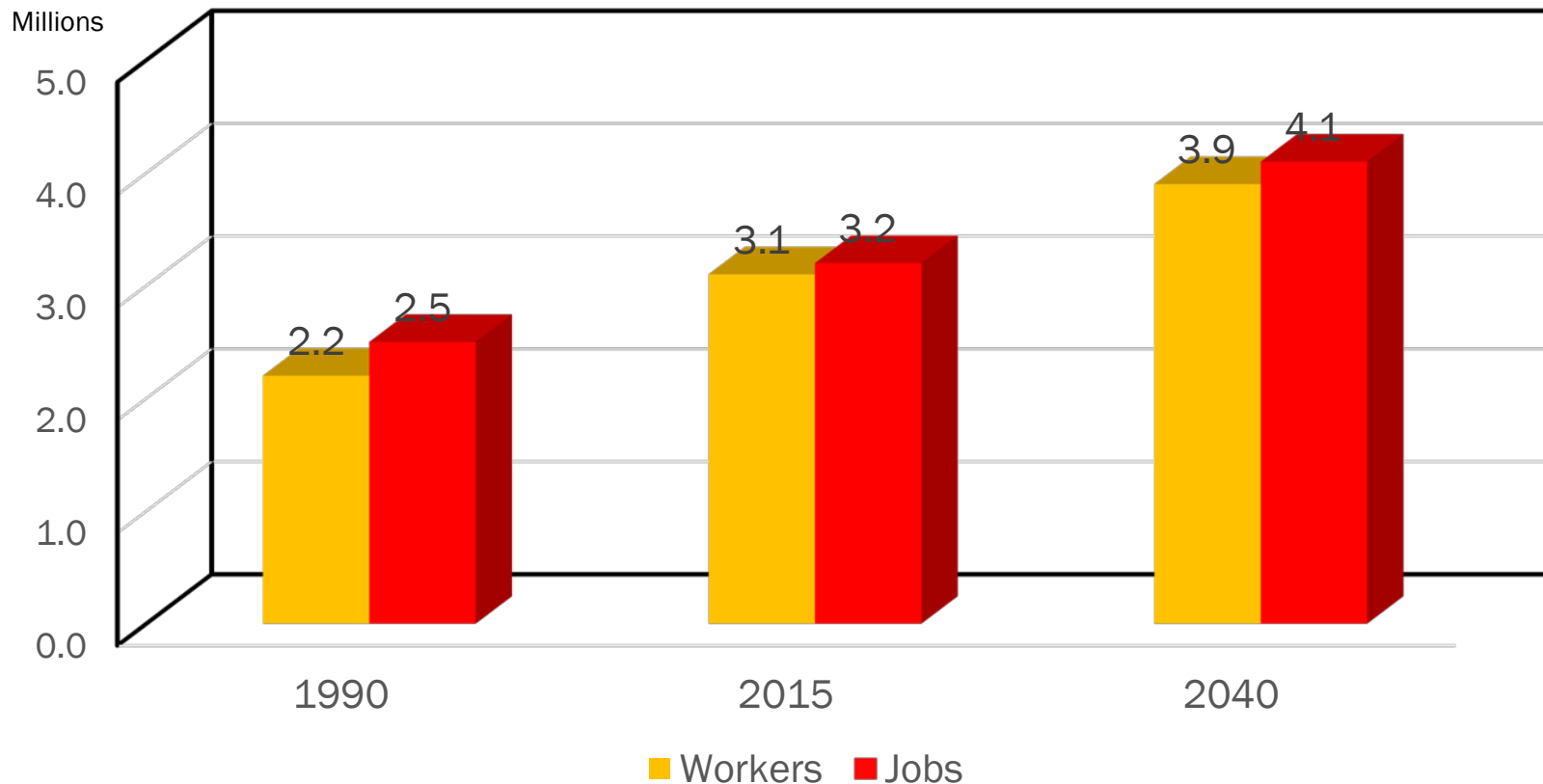


Growth in Jobs, Households & Workers in next 25-years compared to the previous 25-years

- Job growth from 2015 to 2040 (+900,000 jobs) is anticipated to be higher than job growth in the previous 25-years (+700,000 jobs)
- Anticipated household growth is about the same as in the previous 25-years
- The increase in the number of workers residing in the region is expected to be slightly less than in the previous 25-year period
- The implication is that there will be more in-commuting by workers living outside the region



Comparison of Past and Anticipated Changes in the Number of Workers & Jobs in Region

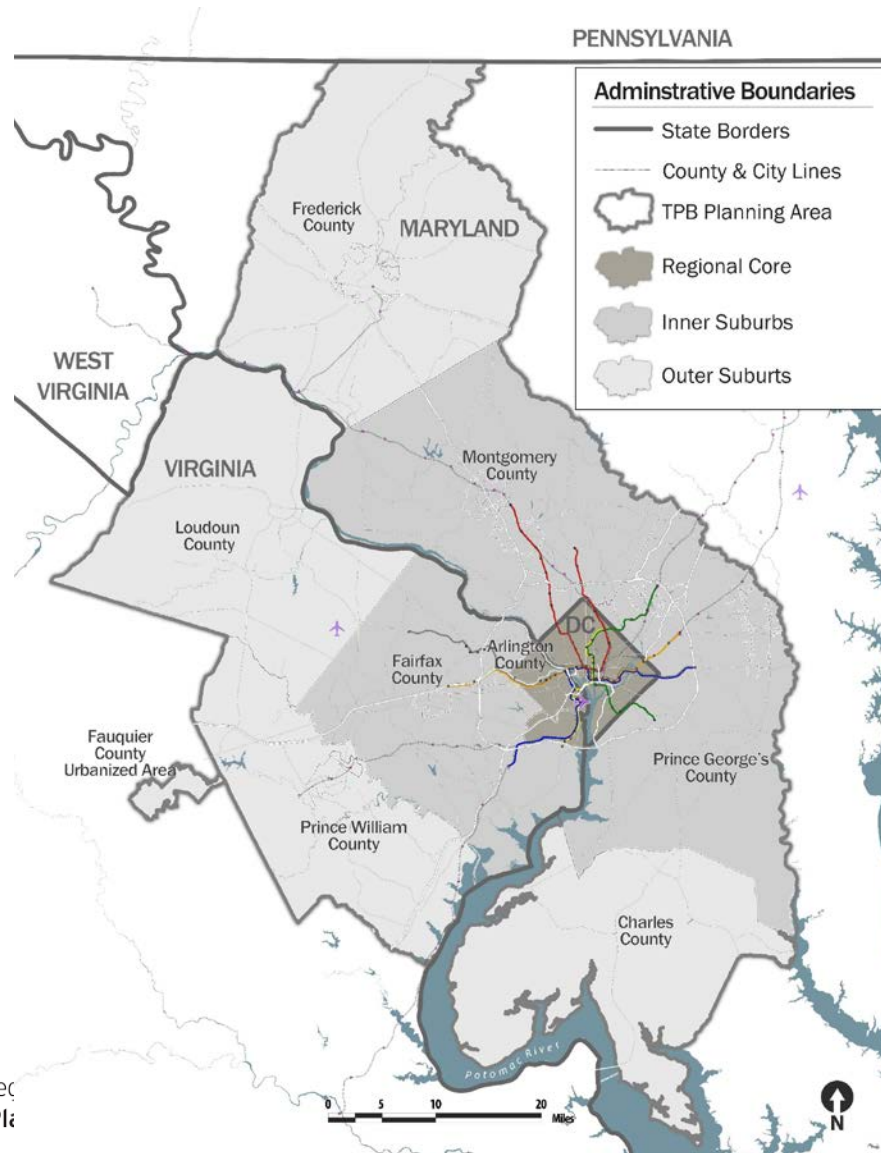


Changes in Regional Balance between Jobs and Resident Workers

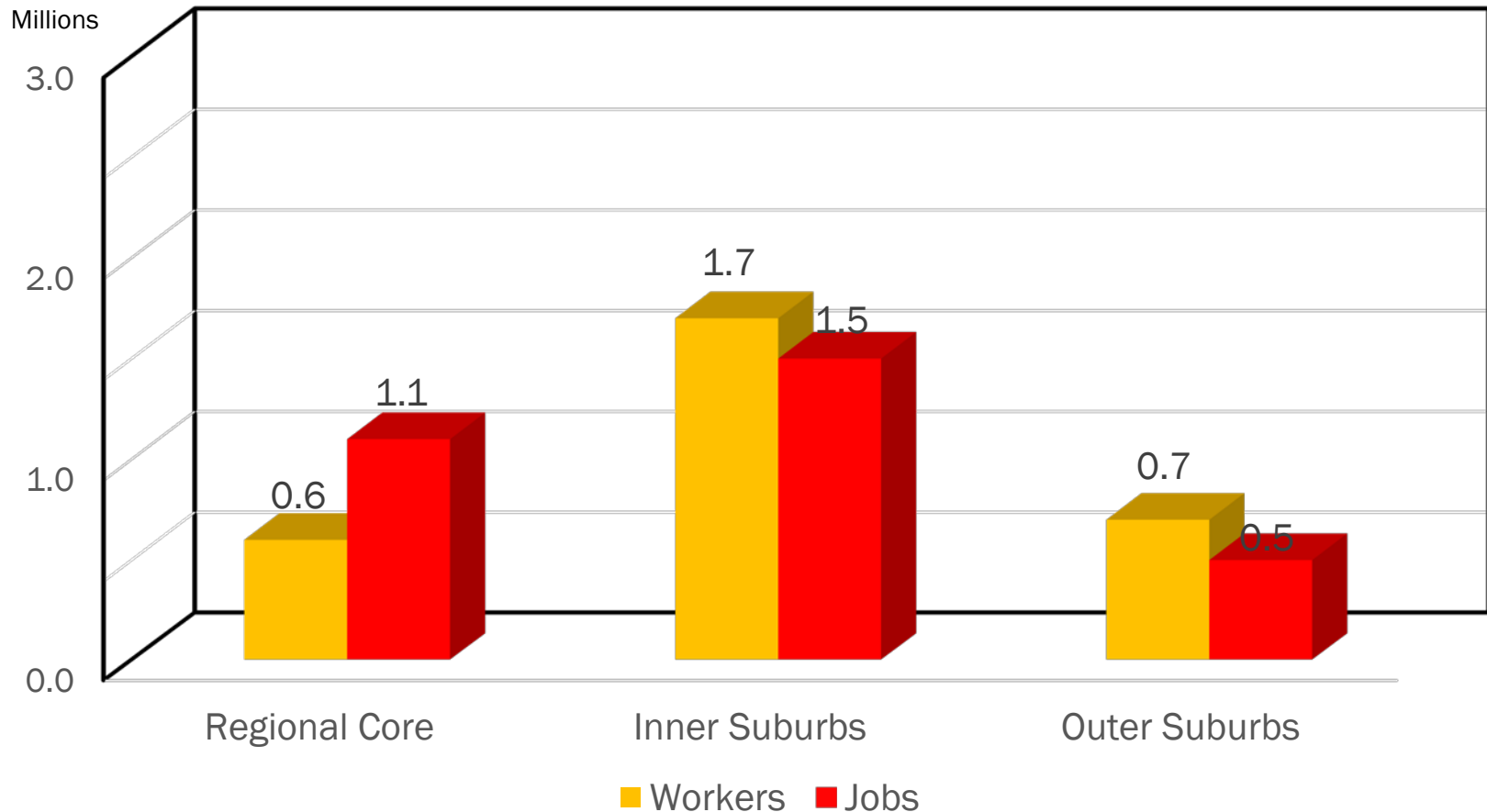
- In 1990 the number of jobs in the region exceeded the number of resident workers by about 300,000
- In 2015 this gap was reduced to about 100,000
- Between 2015 and 2040 this gap is expected to increase to about 200,000.
- This implies a doubling of in-commuting by workers from outside the region between now and 2040.



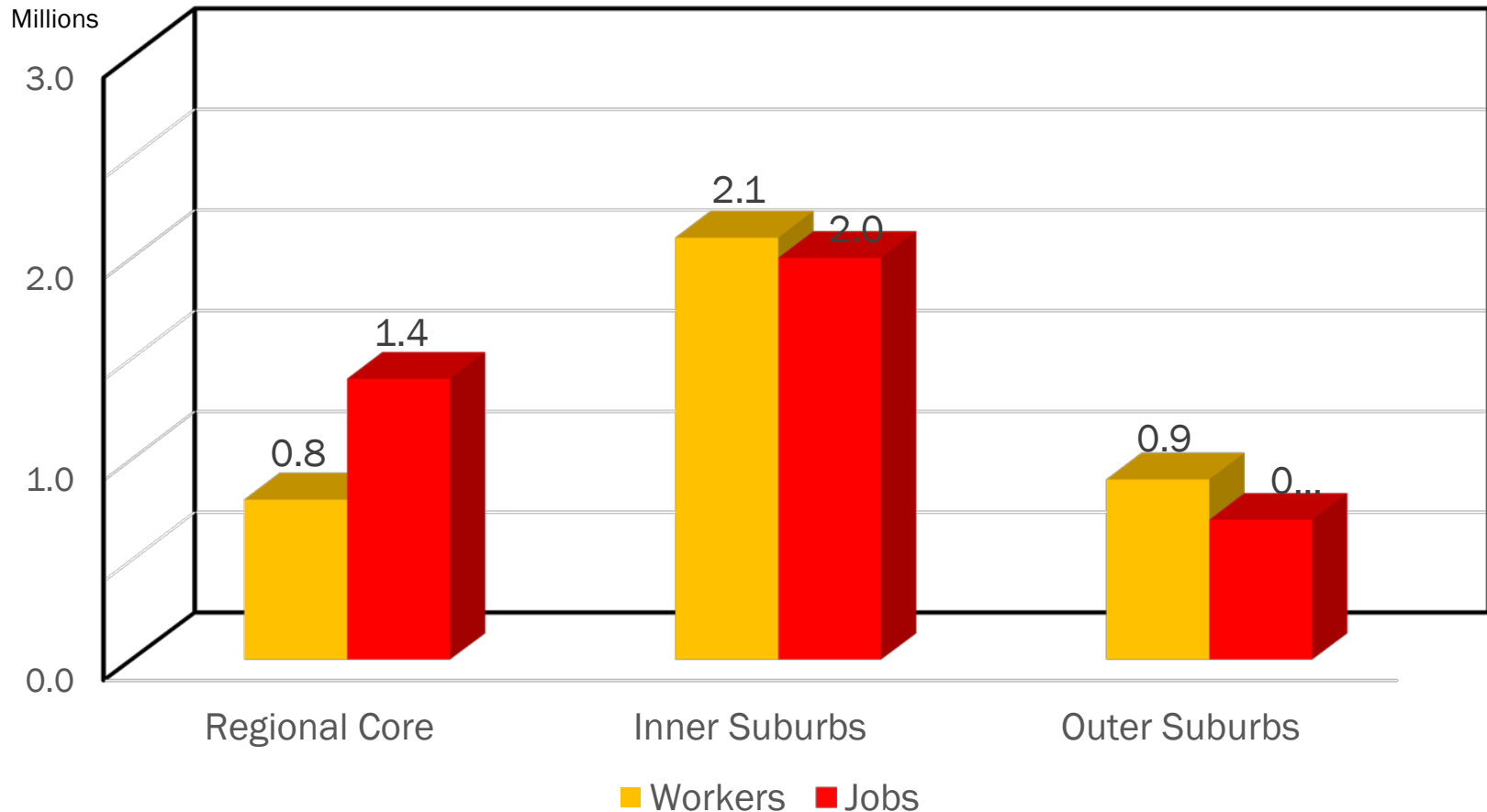
Regional Geographic Sub-Areas



Comparison of Number of Workers & Jobs by Regional Sub-Areas in 2015



Comparison of Number of Workers & Jobs by Regional Sub-Areas in 2040

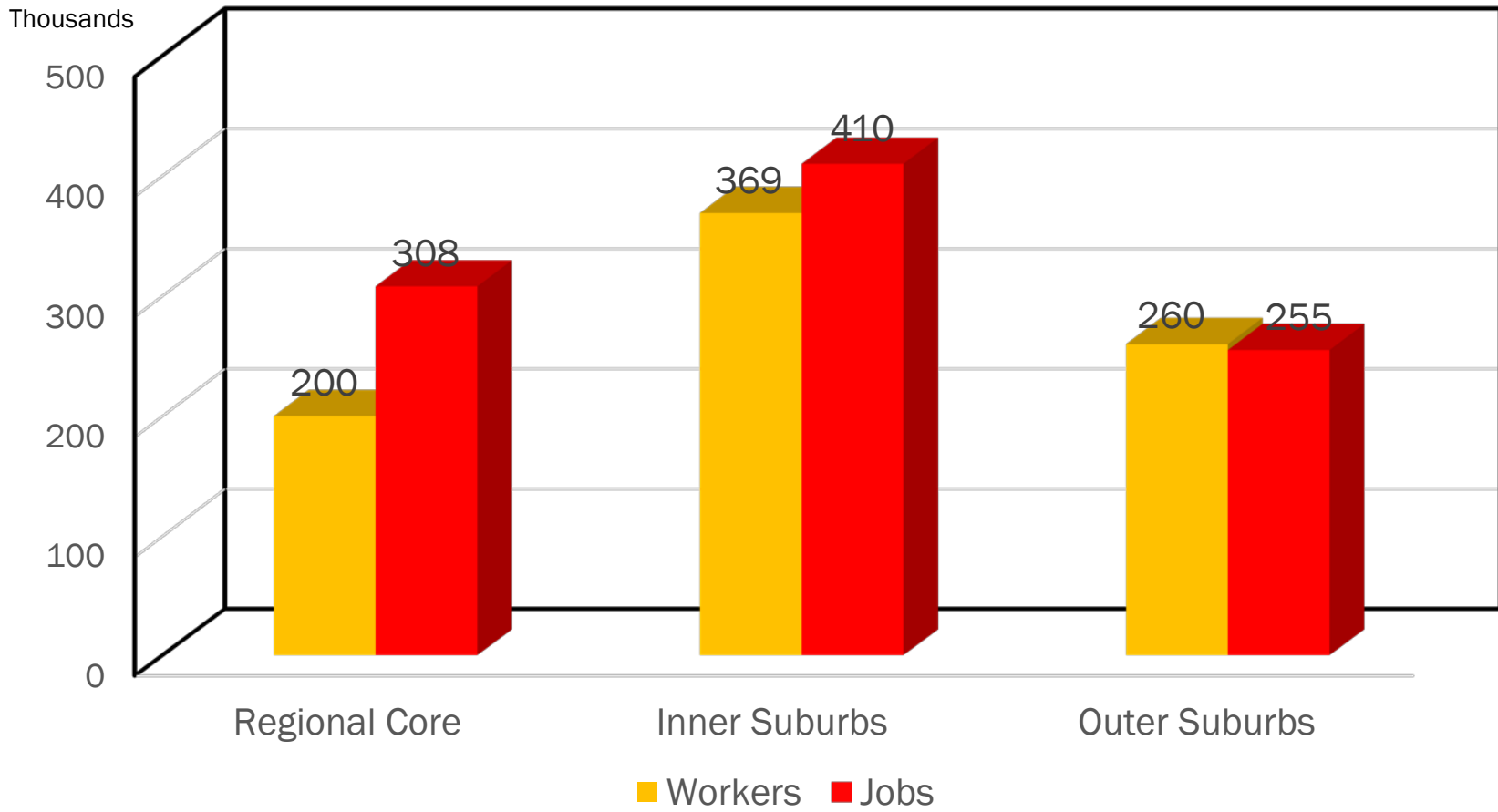


Comparison of Number of Workers & Jobs by Regional Sub-Areas

- Most of the region's workers live in the Inner Suburbs and most of the region's jobs are located there
- The number jobs in the Regional Core area exceed the numbers workers living there by 500,000 to 600,000
- The number of workers living in the Inner Suburbs exceed the number of jobs there by about 100,000 to 200,000
- The number of workers living in the Outer Suburbs exceed the number of jobs there by about 200,000



Change in Number of Workers & Jobs by Regional Sub-Area (2015 -2040)

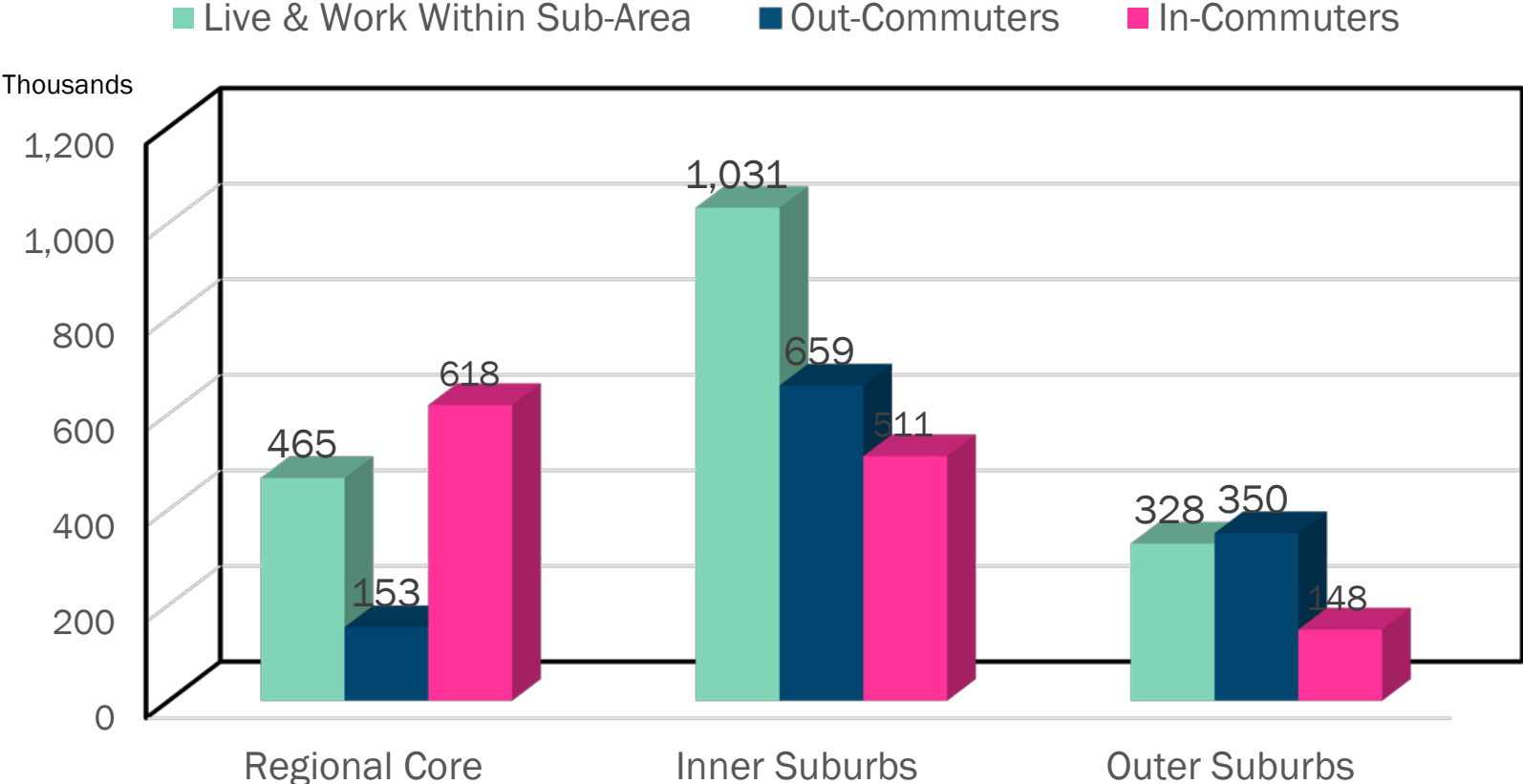


Change in Number of Workers & Jobs by Regional Sub-Area (2015 -2040)

- The 2015 to 2040 increment of job growth in the Regional Core area is anticipated to exceed the increase in the number of workers living there by more than 100,000
- The increment of job growth in the Inner Suburbs is expected to exceed the increase in the number of workers living there by about 40,000
- The increment of job growth and the increase in the number of workers living in the Outer Suburbs is about equal.
- The increase in Regional Core jobs relative to the increase in the number workers living there implies a significant increase in in-commuting to this regional subarea.



Current In-Commuting and Out-Commuting by Regional Sub-Areas (2015)

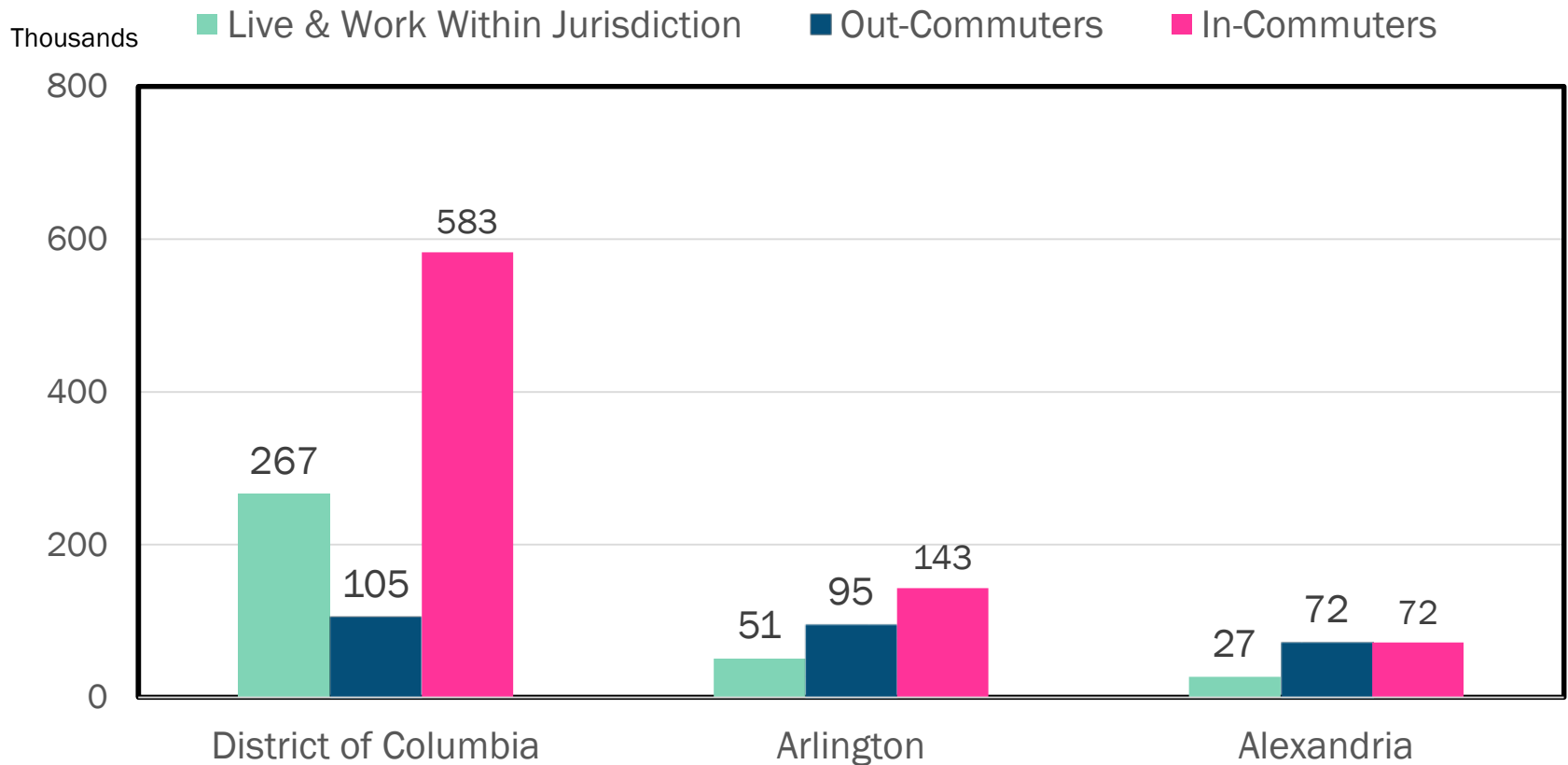


Current In-Commuting and Out-Commuting by Regional Sub-Areas (2015)

- In the Regional Core and Inner Suburb sub-areas most workers who live there, work there
- In the Outer Suburbs most workers out-commute to another regional subarea
- In-Commuting makes up a significant share of the commuting travel to the Regional Core area
- Both in-commuting and out-commuting accounts for significant shares of Inner Suburb commuting travel



In-Commuting and Out-Commuting in Regional Core Area Jurisdictions (2015)

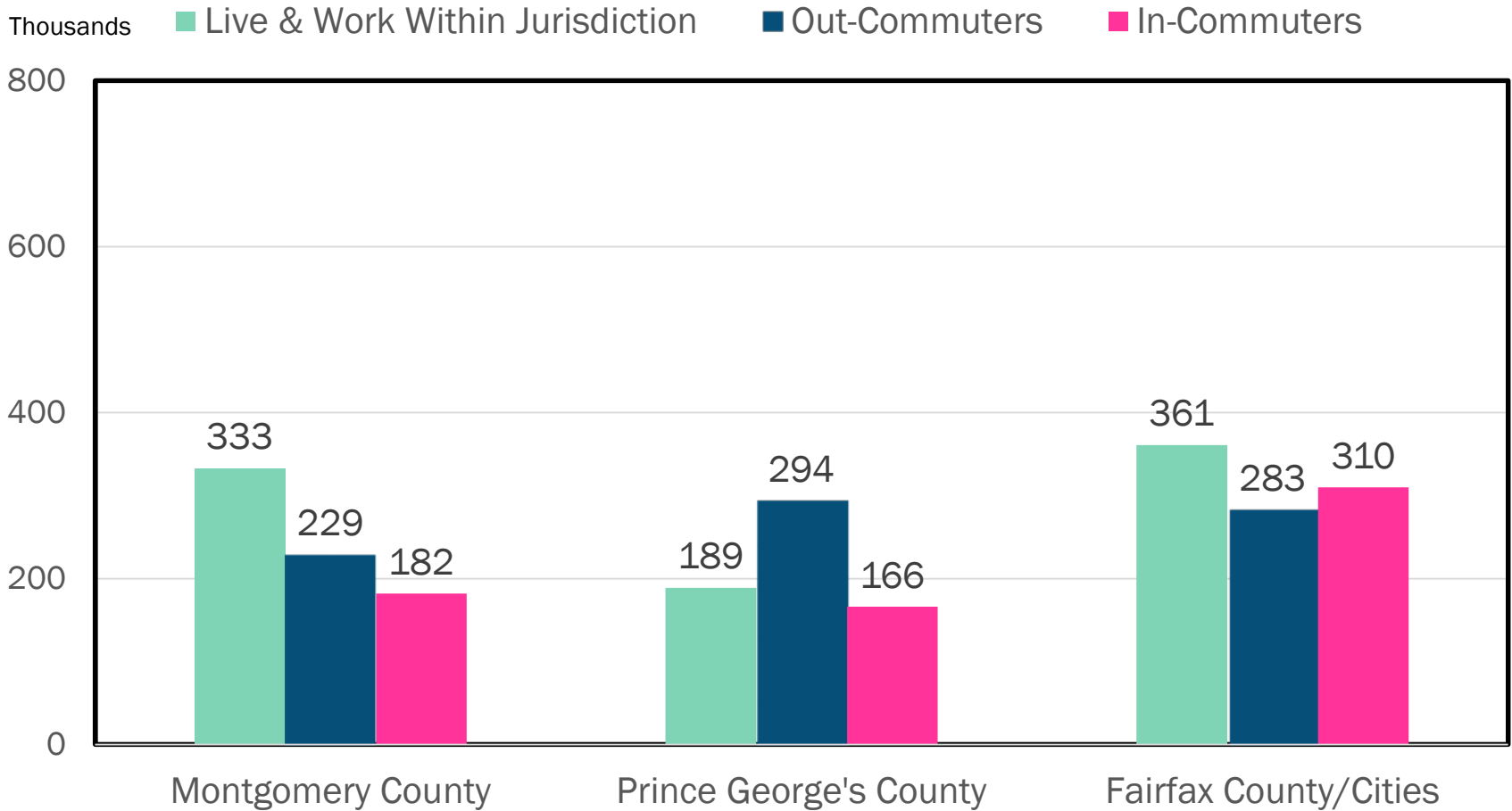


In-Commuting and Out-Commuting in Regional Core Area Jurisdictions (2015)

- In-Commuting to DC, Arlington and Alexandria is generally the most significant component of commuting travel to the Regional Core area
- The number in-commuters to Alexandria equals the number of out-commuters from this jurisdiction



In-Commuting and Out-Commuting in Inner Suburb Jurisdictions (2015)

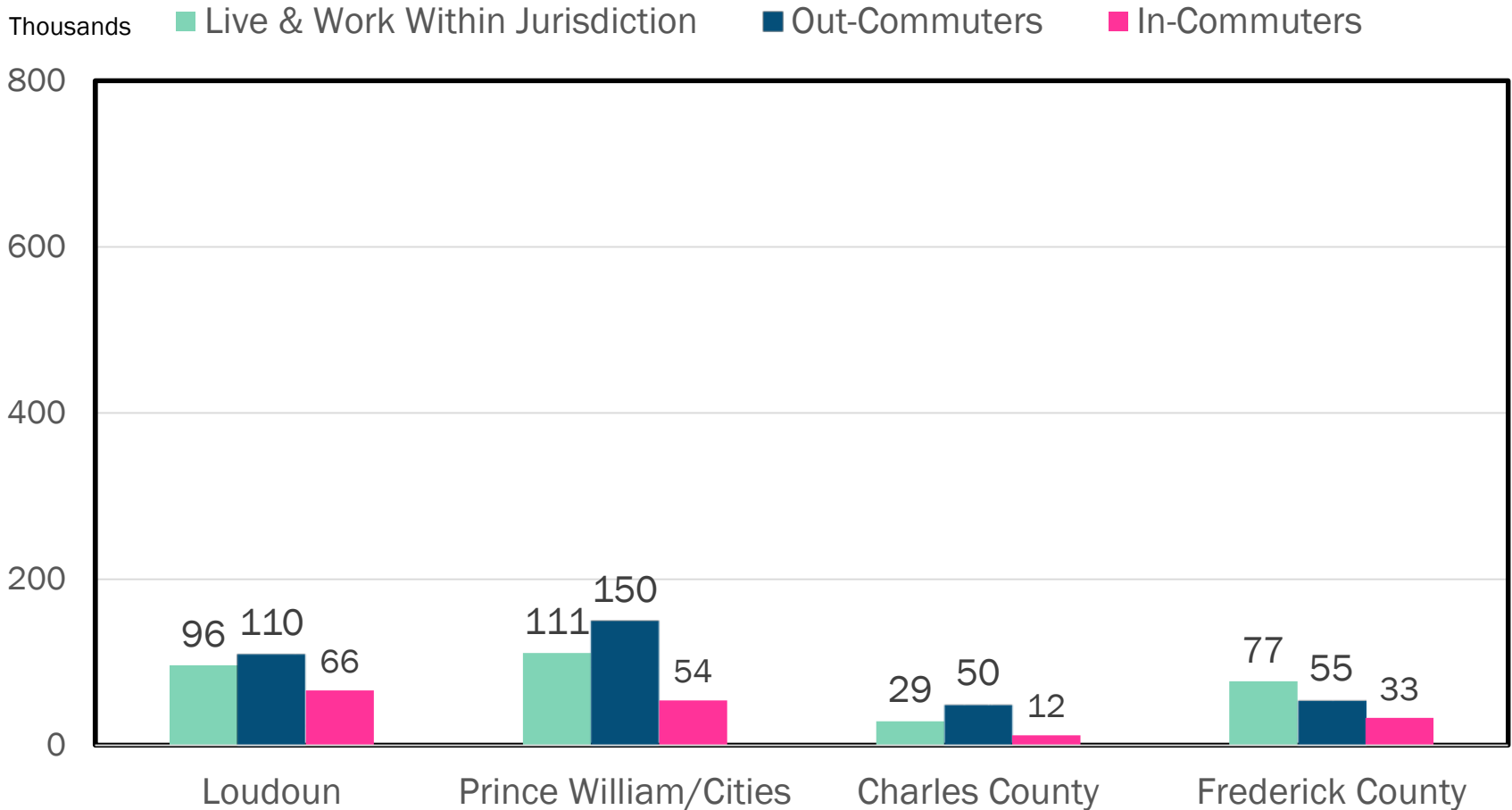


In-Commuting and Out-Commuting in Inner Suburb Jurisdictions (2015)

- Commuting within Montgomery and within Fairfax/Cities is generally the most significant component of commuting travel in these Inner Suburban Jurisdictions
- The pattern of Prince George's commuting travel is significantly different from both Montgomery and Fairfax/Cities in that the number of out-commuters from Prince George's greatly exceeds the number of commuters who both live and work within this jurisdiction
- Fairfax/Cities has both a significant number of in-commuters and out-commuters



In-Commuting and Out-Commuting in Outer Suburb Jurisdictions (2015)



In-Commuting and Out-Commuting in Outer Suburb Jurisdictions (2015)

- Out-Commuting from Loudoun, Prince William/Cities and Charles County is the largest component of commuting travel in these Outer Suburb jurisdictions
- Commuting within Frederick County is the largest component of commuting travel for this Outer Suburb jurisdiction



More Detailed Current Commuting Patterns by Jurisdiction

The following three tables provide more detailed information on jurisdiction-to-jurisdiction commuting patterns for each regional sub-area

Commuting Patterns of Workers Living in the Regional Core Area (2015)

From/To	Number of Commuters	From/To	Number of Commuters	From/To	Number of Commuters
DC-DC	267,000	ARL-ARL	51,000	ALX-ALX	27,000
DC-MTG	27,000	ARL-DC	47,000	ALX-DC	27,000
DC-ARL	19,000	ARL-FFX	25,000	ALX-FFX	22,000
DC-PG	19,000	ARL-ALX	5,000	ALX-ARL	14,000
DC-FFX	14,000	ARL-MTG	6,000	ALX-PG	3,000
DC-ALX	7,000	ARL-PG	3,000	ALX-MTG	2,000
DC-PW	1,000	ARL-PW	2,000	ALX-LDN	2,000
DC-LDN	1,000	ARL-LDN	2,000	ALX-PW	1,000



Commuting Patterns of Workers Living in the Inner Suburbs (2015)

From/To	Number of Commuters	From/To	Number of Commuters	From/To	Number of Commuters
MTG-MTG	333,000	PG-PG	189,000	FFX-FFX	361,000
MTG-DC	111,000	PG-DC	144,000	FFX-DC	106,000
MTG-PG	32,000	PG-MTG	45,000	FFX-ARL	50,000
MTG-FFX	21,000	PG-FFX	22,000	FFX-ALX	29,000
MTG-ARL	9,000	PG-ARL	16,000	FFX-LDN	25,000
MTG-FRD	7,000	PG-ALX	7,000	FFX-MTG	16,000
MTG-ALX	4,000	PG-CHS	3,000	FFX-PW	15,000
MTG-LDN	2,000	PG-LDN	2,000	FFX-PG	11,000
MTG-PW	1,000	PG-PW	1,000	FFX-CHS	1,000



Commuting Patterns of Workers Living in the Outer Suburbs (2015)

From/To	Number	From/To	Number	From/To	Number	From/To	Number
LDN-LDN	96,000	PW-PW	111,000	FRD-FRD	77,000	CHS-CHS	29,000
LDN-FFX	71,000	PW-FFX	77,000	FRD-MTG	25,000	CHS-DC	18,000
LDN-DC	14,000	PW-DC	24,000	FRD-DC	4,000	CHS-PG	13,000
LDN-ARL/ALX	6,000	PW-ARL/ALX	17,000	FRD-FFX	3,000	CHS-ARL/ALX	5,000
LDN-PW	4,000	PW-LDN	9,000	FRD-PG	2,000	CHS-FFX	5,000
LDN-MTG	4,000	PW-PG	3,000	FRD-LDN/PW	2,000	CHS-MTG	1,000
LDN-PG	1,000	PW-MTG	3,000	FRD-ARL/ALX	1,000		



Presentation Summary

- The growth and spatial distribution of jobs, households & workers are some of the key drivers of the region's future transportation system performance challenges
- The gap between the expected increase the number of workers and job growth will mean more in-commuting by workers who live outside the region
- Job growth in the Regional Core area is anticipated to exceed the increase in workers living there, this will mean a significant increase in in-commuting to this regional subarea
- The greatest increase in jobs and workers is expected to occur in the inner suburbs, this will mean significant increases in both in-commuting and out-commuting from this regional subarea
- Commuting patterns are complex and change relatively slowly. The region's current commuting patterns will also pose a key challenge for future transportation system performance.



Key Drivers of Future Transportation System Performance Challenges

Detailed insights from the travel demand forecasts

Ronald Milone

Director, Travel Forecasting and Emissions Analysis, COG/TPB

TPB Long-Range Plan Task Force

May 17, 2017



Presentation Overview:

1. A recap of the regional (2016 CLRP) performance summary and travel trends
2. A performance assessment at the subregional level



2016 CLRP Performance Summary for the TPB Member Area

Metric	2016	2040	% Change ('16 - '40)
Population	5,458,300	6,702,800	23%
Employment	3,209,500	4,151,700	29%
Highway lane-miles	16,900	18,100	7%
Miles of high-capacity transit	292	368	26%
SOV trips	7,234,900	8,220,400	14%
Transit trips	1,155,700	1,527,400	32%
Bike/Walk trips	1,977,800	2,916,200	47%
Vehicle Miles of Travel (VMT)	117,417,100	141,919,700	21%
VMT per Capita	21.51	21.17	-2%
Daily Vehicle Hours of Delay (VHD)	1,067,300	1,854,700	74%



2016 CLRP Demographic and Travel Trends in the TPB Planning Area

Year --->	2016	2040	Diff.	% Diff.
Demographic Data (000s)				
Population	5,458	6,703	1,245	23%
Households	2,044	2,571	527	26%
Jobs	3,210	4,152	942	29%
Mode Choice Work Purpose Trips (000s)				
Person Trips (Mot. + Non-Mot.)	3,561	4,430	869	24%
Transit Trips	833	1,092	259	31%
% Transit*	23.4%	24.7%	0.01	5%
Auto Person Trips	2,581	3,090	509	20%
Non-Motorized Trips	147	248	101	69%
Mode Choice Total Purpose Trips (000s)				
Person Trips (Mot. + Non-Mot.)	17,259	21,014	3,755	22%
Transit Trips	1,156	1,527	371	32%
% Transit*	6.70%	7.27%	0.01	8%
Auto Person Trips	14,125	16,571	2,446	17%
Non-Motorized Trips	1,978	2,916	938	47%
Traffic Assignment				
Vehicle Trips (000s)	13,009	15,342	2,333	18%
Vehicle Miles Traveled (millions)	117.42	141.92	24.50	21%

*Note: *Based on motorized and non-motorized trips*



Assessment of CLRP Performance

Progress has been made:

- Transit investments will increase ridership
- Majority of growth is in Regional Activity Centers
- Walk and bike trips will increase
- More toll lanes will provide an alternative to congested roads and accommodate reliable transit travel times

And challenges remain:

- Highway congestion will increase
- Auto accessibility to jobs will decrease in eastern parts of the region
- SOV mode will remain dominant in the suburbs
- Total Vehicle Hours of Delay (VHD) will increase



Travel forecasting realities

“The input is the output”

- Changes in forecasted travel generation are directly correlated with changes in projected HHs and jobs
- Changes in forecasted accessibility and mobility are directly connected to changes in the network (transportation supply)

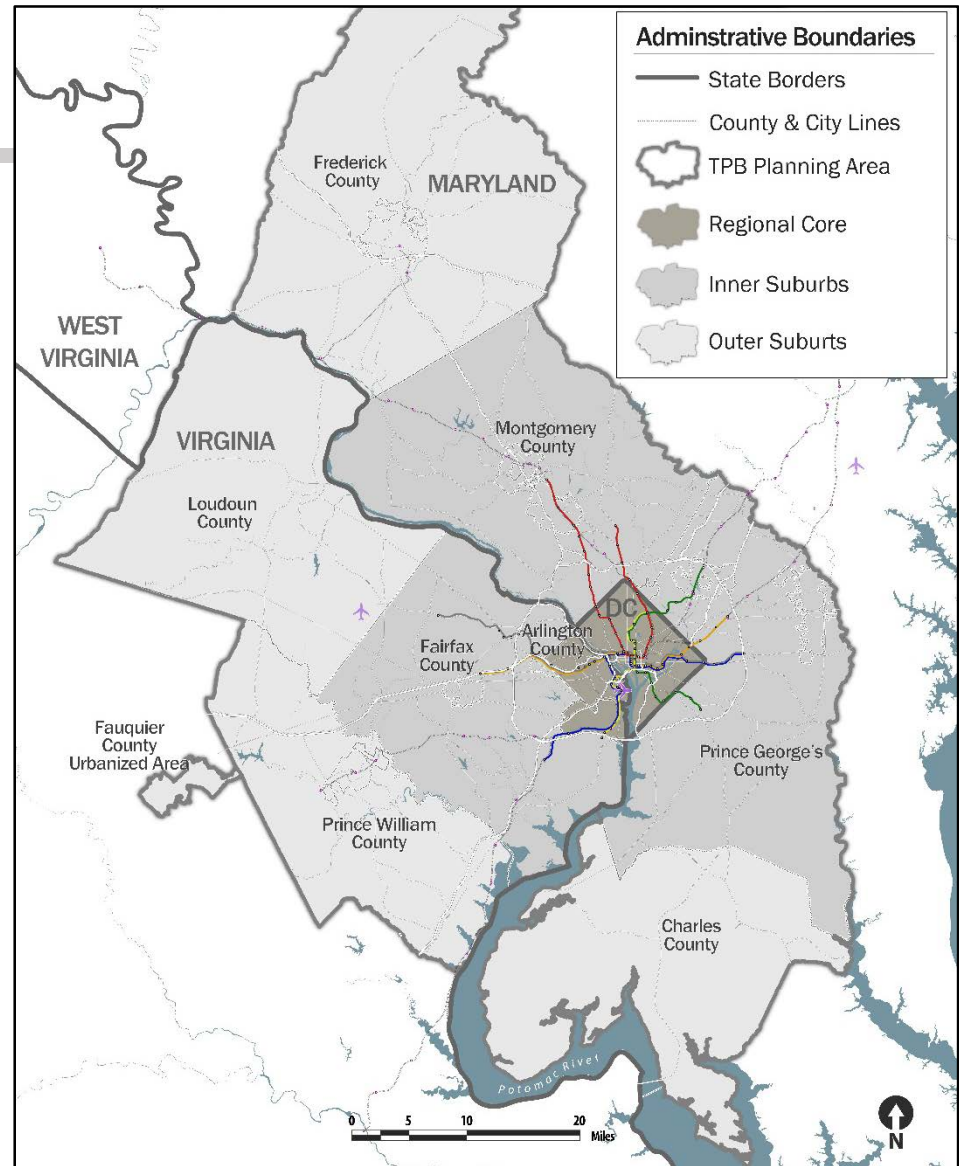
Uncertainty is an inherent liability

- Model is calibrated to observed behavior (2007/08 HTS)
- Plausible change in travel behavior due to emerging influences not implicitly accounted for :
 - Major shifts in life style (e.g., housing location, size; mode of travel for all trip purposes)
 - Major changes at work place and commercial activity (e.g., extensive remote and virtual work place, web-based commercial activity)
 - Widespread applications of technology (e.g., autonomous/semi-autonomous systems; goods manufacturing and delivery)



Subregions Examined

- 1. Regional Core:**
District of Columbia,
Arlington Co.,
Alexandria
- 2. Inner Suburbs:**
Montgomery Co.,
Pr. George's Co.,
Fairfax Co. & Cities
- 3. Outer Suburbs:**
Charles Co.,
Loudoun Co.,
Frederick Co.,
Pr. William Co. & Cities



Subregional Performance Metrics

- Commuting metrics were analyzed at the “3 by 3” level of analysis:

- Resident Auto Driver trips
- Transit trips
- VMT
- Avg. delay per trip

HOME Place	WORK Place			TOTAL
	Regional Core	Inner Suburbs	Outer Suburbs	
Reg. Core				
Inner Sub.				
Outer Sub.				
TOTAL				

Why is this analysis useful?

- *A more detailed geographic market analysis allows us to better understand regional numbers and averages*
- *Informs the process of identifying ways to address the CLRP system performance deficiencies*



Auto Driver Commute Trips

- Total regional auto driver trips will increase by 20% between 2016 and 2040 (1.97M to 2.37M)
- The largest trip movement is from the inner suburbs to inner suburbs which is ~40% of all trips, both today (815K) and in the future (946K)
- The trip movement with the least growth between 2016 and 2040 is from the inner suburbs to the regional core, from 338K to 366K (about 8% growth)



Transit Commute Trips

- Total regional transit trips will increase by 30% between 2016 and 2040 (792K to 1,031K)
- 81% of all work transit trips are destined to the regional core (639K) in 2016
- Transit trips to the regional core will increase by 24% (to 793K) in 2040, but its share of the total will decrease to 77%
- Transit trips from the inner suburbs to the inner suburbs will grow from 99K in 2016 to 157K in 2040, a 57% increase



Auto Vehicle Miles of Travel (VMT)

- Total regional commute VMT will increase by 21% between 2016 and 2040 (26.9M to 32.7M); Trip lengths will not change between 2016 and 2040 (~13.5 mi), and so, VMT growth will be driven primarily by trip growth
- VMT generated from the inner suburbs accounts for about ½ of all VMT in the region, both today and in the future (14.5M in 2016 and 16.5M in 2040)
- VMT within the inner suburbs accounts for 30% of all VMT in 2016 (8.1M); This share will decrease to 28% in 2040 (9.3M)
- The largest percentage change in VMT from 2016 to 2040 will be within the outer suburbs, from 2.4M to 3.6 M (a 50% increase)



Average Auto Commute Trip Delay

- The regional average delay time per trip will increase from 16 minutes in 2016 to 21 minutes in 2040 (a 31% increase)
- The average delay per trip to the regional core from anywhere will increase from 27 minutes in 2016 to 37 minutes in 2040 (a 37% increase)
- The average delay per trip to the inner suburbs from anywhere will increase from 13 minutes to 19 minutes (46% increase)
- The average delay per auto commute trip from the outer suburbs to anywhere will increase from 23 minutes in 2016 to 33 in 2040 (a 43% increase)



Understanding Total VHD & Delay per Trip

An example:

Year	Auto Trips	Delay per Trip (minutes)	Vehicle Hours of Delay
2016	1,000,000	2.0	33,333
2040	1,500,000	2.3	57,500
% Chg:	50%	15%	73%

- The change in VHD is the product of the trips and delay
- The per trip delay removes the influence of trip growth, although a higher amount of delay is attributed to increased trip demand

Consequently:

- The change in VHD (used in CLRP dashboard) is disproportionately higher than the change in the per trip delay



Conclusions

- The majority of auto commute trips and VMT is generated from the inner suburbs (Fairfax County/Cities, Montgomery Co., and Prince George's Co.)
- The majority of regional transit commute trips, today and in the future, will remain headed to the regional core
- Planned investments in the 2016 CLRP will yield a 57% increase in inner suburban transit passengers
- The overall per trip delay will increase everywhere in the region, in particular, commute trips to the regional core, and to a lesser extent, to the inner suburbs
- Auto commuters from the outer suburbs experience the greatest delay today and will experience even greater delay in the future

