



VTrans2040 Trends

Commonwealth Transportation Board

November 12, 2014



TRENDS ANALYSIS:

- Part of the first phase of developing VTrans2040
- To understand how future trends may shape transportation demand, supply and performance

TRENDS
(what the world may look like in 2040)

OUTCOMES
(what transportation may look like in 2040)



Today's Topics



- Economics

- Workforce Needs

- Goods Movement



- Environment



- Travel Behavior

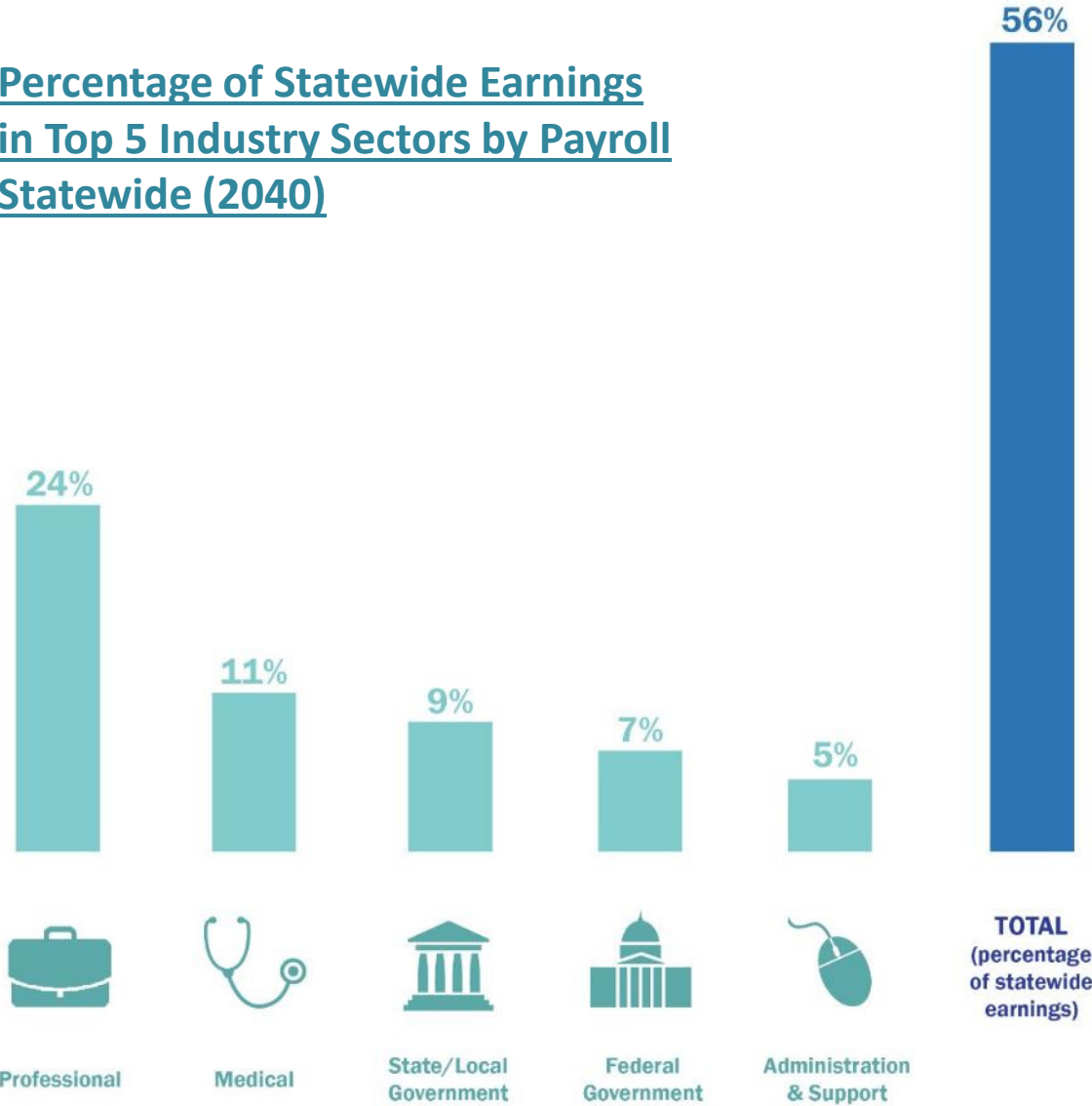


Summary Trend:



Forecast Growth in Key Sectors

Percentage of Statewide Earnings in Top 5 Industry Sectors by Payroll Statewide (2040)



WHY IS THIS IMPORTANT?
These economic sectors will be key contributors to Virginia's economy

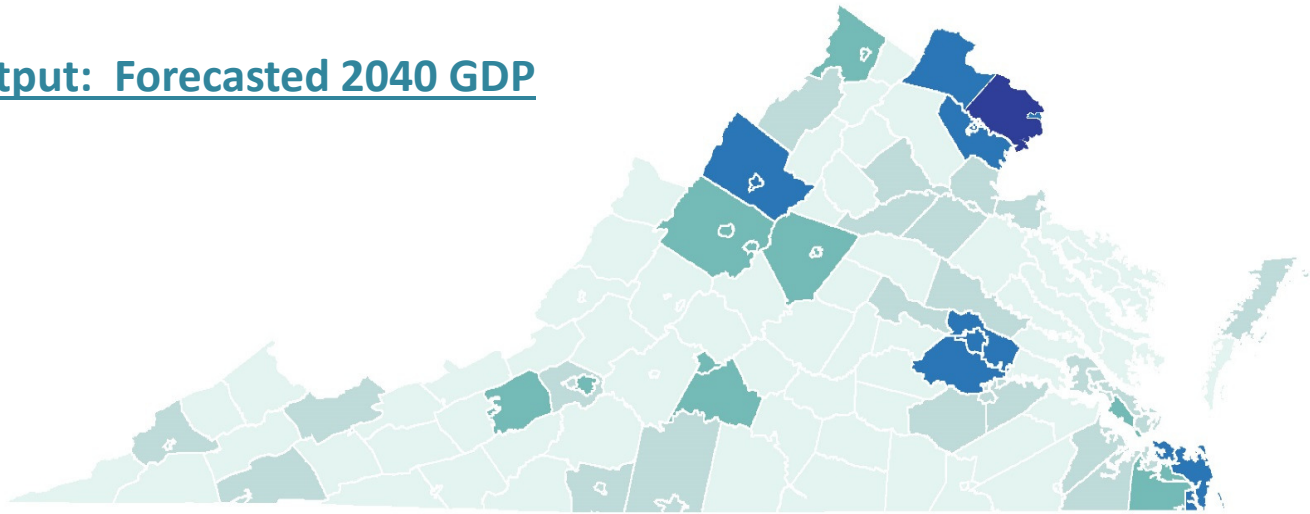
Source: Woods & Poole



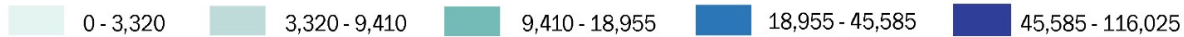
**Retail replaces state/local govt. when ranking in terms of employment. All others maintain same rank.*

Forecast Economic Output by County

Output: Forecasted 2040 GDP



LEGEND: FORECASTED ECONOMIC OUTPUT IN 2040 (MILLIONS OF REAL DOLLARS)

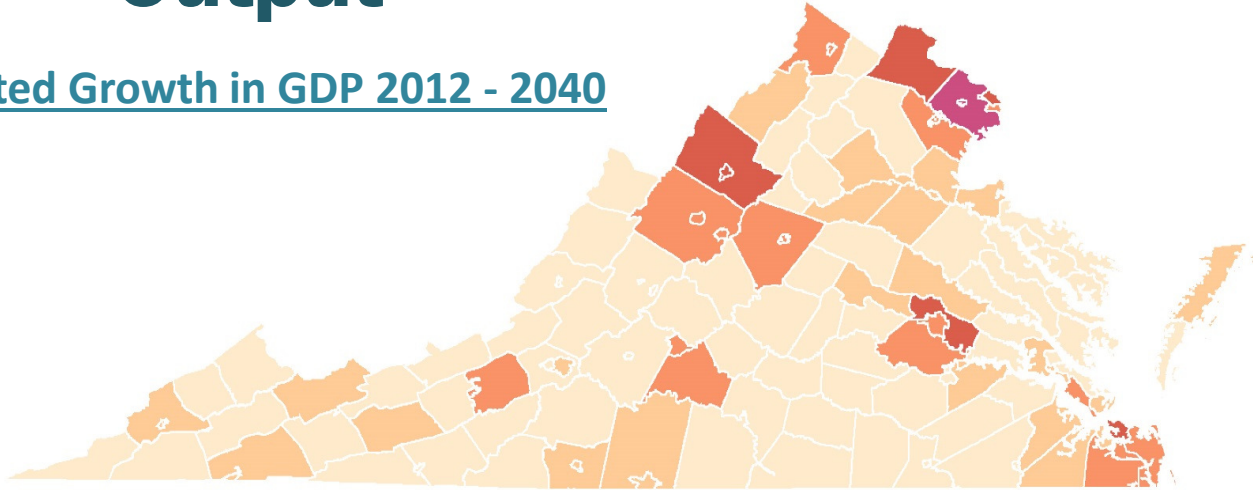


WHY IS THIS IMPORTANT?
GDP is an indicator of overall economic activity, which drives both workforce and freight needs

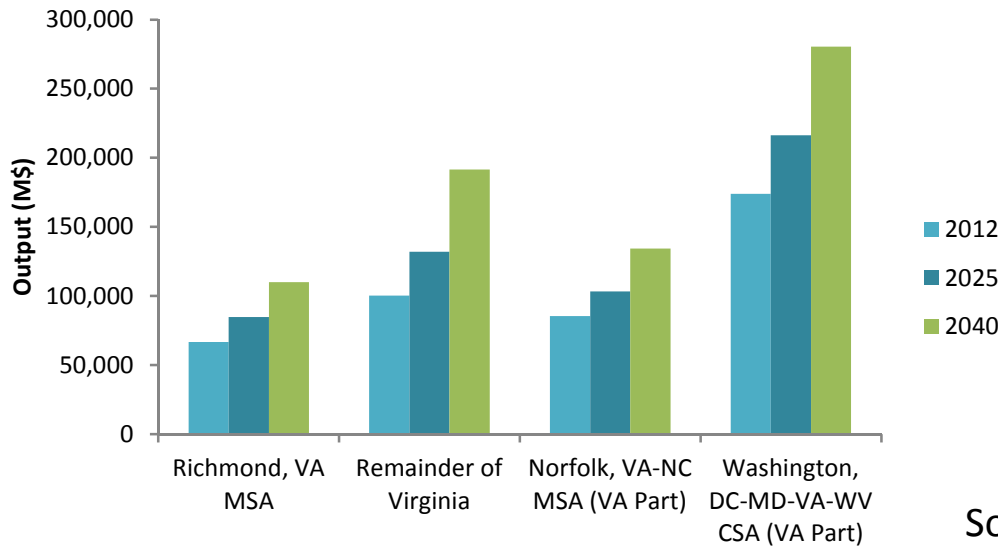
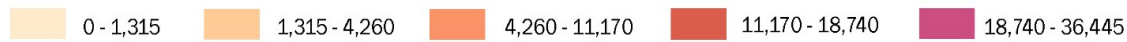
Source: Moody's, Cambridge Systematics

Forecast Change in Economic Output

Forecasted Growth in GDP 2012 - 2040



LEGEND: FORECASTED CHANGE IN ECONOMIC OUTPUT (MILLIONS OF REAL DOLLARS)

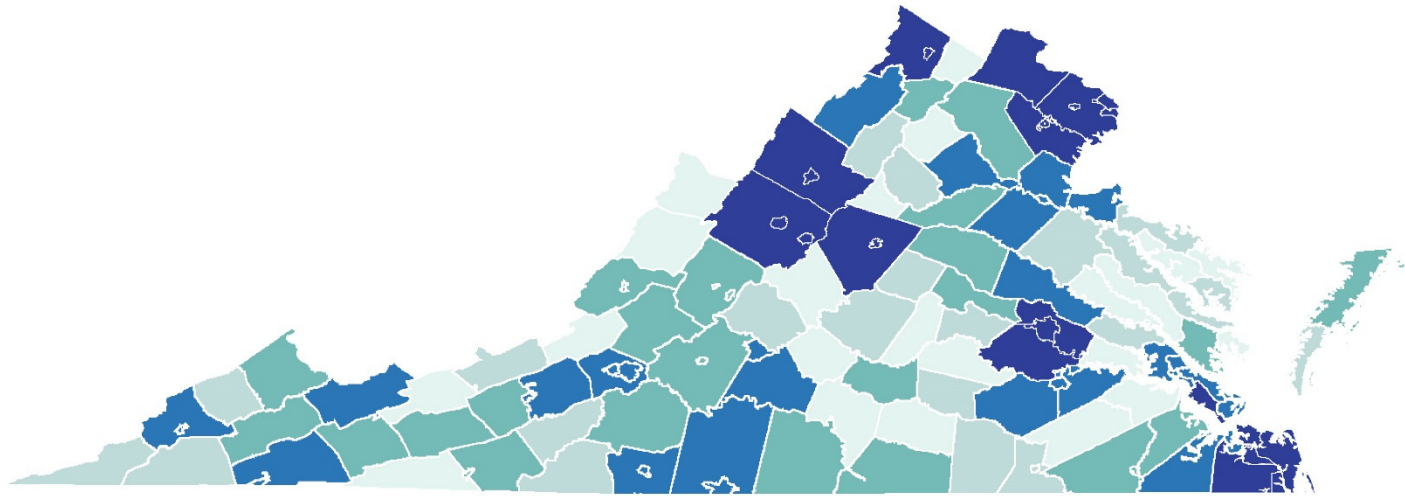


Source: Moody's, Cambridge Systematics

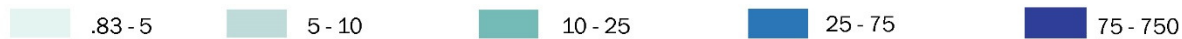


Forecast Employment by County

Forecasted Employment 2040



LEGEND: FORECASTED 2040 EMPLOYMENT (THOUSANDS)



WHY IS THIS IMPORTANT?

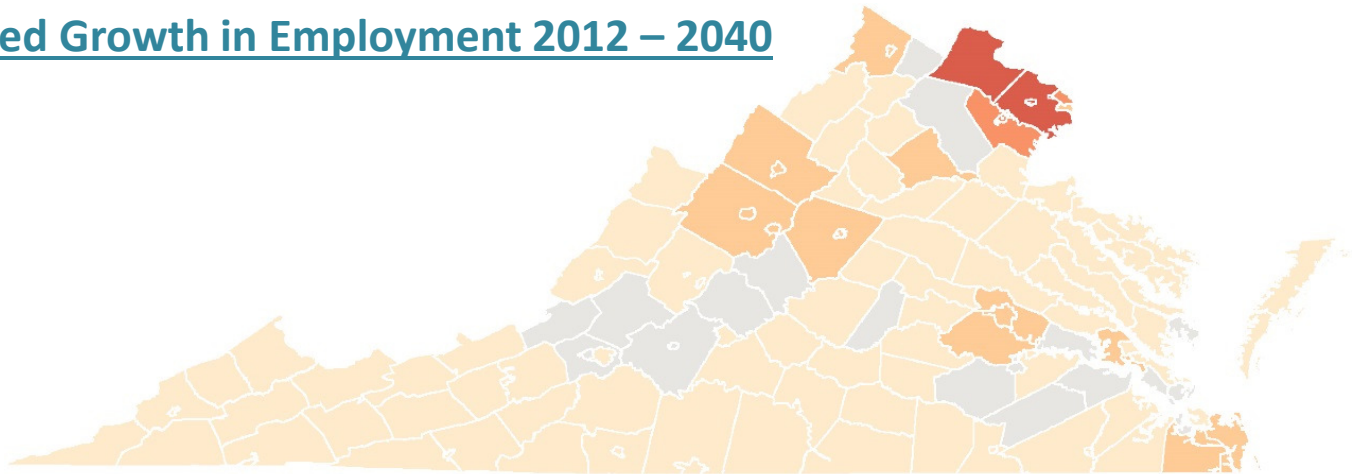
Employment is a primary driver of future population growth and regional vitality

Source: Moody's, Cambridge Systematics

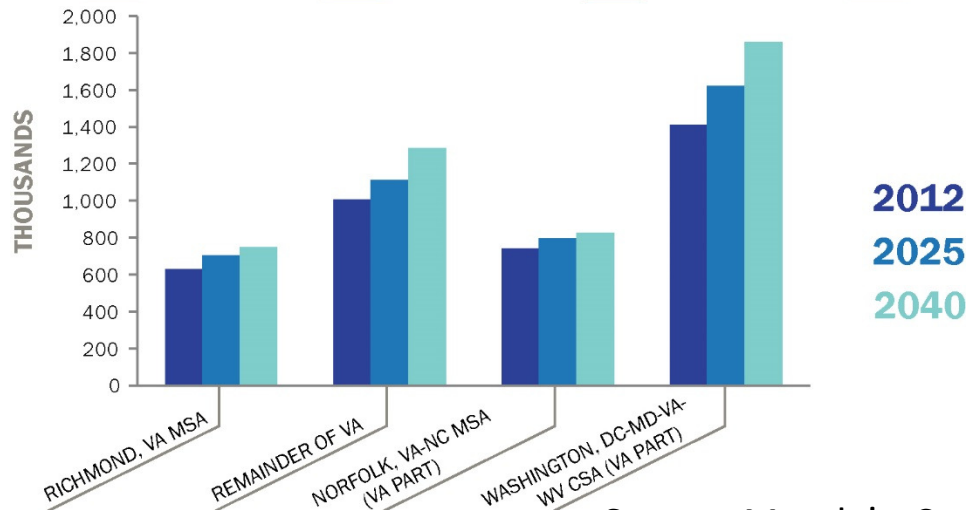
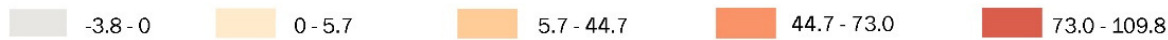


Forecast Change in Employment

Forecasted Growth in Employment 2012 – 2040



LEGEND: FORECASTED CHANGE IN EMPLOYMENT (THOUSANDS)

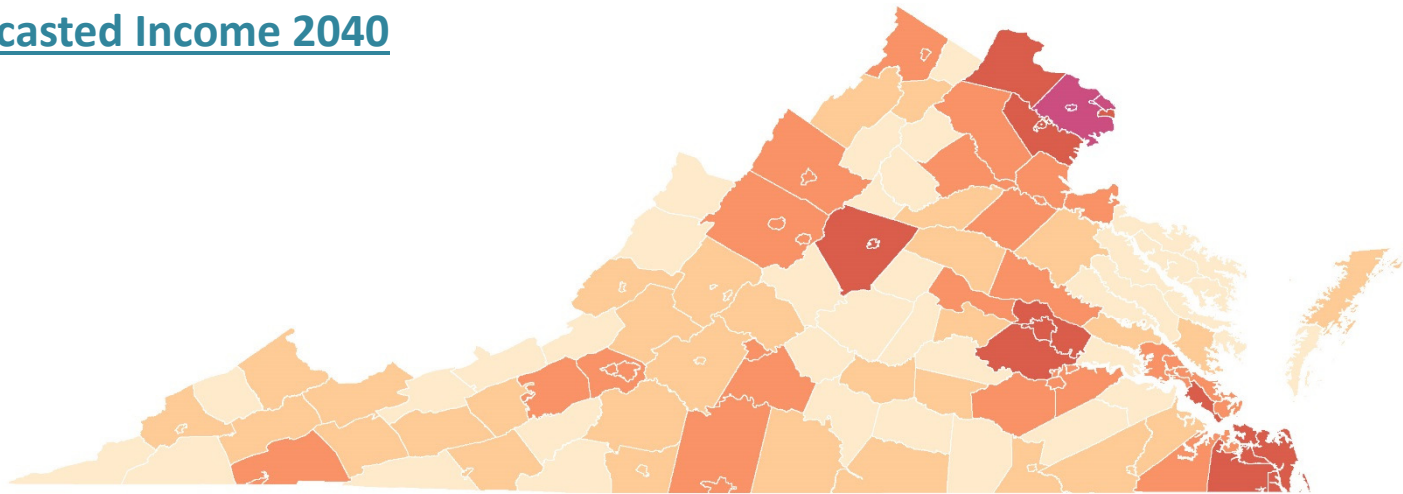


Source: Moody's, Cambridge Systematics

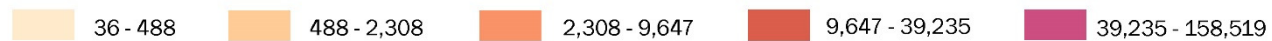


Forecast Income by County

Forecasted Income 2040



LEGEND: FORECASTED 2040 INCOME (MILLIONS OF CONSTANT DOLLARS)



WHY IS THIS IMPORTANT?

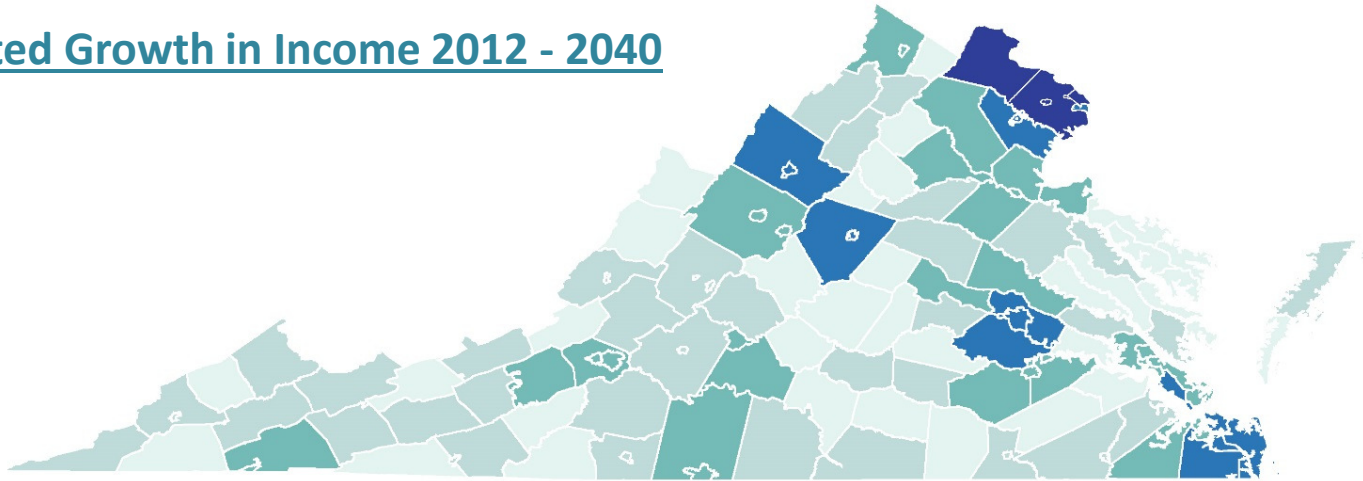
Income correlates with passenger and freight transportation demand.

Source: Moody's, Cambridge Systematics



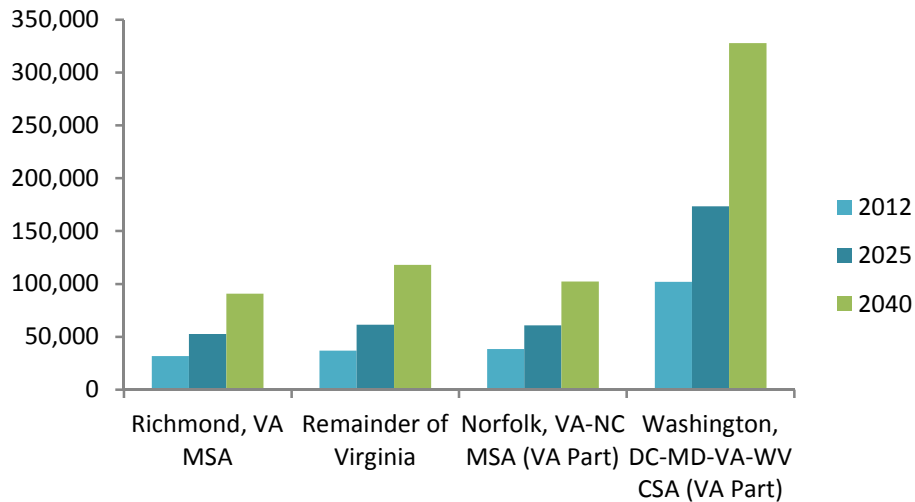
Forecast Growth in Income

Forecasted Growth in Income 2012 - 2040



LEGEND: FORECASTED CHANGE IN INCOME 2012-2040 (MILLIONS OF CONSTANT DOLLARS)

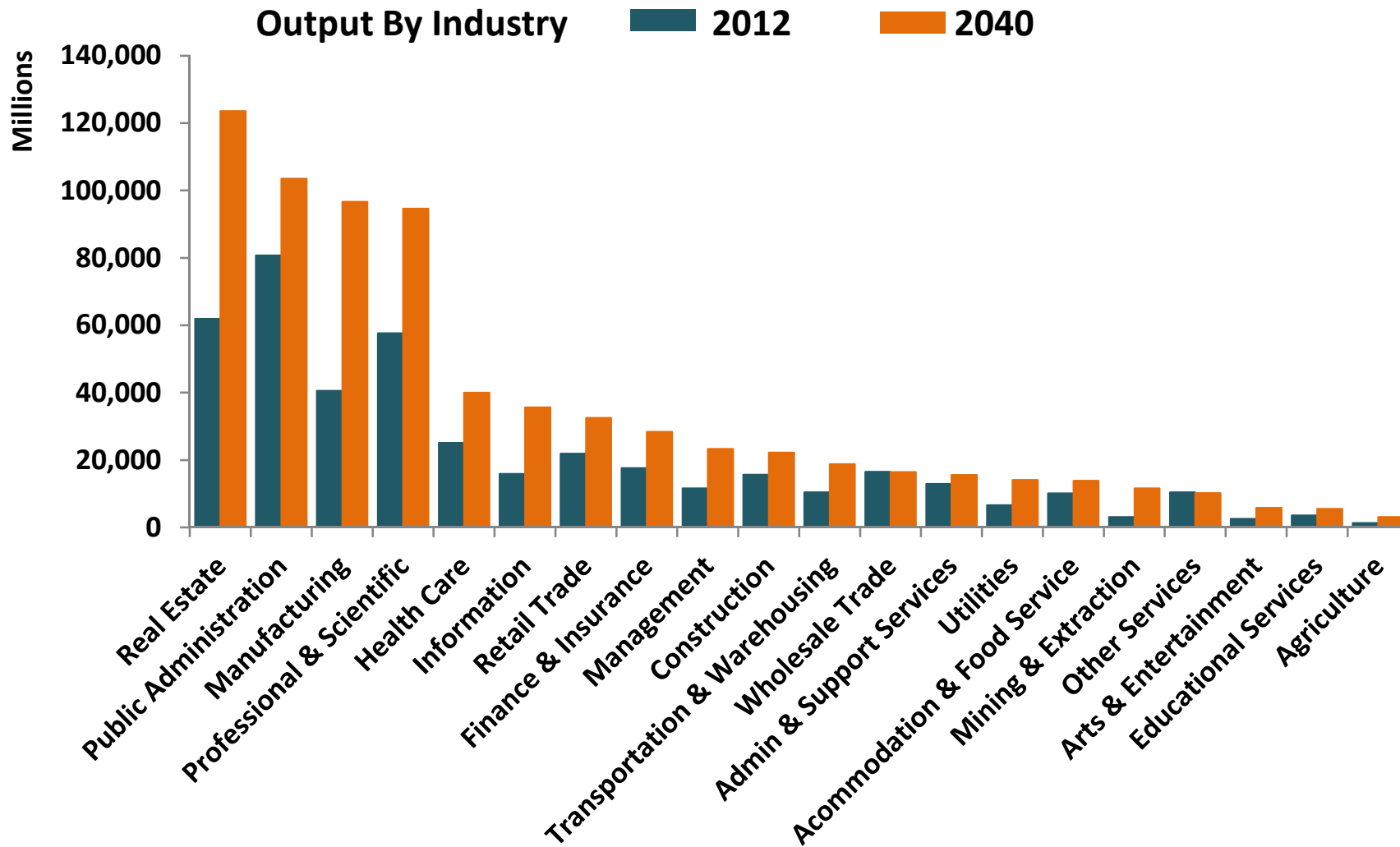
20 - 272 272 - 1,336 1,336 - 5,822 5,822 - 24,738 24,738 - 104,506



Source: Moody's, Cambridge Systematics



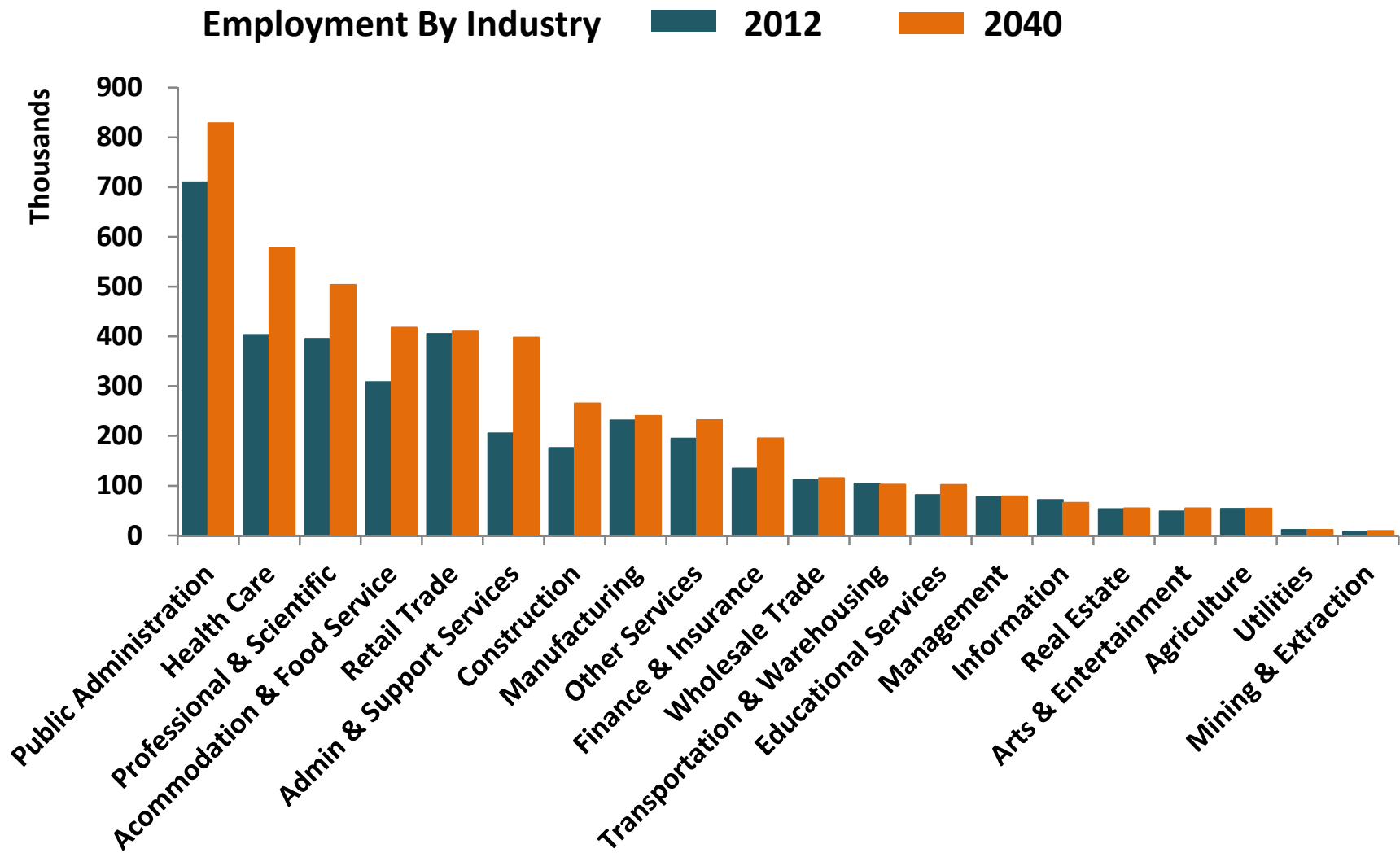
Forecast Trends in Output by Economic Sector



Source: Moody's, Cambridge Systematics



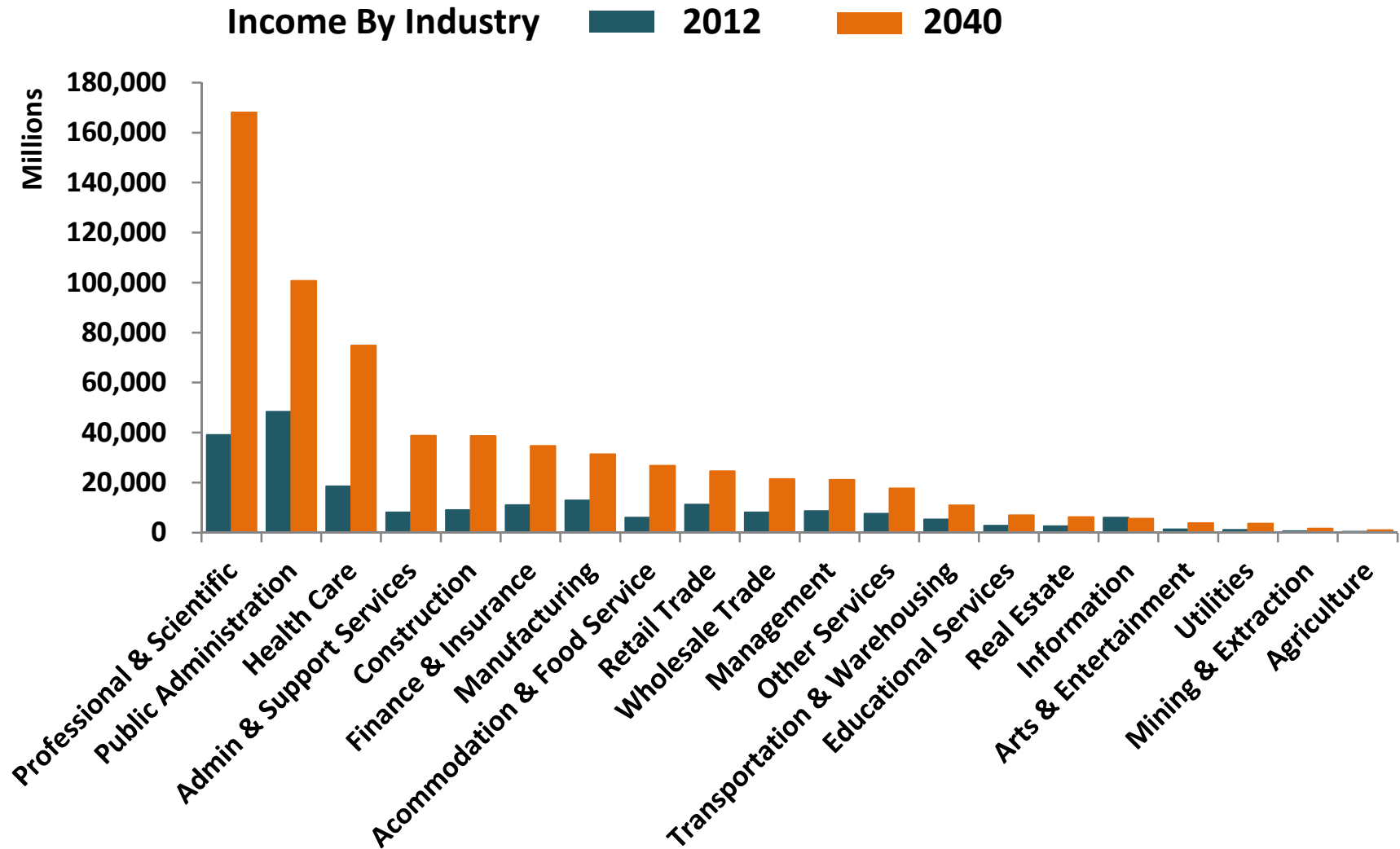
Forecast Trends in Employment by Economic Sector



Source: Moody's, Cambridge Systematics



Forecast Trends in Income by Economic Sectors

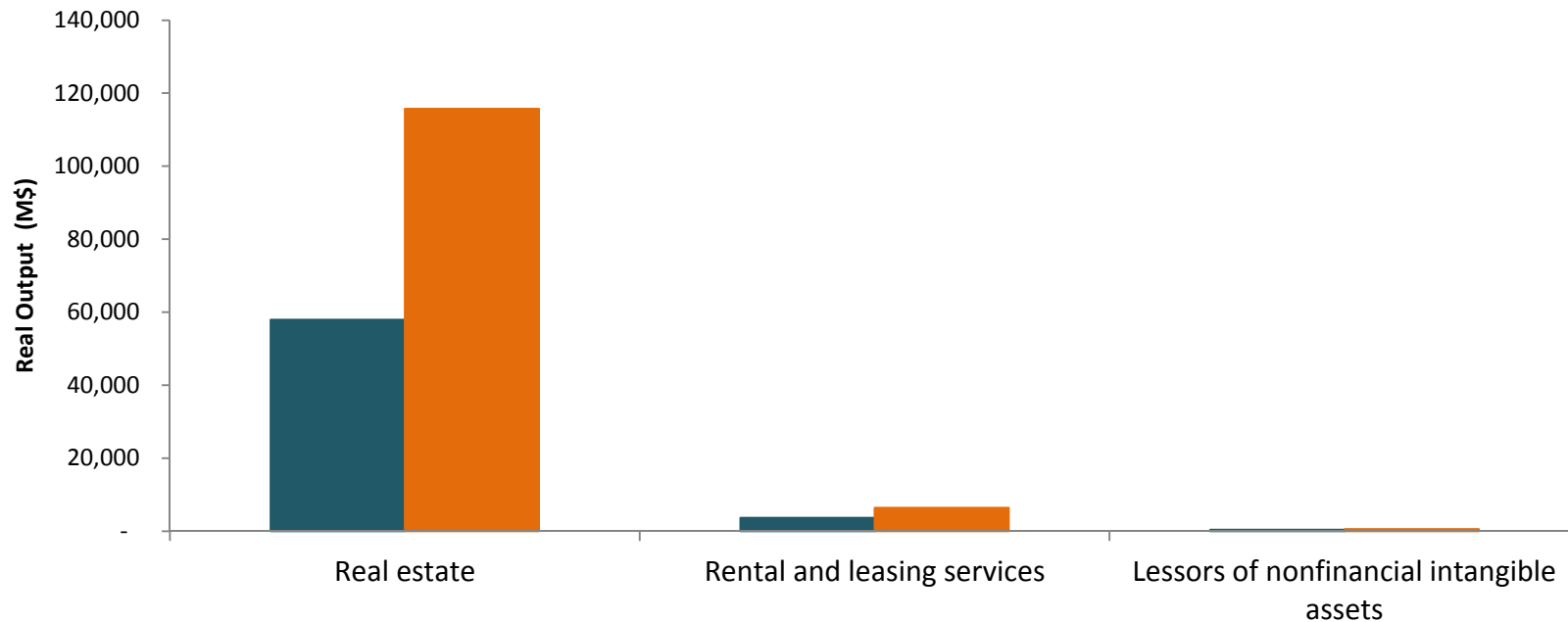


Source: Moody's, Cambridge Systematics



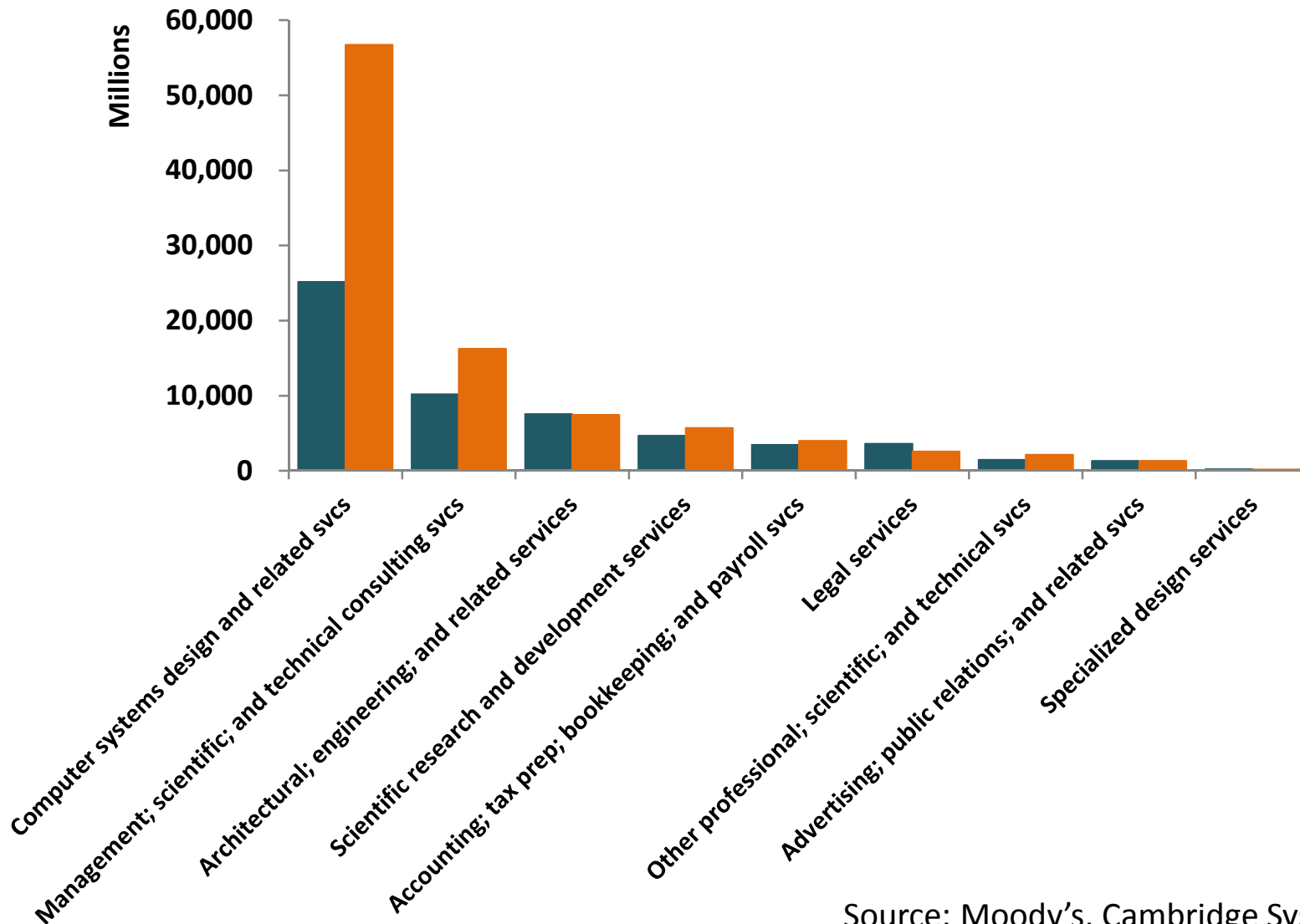
#1 Real Estate

Output By Industry 2012 2040



#2 Professional Services

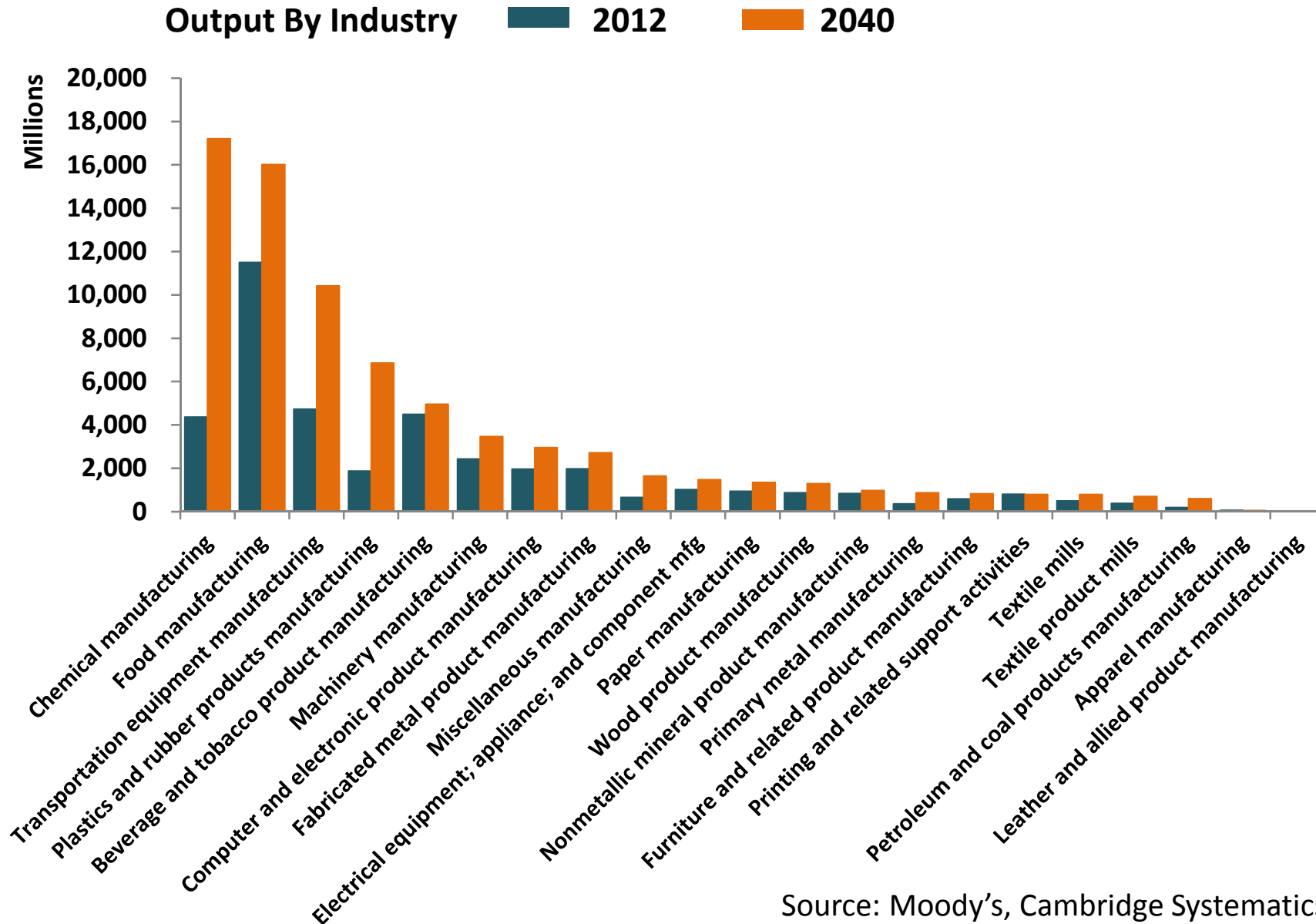
Output By Industry 2012 2040



Source: Moody's, Cambridge Systematics



#3 Manufacturing

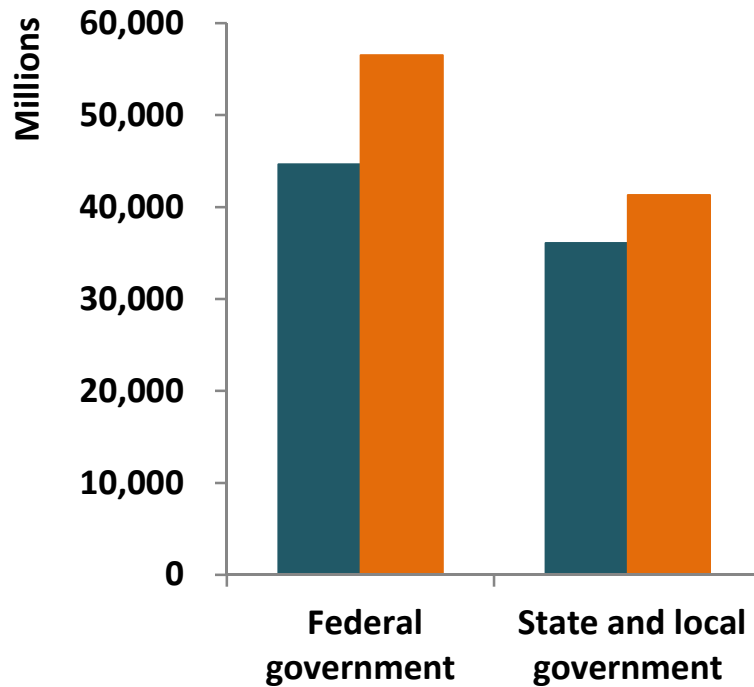


Source: Moody's, Cambridge Systematics



#4 Public Administration

Output By Industry 2012 2040



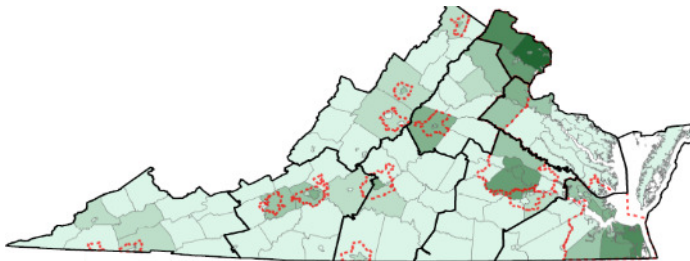
Source: Moody's, Cambridge Systematics



Economic Concentrations by Region

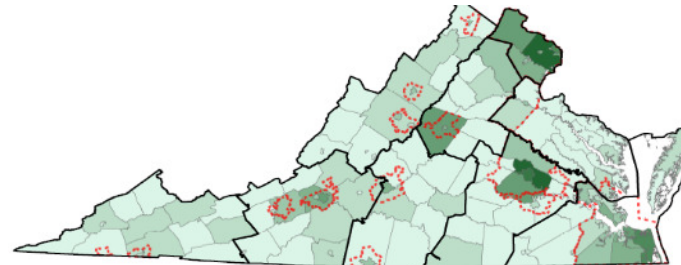
Professional Services Employment (2040)

Note the Urban Concentration

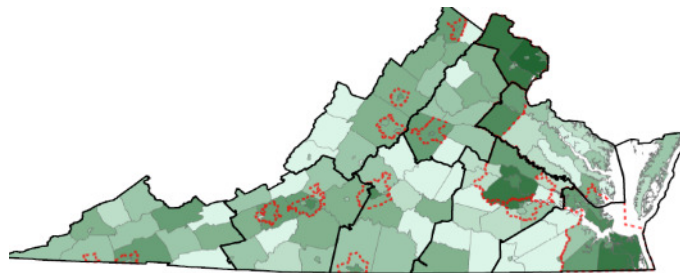


Finance and Insurance Payroll (2040)

Note the Urban Concentration

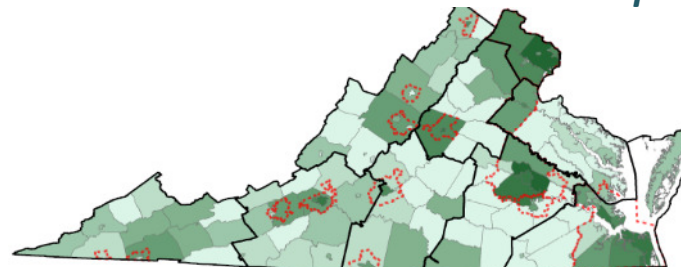


Retail Trade Employment (2040)



Health Care and Social Assistance Payroll (2040)

Note the Pattern – Similar to Population



WHY IS THIS IMPORTANT?

Different Industry sectors will have different workforce and transportation needs



Most Significant Professional Services Employment Shifts 2001-2013

Fairfax County

- Computer systems design and related services + 18K employees
- Management and technical services + 11K employees

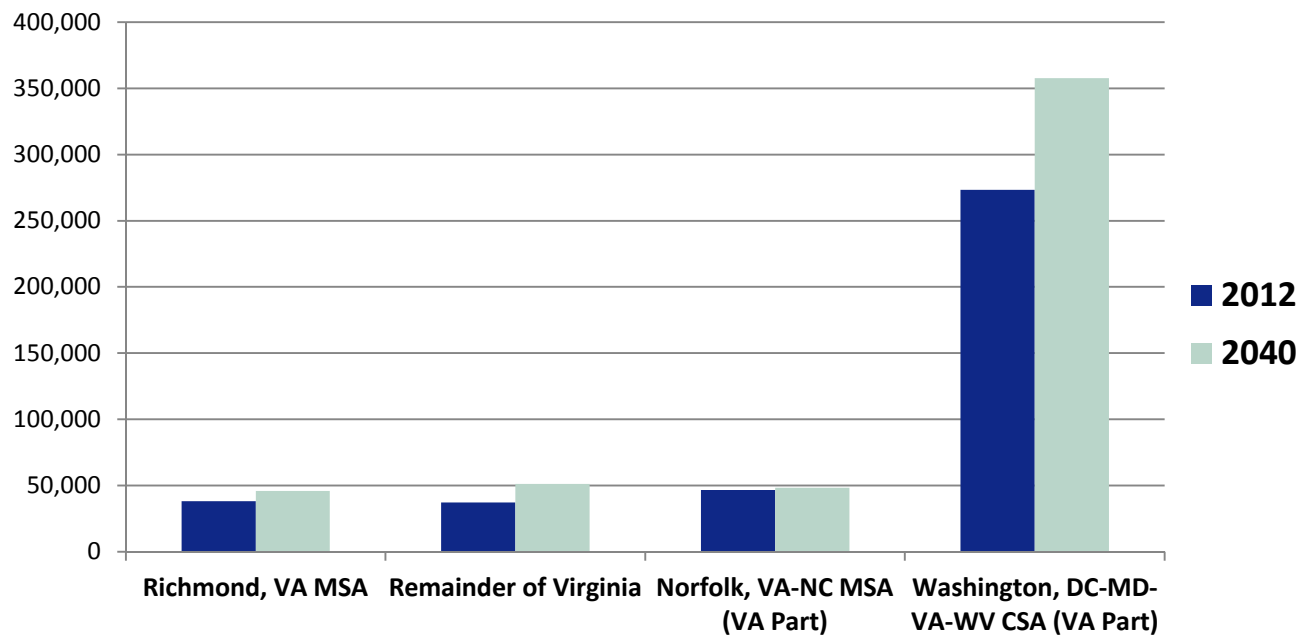
Loudoun County

- Computer systems design and related services + 6K employees

Arlington County

- Management and technical services + 6K employees

Professional Services Employment 2012 & 2040



Source: Bureau of Economic Analysis

Source: Moody's, Cambridge Systematics



Measuring Relative Change in Industrial Specialization through Location Quotient (LQ) Analysis

- While the greatest magnitude of job gains occur in the largest counties, LQ Analysis can show which counties have seen the greatest relative change in industrial specialization

Largest Gains in Professional Services (NAICS 54) 2001-2013



LYNCHBURG:

(Architectural & Engineering Services) **+3.04 LQ**



ALBEMARLE COUNTY:

(Scientific Research & Development) **+2.63 LQ**



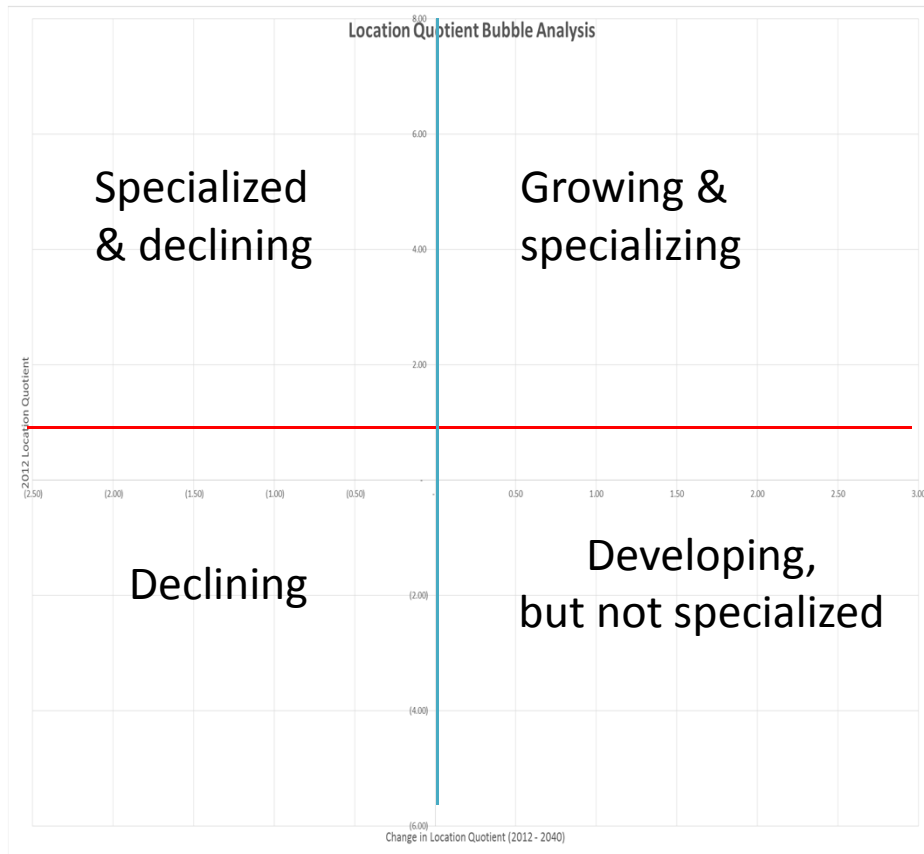
BEDFORD COUNTY:

(Advertising) **+2.29 LQ**

WHY IS THIS IMPORTANT?
Concentrations of key industries indicate local/regional workforce and transportation needs



Location Quotients: Assessing Regional Economic Specialization



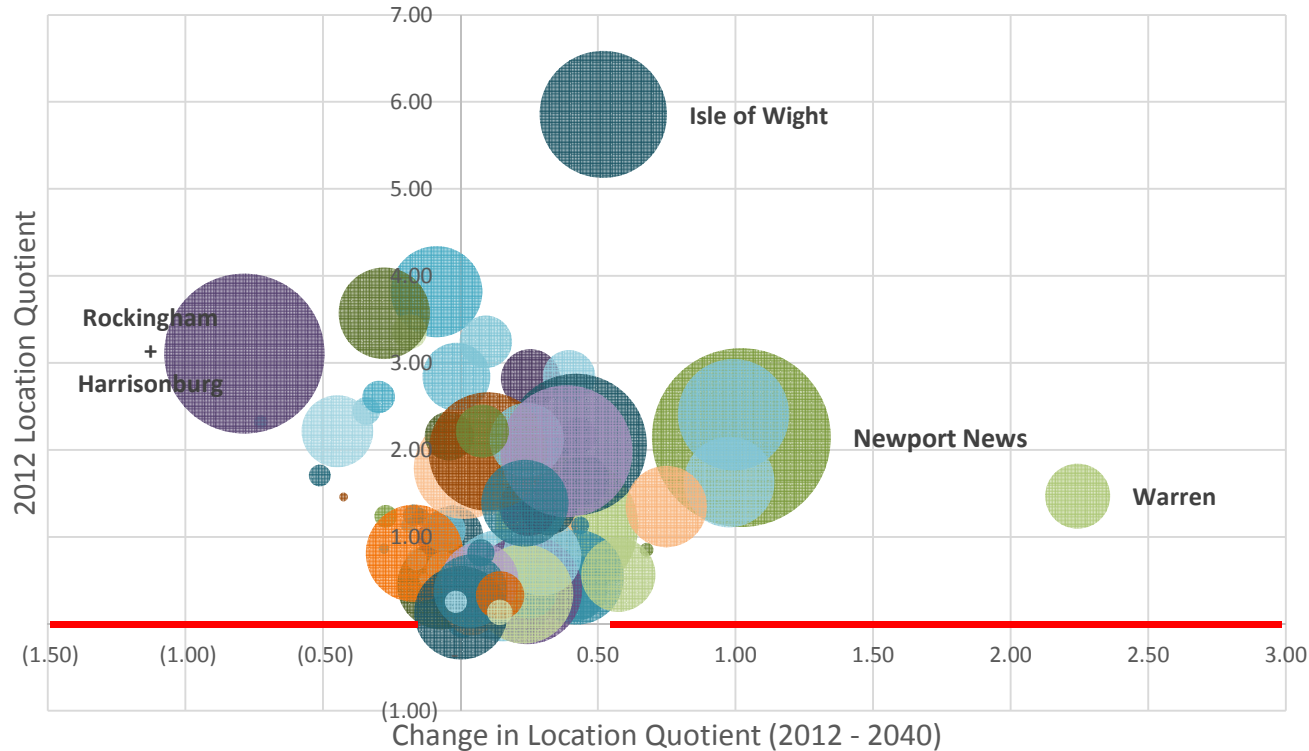
- Vertical axis value greater than 1.0 show increasing level of industry concentration relative to US Trends
- Horizontal axis shows whether a region’s industry has been growing or shrinking relative to measure
- The diameter of the Bubble indicates the 2040 size of the industry

WHY IS THIS IMPORTANT?

Concentrations and trends of key industries indicate local/regional workforce and transportation needs



Location Quotient Analysis – Manufacturing











2040 (\$Mil)	Region
7,363	Newport News city (VA)
5,911	Rockingham + Harrisonburg (VA)
4,717	Chesterfield County (VA)
4,609	Campbell + Lynchburg (VA)
4,003	Montgomery + Radford (VA)
3,727	Isle of Wight County (VA)
3,220	Frederick + Winchester (VA)
2,876	Loudoun County (VA)
2,760	Norfolk city (VA)
2,371	Augusta; Staunton + Waynesboro (VA)

- Isle of Wight and Newport News are developed, concentrated sources of manufacturing output relative to national trends
- Warren County is developing rapidly, and is projected to exceed national trends by 2040
- Rockingham is a large source of manufacturing output, but is expected to grow more slowly than national trends



Measuring Relative Change in Industrial Specialization through Location Quotient (LQ) Analysis of Output

DRIVER	COUNTY (VDOT DISTRICT)	LQ (2012-2040)	Output 2040
 PROFESSIONAL, SCIENTIFIC, & TECHNICAL	CUMBERLAND COUNTY (LYNCHBURG)	2.60	4.0 (\$Million)
 FISHING, HUNTING, ETC.	FLUVANNA COUNTY (CULPEPER)	2.73	10.5 (\$Million)
	ARLINGTON COUNTY (NORTHERN VIRGINIA)	2.51	0.7 (\$Million)
	BRUNSWICK COUNTY (RICHMOND)	2.26	16.3 (\$Million)
 FARMS	CHARLES CITY COUNTY (RICHMOND)	2.22	2.8 (\$Million)
 MINING, QUARRYING, OIL & GAS EXTRACTION	SUSSEX COUNTY (HAMPTON ROADS)	4.59	0.6 (\$Million)
	PAGE COUNTY (STAUNTON)	1.55	4.3 (\$Million)
 UTILITIES	SCOTT COUNTY (BRISTOL)	2.05	52.5 (\$Million)
 EDUCATIONAL SERVICES	WESTMORELAND COUNTY (FREDERICKSBURG)	4.64 RG)	8.1 (\$Million)
 TRANSPORTATION & WAREHOUSING	MIDDLESEX COUNTY (FREDERICKSBURG)	3.05	161.5 (\$Million)
 REAL ESTATE, RENTAL & LEASING	FLOYD COUNTY (SALEM)	2.83	49.0 (\$Million)



Tourism

IN 2012, VIRGINIA TOURISM:



Generated **\$21.2 BILLION**
in visitor spending



Supported **210,000 jobs**



Contributed to **\$4.7 BILLION**
in payroll- **3%** of Virginia's total payroll

Source: U.S. Travel Association for the Virginia
Tourism Corporation (2012)

TOURISM ACCOUNTS FOR:



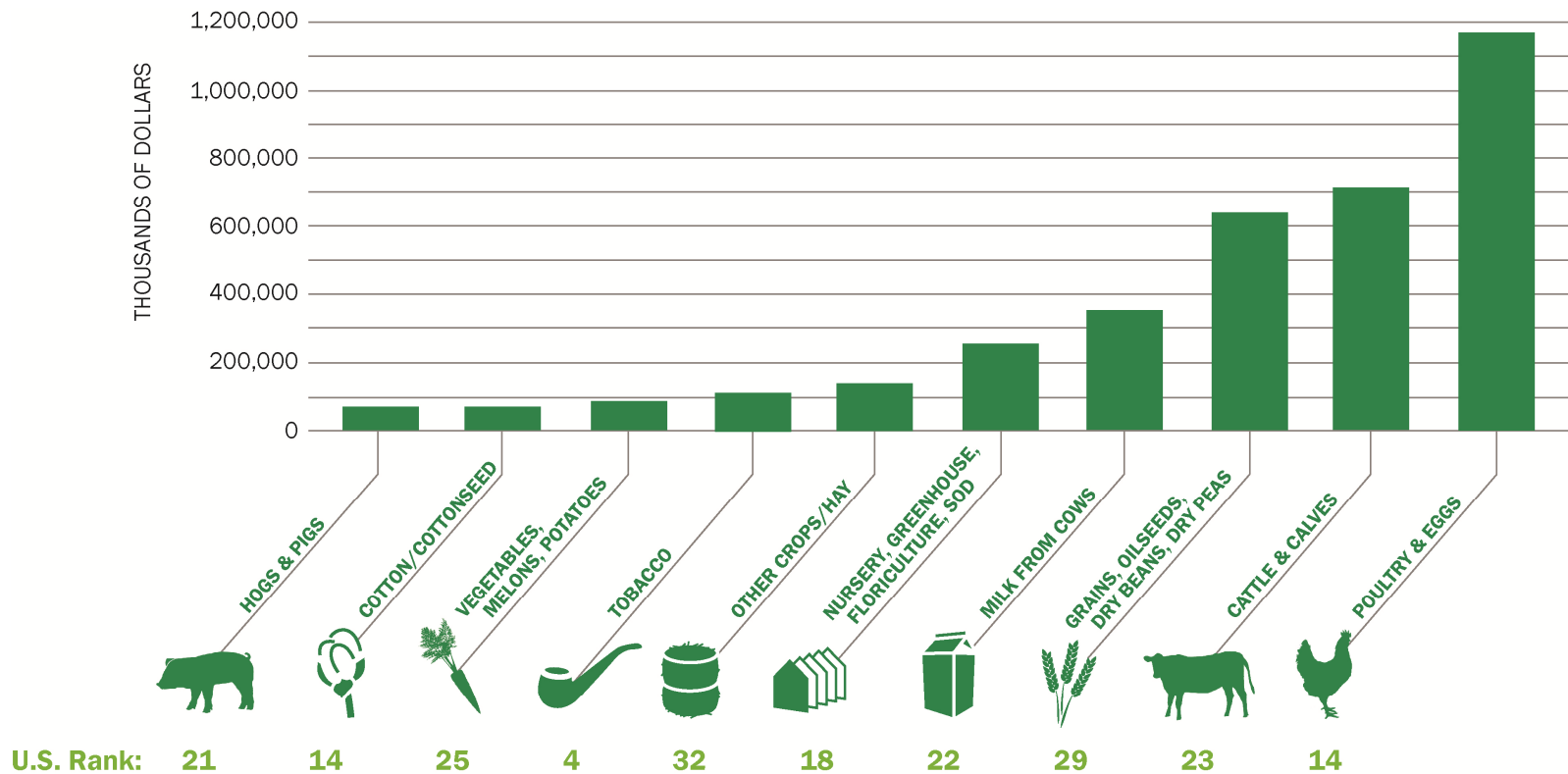
WHY IS THIS IMPORTANT?

Transportation plays a critical
role in tourism, especially in
rural and historic areas that
depend on tourism for
economic growth



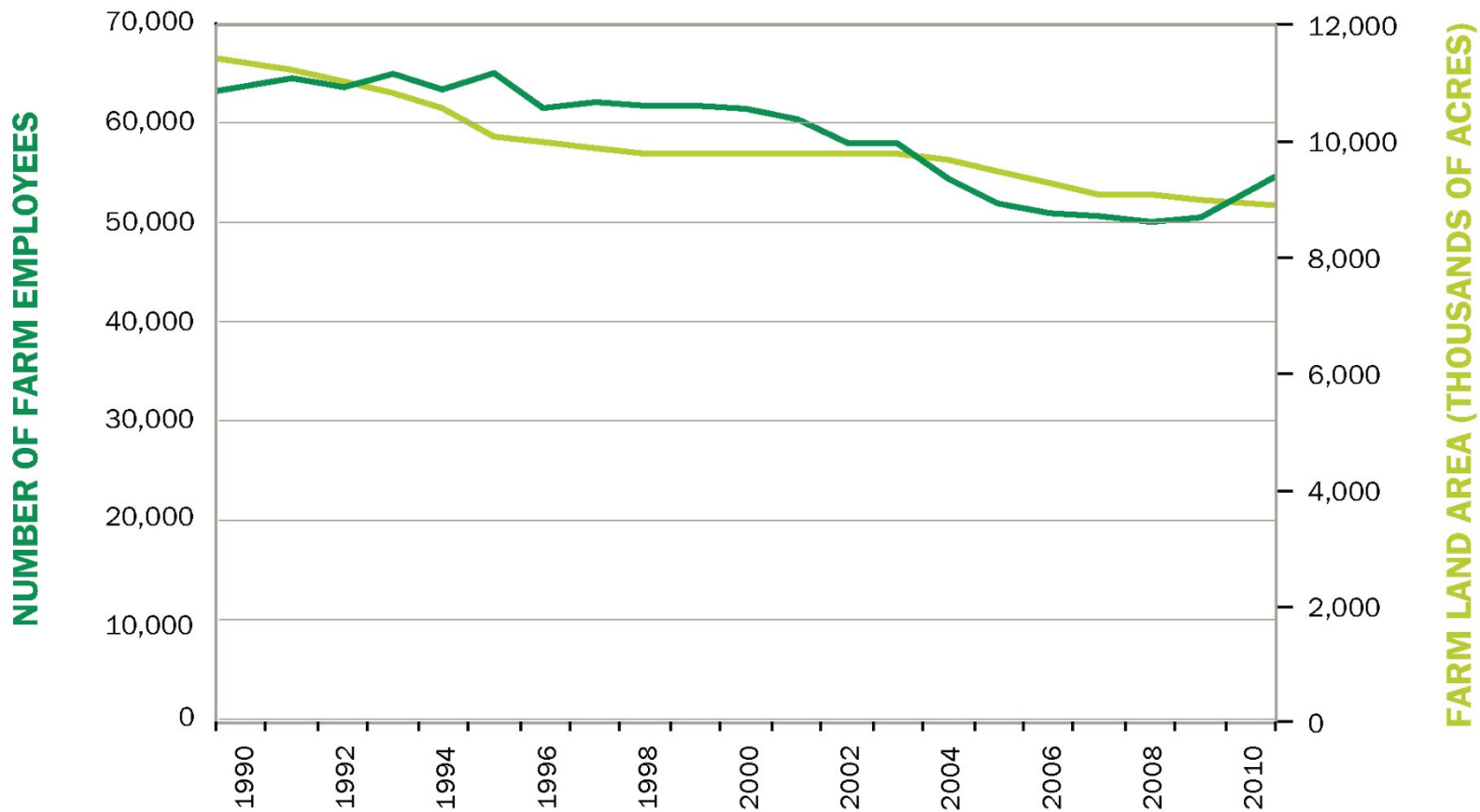
Agriculture

Sales Value & Rank Within the US, 2012

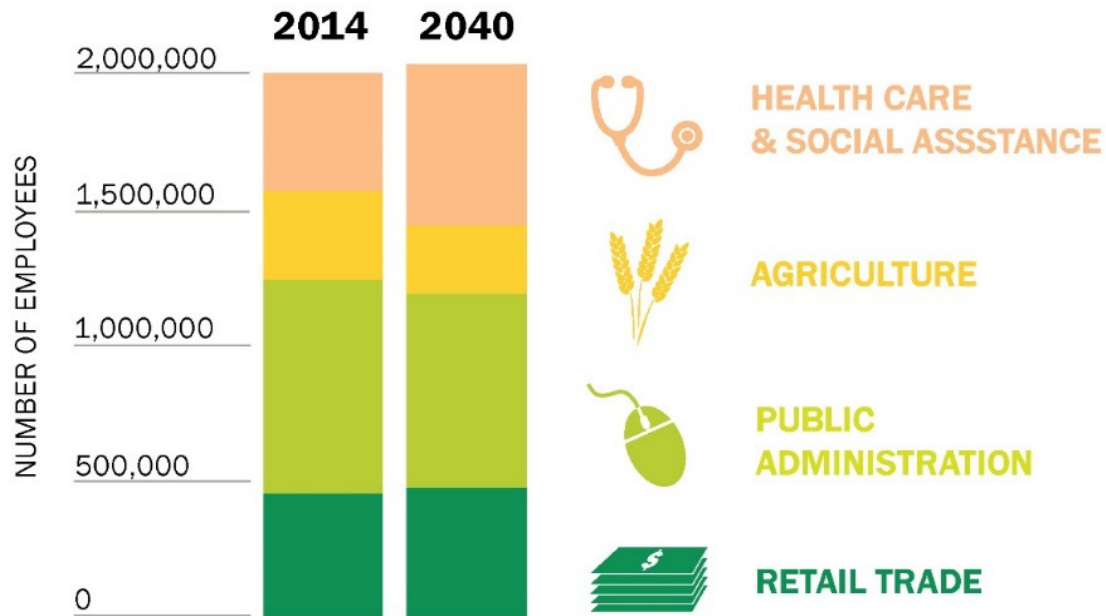


Farm Employment & Land Area

Virginia Farm Employment and Land Area



Forecast Rural Employment Change



WHY IS THIS IMPORTANT?

While holding steady overall, rural employment will grow in healthcare & social services. Some suburban areas are also forecast to lose jobs.



Summary Trend:



GOODS MOVEMENT NEEDS

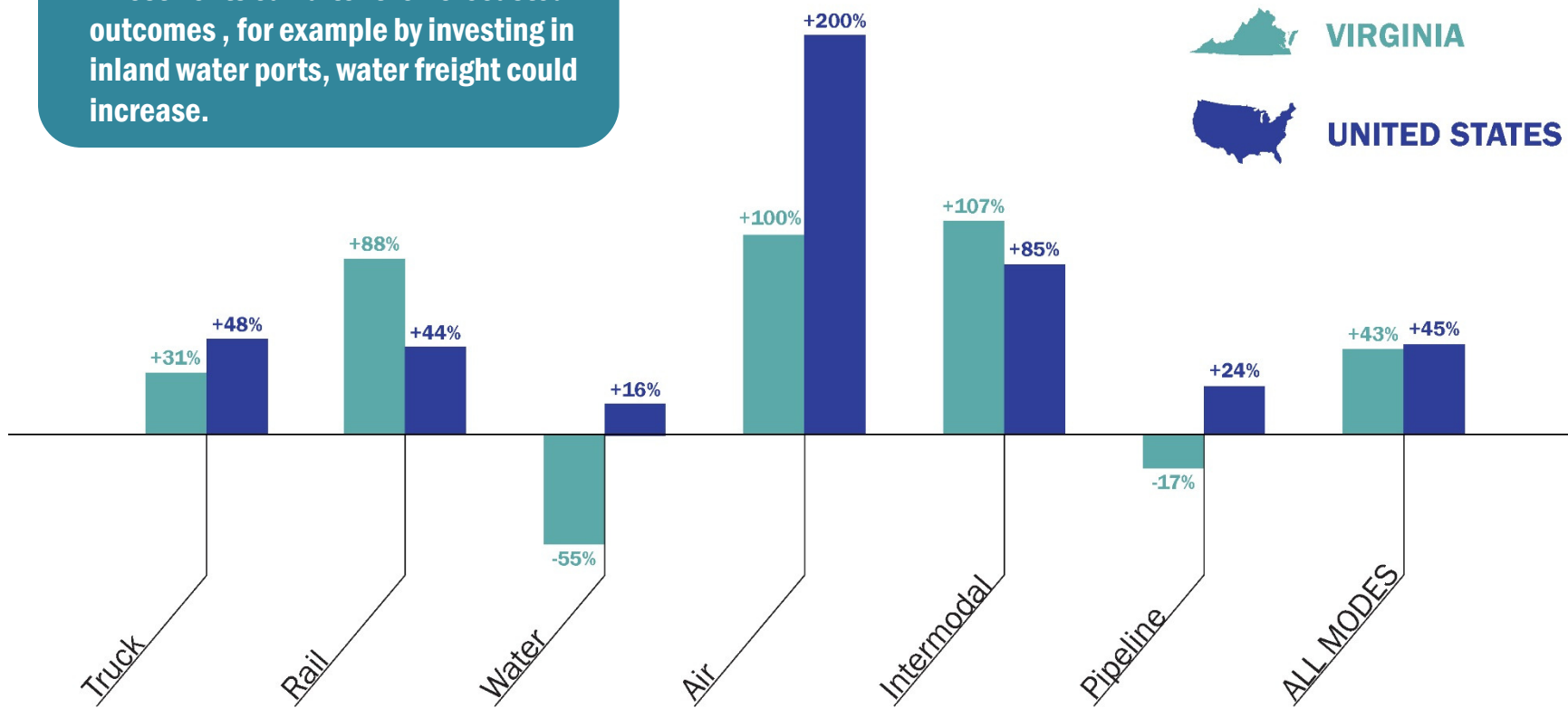


Forecast Change in Freight Modes

FORECASTED TRENDS IN FREIGHT MODE SHIFTS TO 2040

WHY IS THIS IMPORTANT?

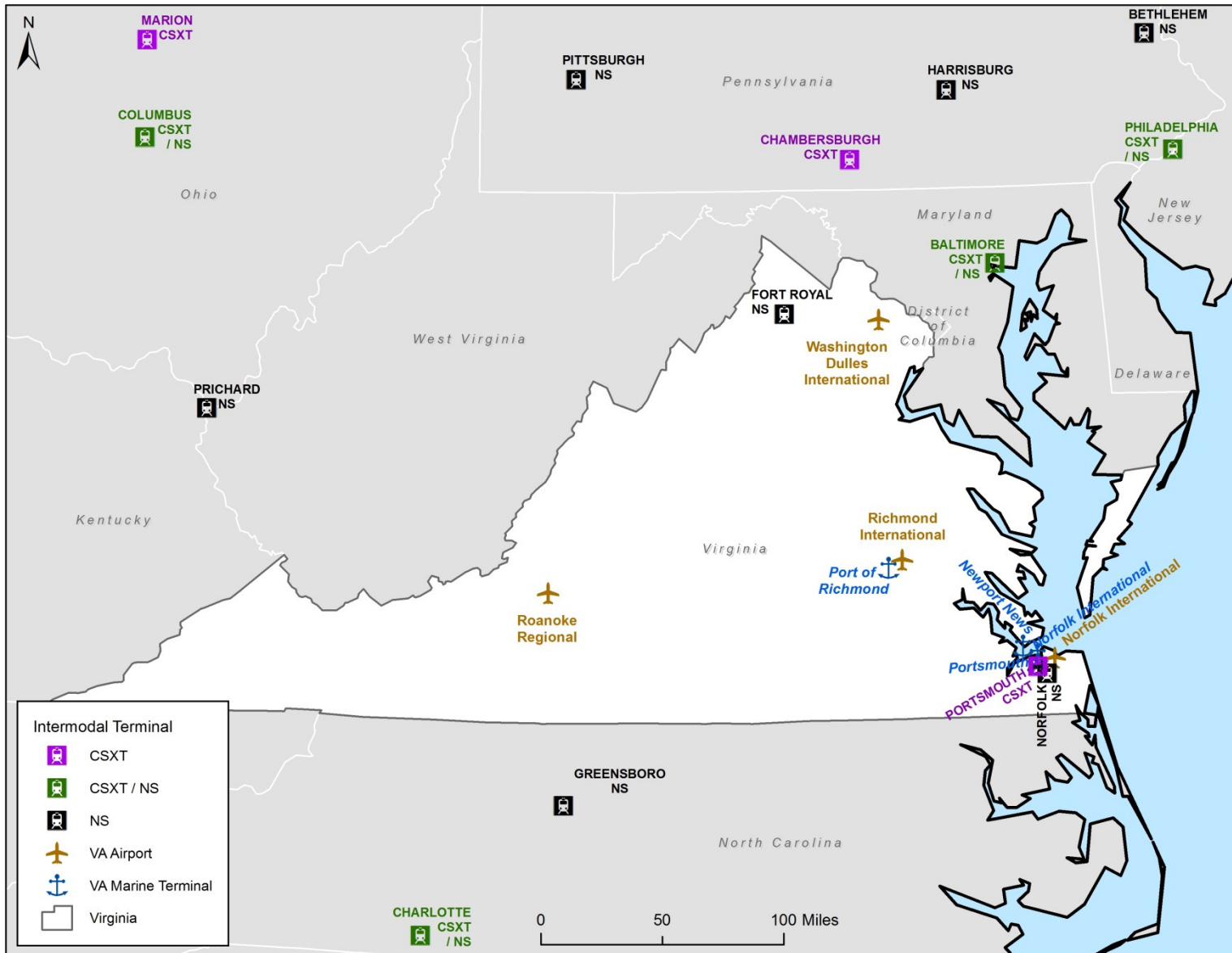
Investments can alter the forecasted outcomes, for example by investing in inland water ports, water freight could increase.



Source: Cambridge Systematics, from FHWA Freight Analysis Framework 3 data



Intermodal Facilities



Freight Dynamics – Trucks



SOURCE: INRIX

Long-Haul Truck
Density
(2010)

- GDP outpaces transportation investment
- Truck VMT increases faster than auto
 - 17% from 98' to 08' for truck vs 13% for auto
- Bottlenecks
 - Highway
 - Rail



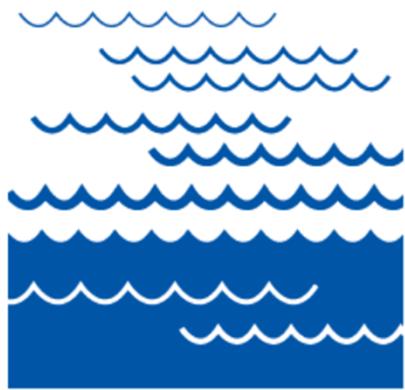
Summary Trend:



ENVIRONMENTAL TRENDS



Risks to Coastal Virginia



COASTAL VIRGINIA IS THE SECOND MOST VULNERABLE REGION IN THE U.S. AND IS FACING:

- **DEGRADATION OF ECOSYSTEMS**
- **INCREASED VULNERABILITY DUE TO LOW ELEVATIONS & LAND SUBSIDENCE**
- **RATES OF SEA-LEVEL RISE GREATER THAN AVERAGE**

US DOT, 2008; Transportation Research Board, 2008



Climate Impacts

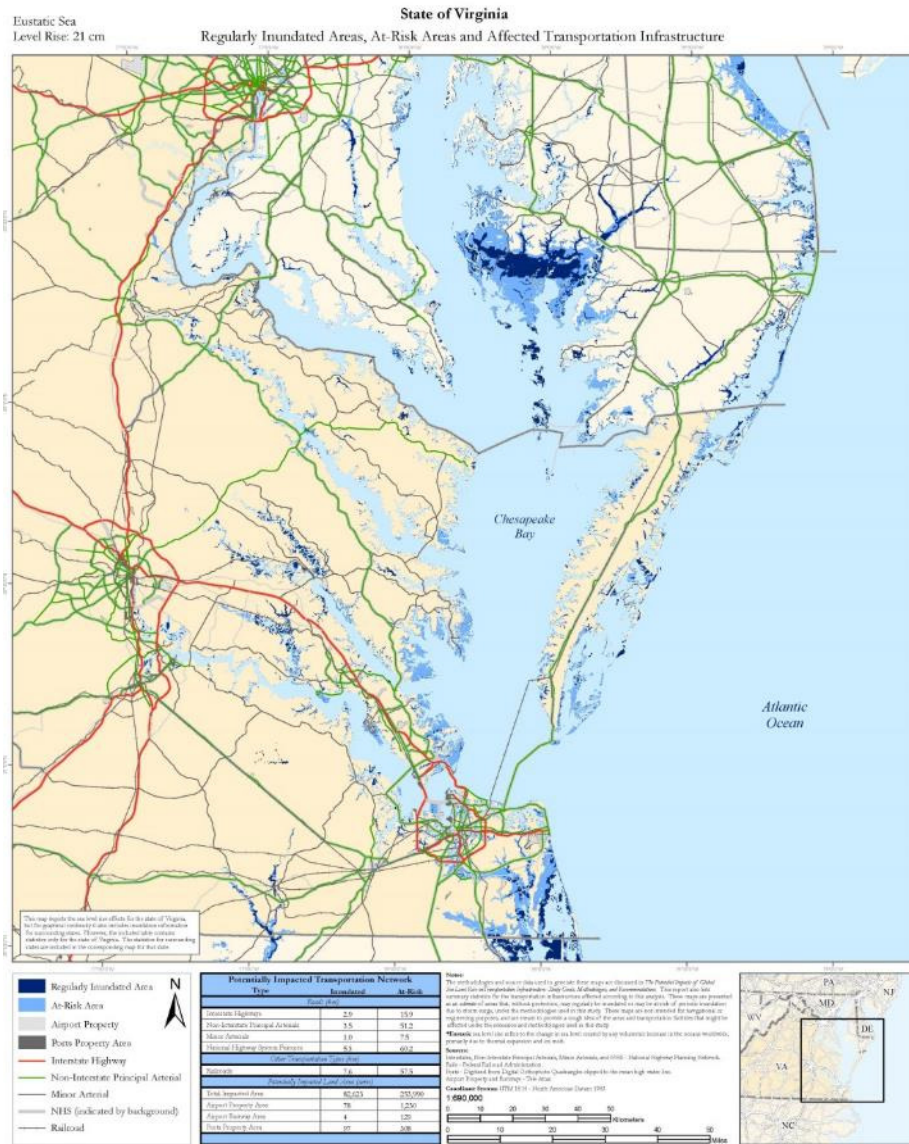
Potential for At Risk Coastal Infrastructure in VA

Type	Inundated	At-Risk
<i>Roads (miles)</i>		
Interstate Highways	1.8	9.9
Non-Interstate Principal Arterials	2.2	31.8
Minor Arterials	0.6	4.7
National Highway System Features	3.3	37.4
<i>Other Transportation Types (miles)</i>		
Railroads	4.7	35.7
<i>Potentially Impacted Land Area (acres)</i>		
Total Impacted Area	82,623	253,990
Airport Property Area	78	1,230
Airport Runway Area	4	129
Ports Property Area	97	308

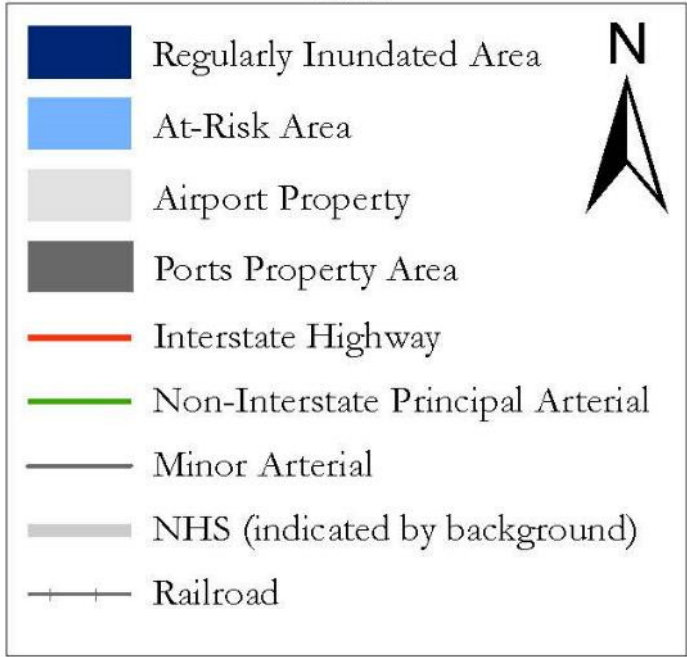
Source: "The Potential Impacts of Global Sea Level Rise on Transportation Infrastructure," U.S. DOT, 2007-2008



Climate Change



Regularly inundated areas, at-risk areas and affected transportation infrastructure in Virginia



Source: "The Potential Impacts of Global Sea Level Rise on Transportation Infrastructure," U.S. DOT, 2007-2008



Climate Change – Transportation Infrastructure

Rising sea levels w/ storm surge impacts

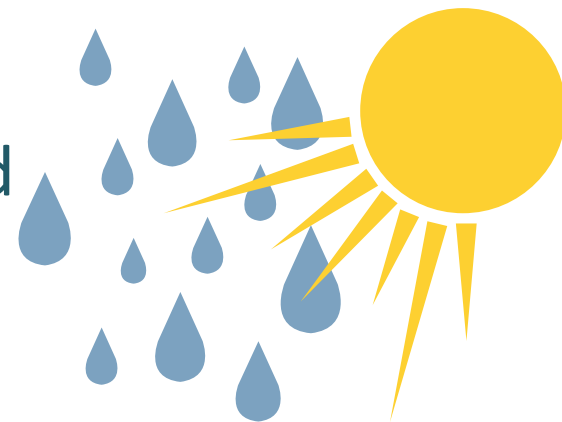
- More frequent flooding – tunnels, marine terminals, warehouse entrances, low-lying infrastructure

Increase in very hot days/heat waves impacts

- Thermal expansion – bridges and pavements
- Rail track deformations

WHY IS THIS IMPORTANT?

Significant changes in how transportation professionals plan, design, operate, and maintain the infrastructure will be required.



Climate Change – Transportation Infrastructure

Increase in intense precipitation events

- Flooding of roadways, rail lines, runways
- Scouring of pipeline supports and bridge foundations

More frequent strong hurricanes

- Greater probability of infrastructure failures – eg. failure of bridge decks
- Damage to ports and harbors



Photo: NOAA, National Weather Service

Source: Transportation Research Board, 2008



Summary Trend:

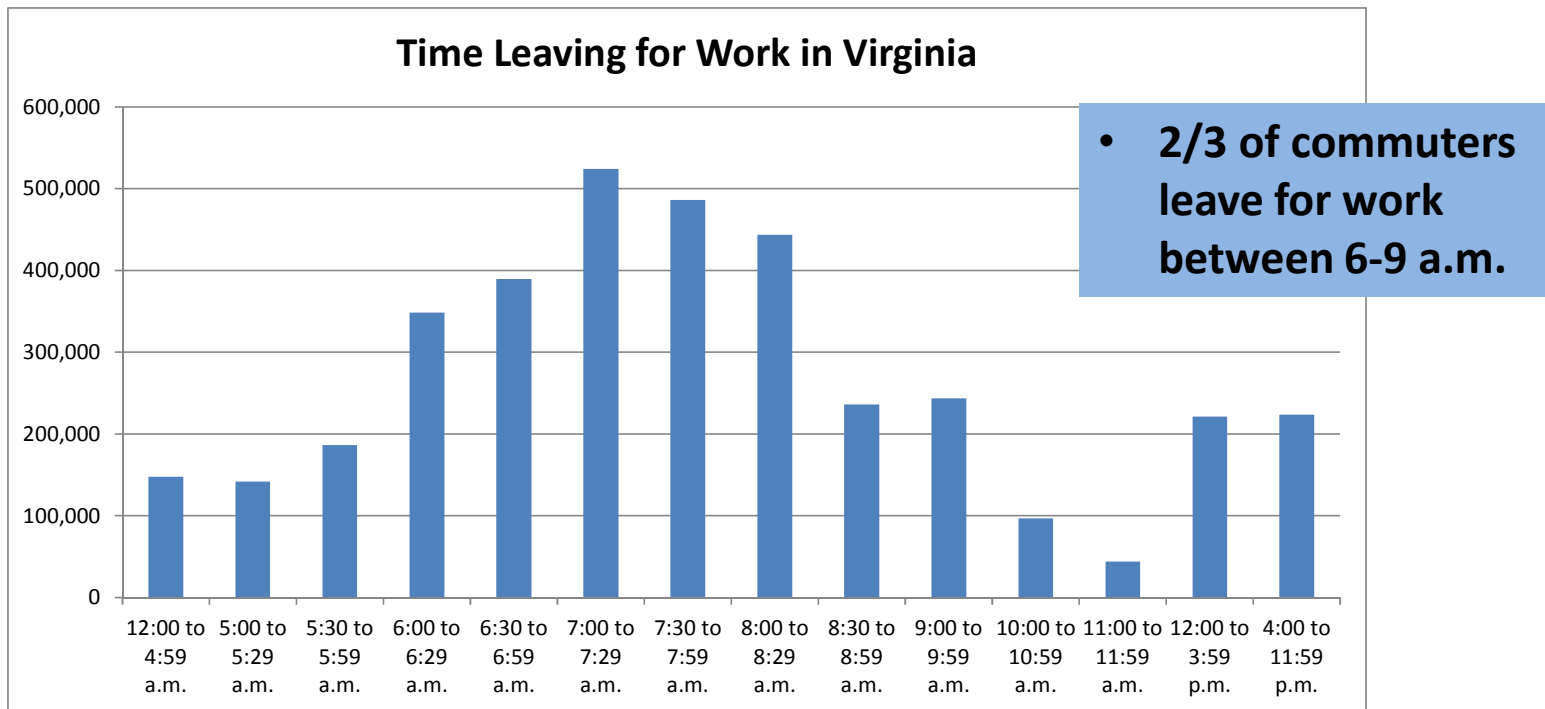


**CHANGING TRAVEL
BEHAVIOR**

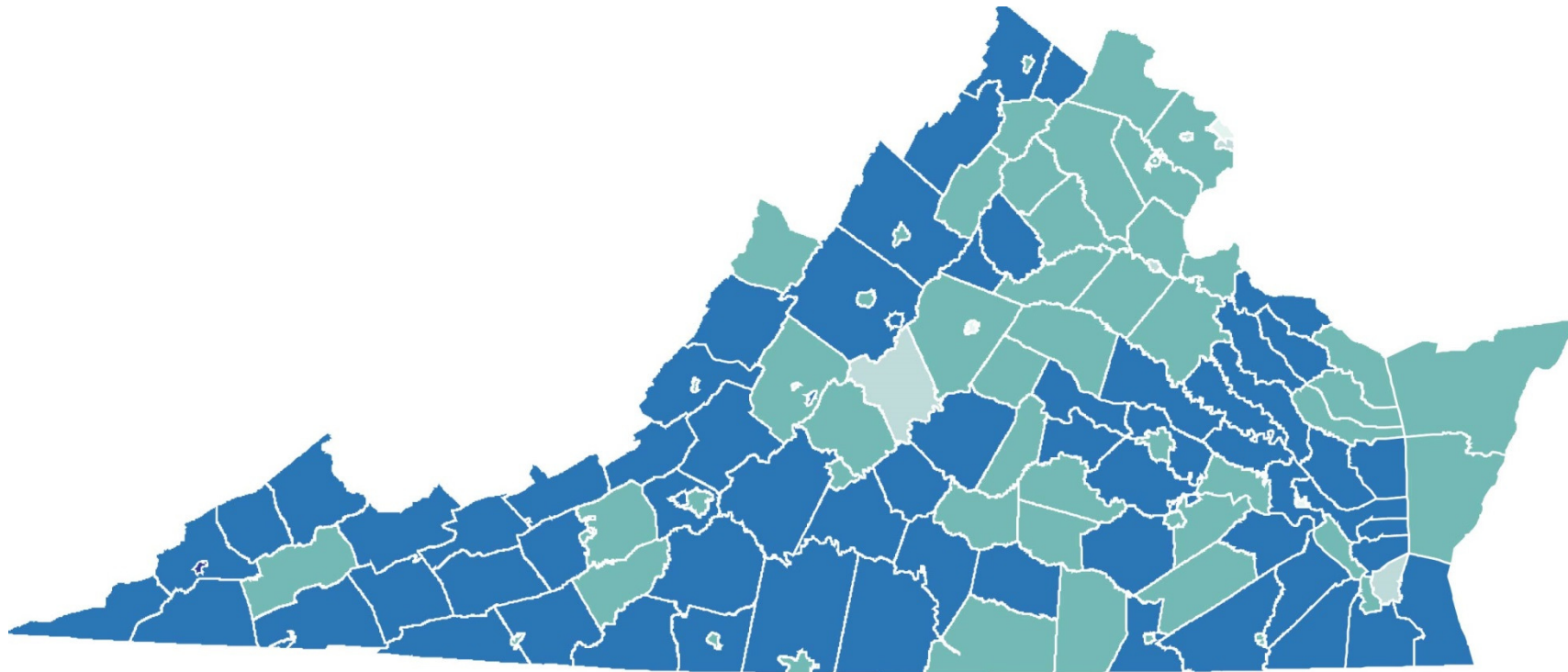


Commuting Still Matters

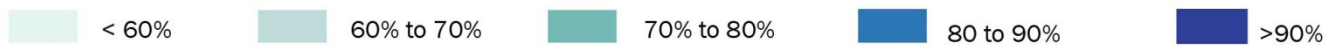
- Only 16% of all trips are commute trips
- Congestion is concentrated in the commuting hours
- Workers link commuting with trips for non-work activities such as errands and shopping



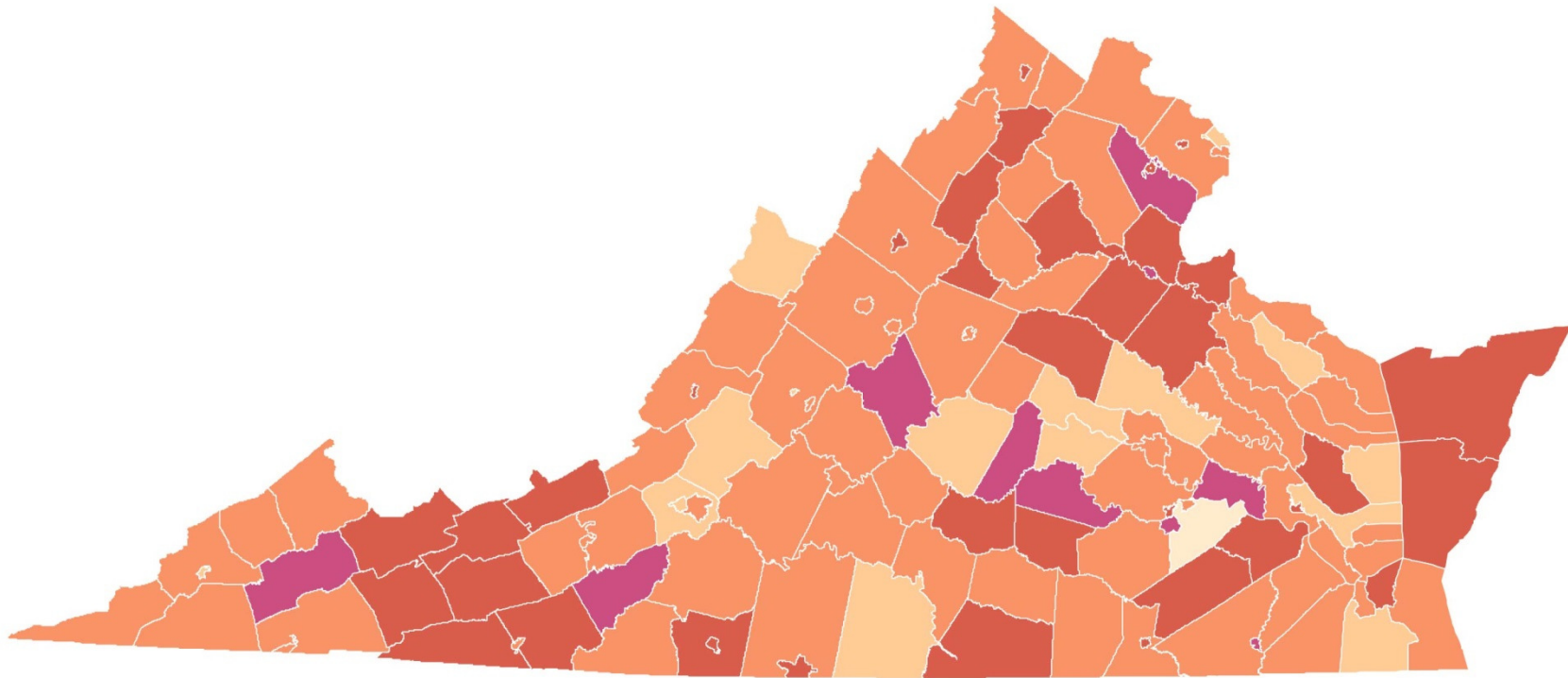
Commute Share - SOV (by Place of Residence)



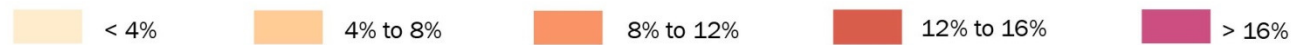
Percent of Commuters using Single Occupancy Vehicles (by Place of Residence)



Commute Share – Non-SOV



Percent of Commuters Carpooling or Ride Sharing (by Place of Residence)



Characteristics of Commuters

Counties with lowest SOV share of commute today:

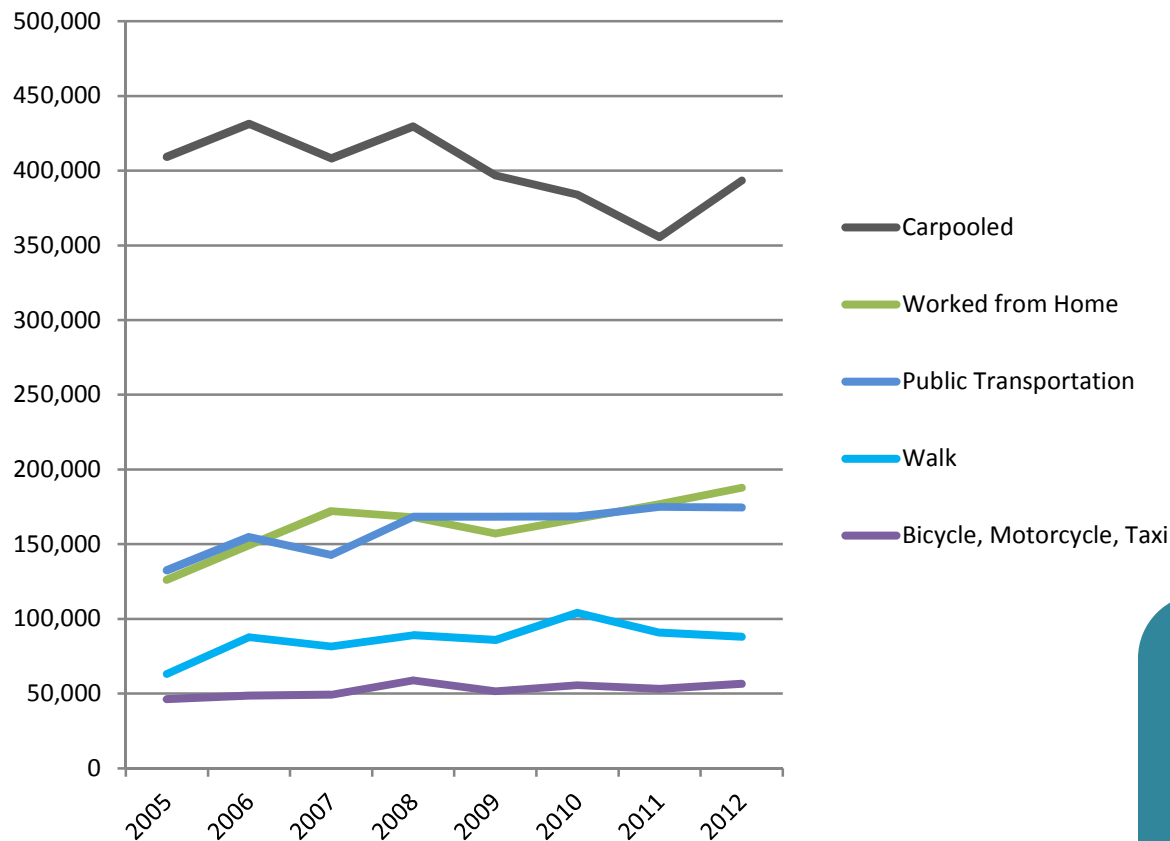
COUNTY	SOV	AUTO NON-SOV	WALK/BIKE	WORK AT HOME	BUS/RAIL/SUBWAY	OTHER
ARLINGTON COUNTY	52.79	7.37	6.51	4.80	27.24	1.28
WILLIAMSBURG CITY	57.50	13.31	21.74	4.47	2.37	0.61
CHARLOTTESVILLE CITY	58.75	10.56	16.87	5.30	7.28	1.24
LEXINGTON CITY	59.02	6.34	28.29	2.44	0.00	3.90
ALEXANDRIA CITY	60.58	8.60	4.04	3.61	22.04	1.13
FALLS CHURCH CITY	64.15	7.08	3.59	6.68	17.36	1.14
NORFOLK CITY	69.18	12.02	5.14	7.81	4.22	1.63
NELSON COUNTY	69.47	17.74	2.19	6.64	0.00	3.96
FAIRFAX CITY	69.54	14.06	2.13	4.70	9.06	0.51
FREDERICKSBURG CITY	69.84	16.47	5.65	2.63	3.73	1.68

Source: 2008-2013 American Community Survey



Travel Behavior is Changing

Commuter Trips by Mode in Virginia 2005 - 2012

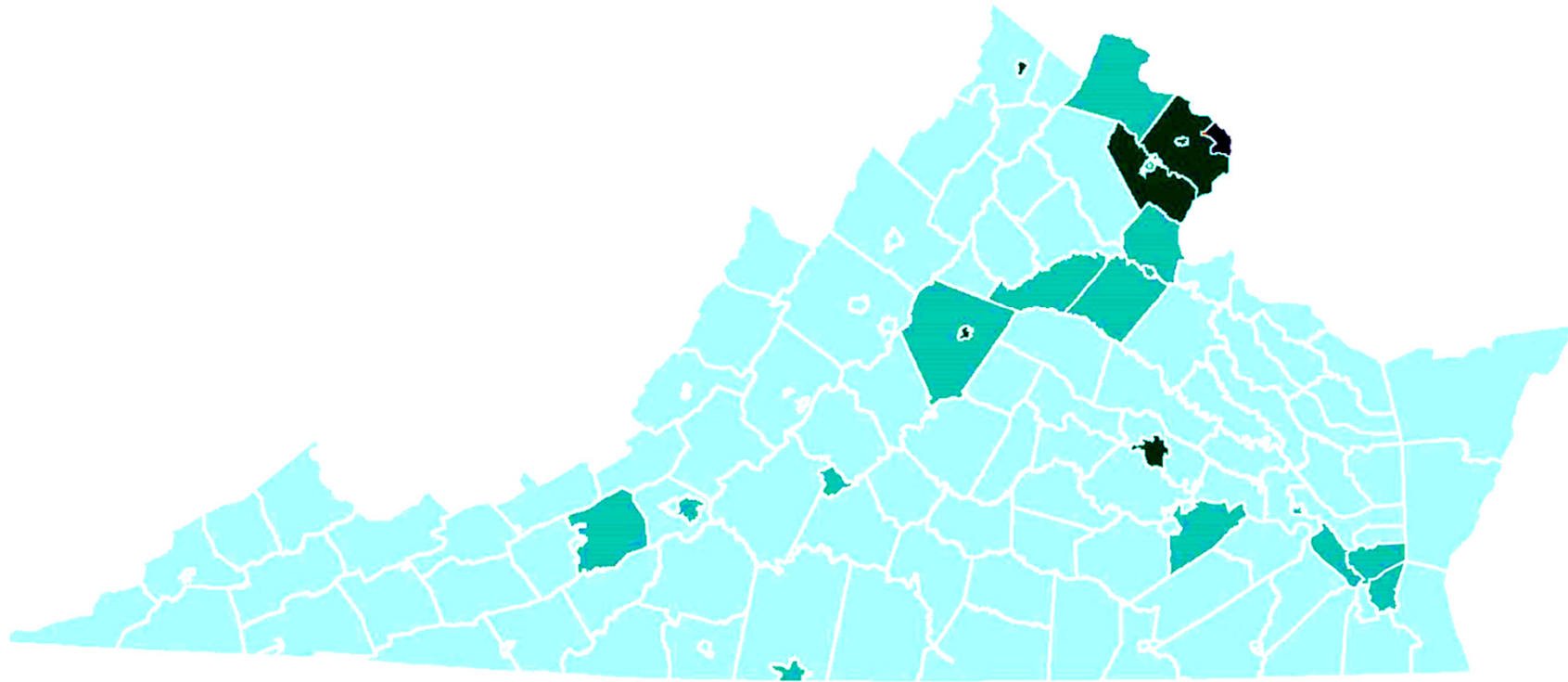


WHY IS THIS IMPORTANT?

Future transportation plans must recognize changing preferences of commuters and travelers



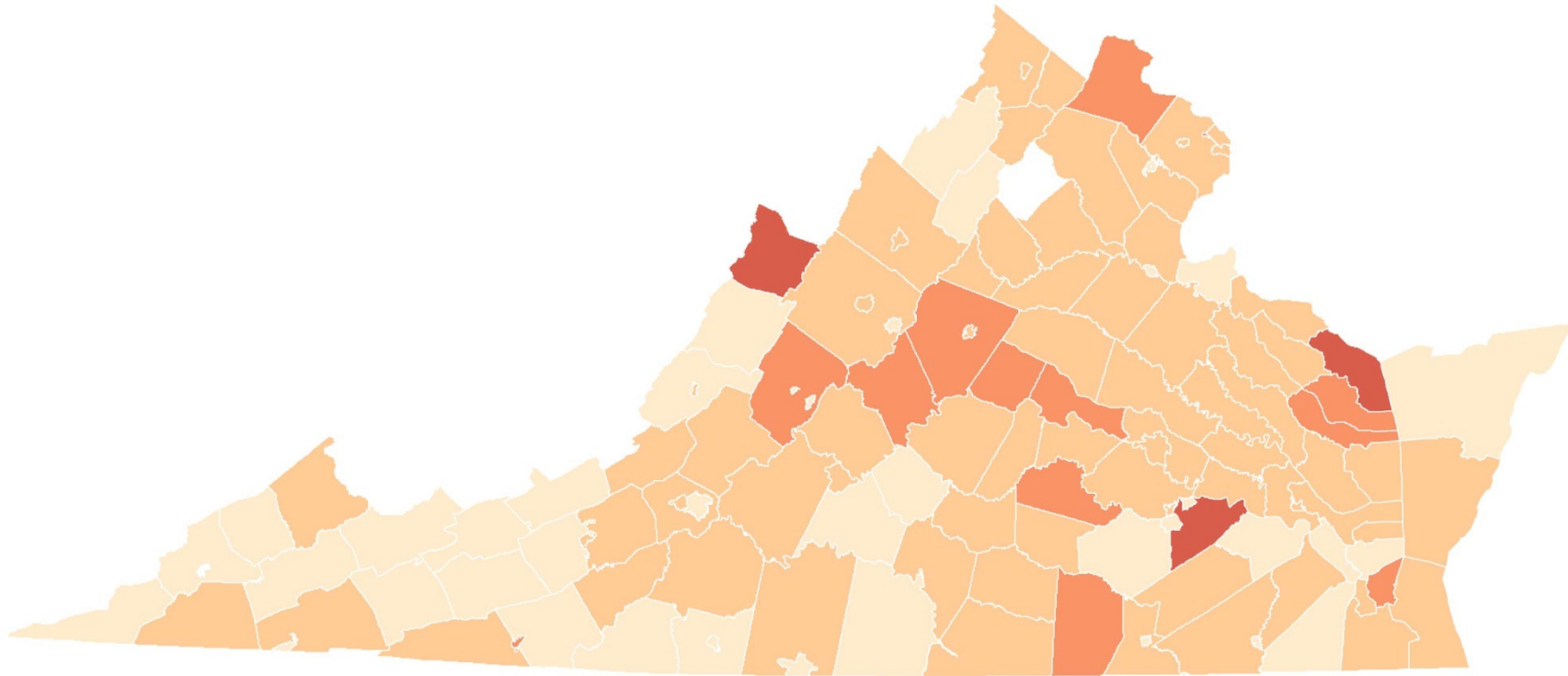
Commutate Share - Transit



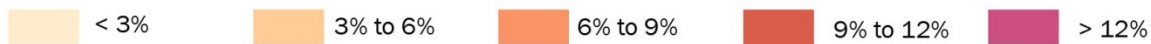
Percent of Commuters Using Public Transportation to Work (by Place of Residence)



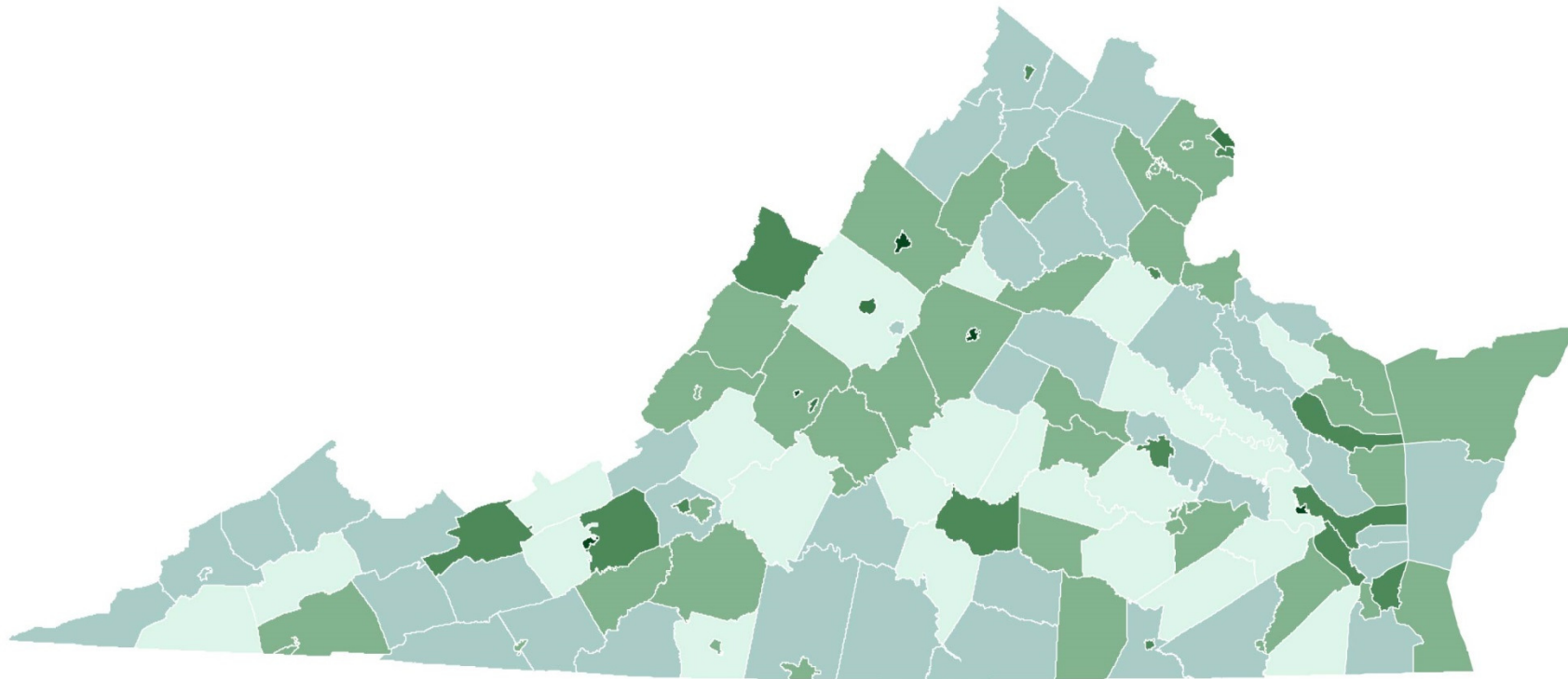
Commuter Share - Work at Home



Percent of Commuters Working from Home (by Place of Residence)



Commutate Share - Walk/Bike

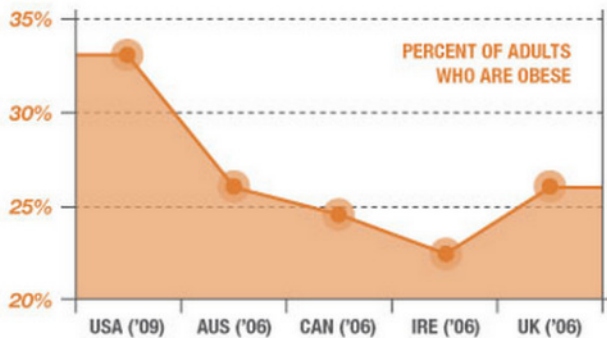
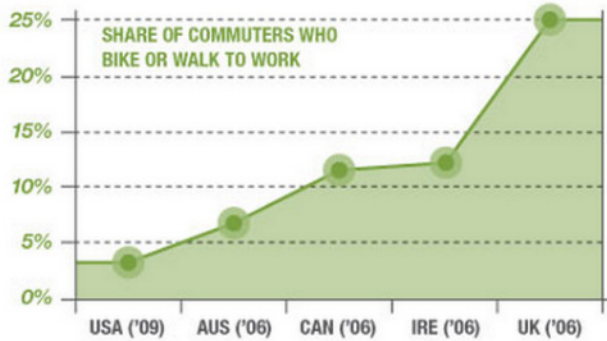


Percent of Commuters Walking or Biking to Work (by Place of Residence)



Transportation & Health

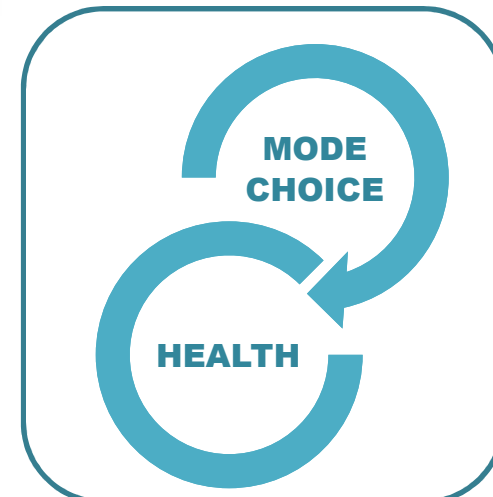
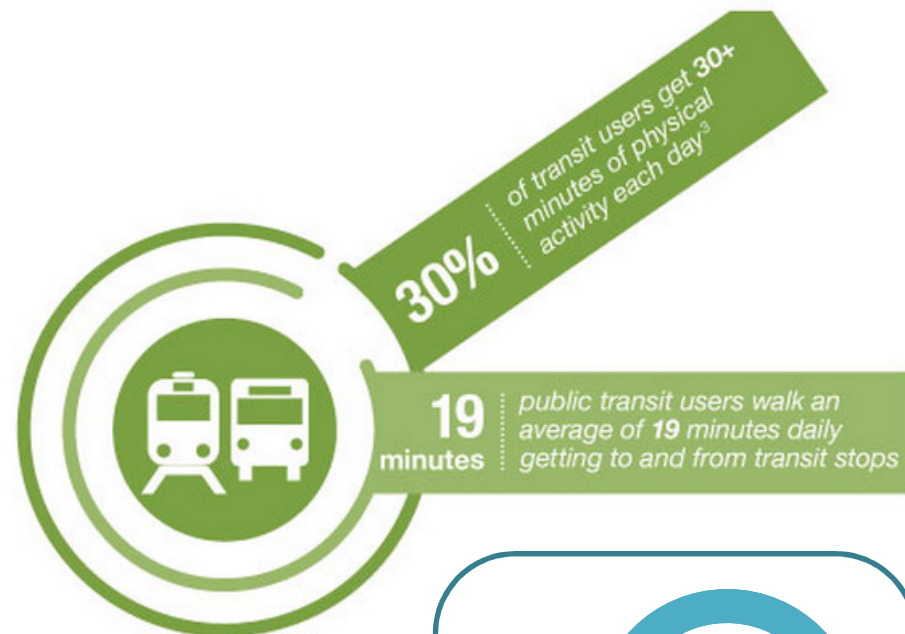
Active Commuting and Obesity Rates by Country (Source: Robert Wood Johnson Foundation)



WHY IS THIS IMPORTANT?

Walking, biking and transit commuting are linked to health benefits

Public Transit and Physical Activity (Source: Robert Wood Johnson Foundation)



Commuting and Density

- According to the US Census, the denser the population, the more likely commuters are to:
 - Walk and bike (slightly more likely)
 - Take bus/rail (significantly more likely)
- The less dense the population, the more likely commuters are to:
 - Drive alone (slightly more likely)
 - Drive with others (slightly more likely)
 - Work at home (slightly more likely)

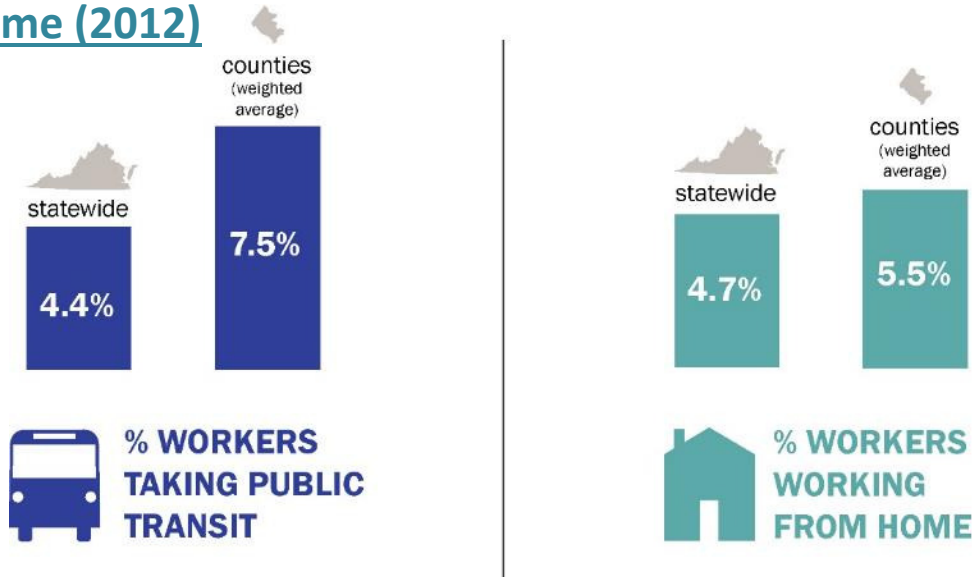


Mode & Counties with Top Industries by Payroll

WHY IS THIS IMPORTANT?

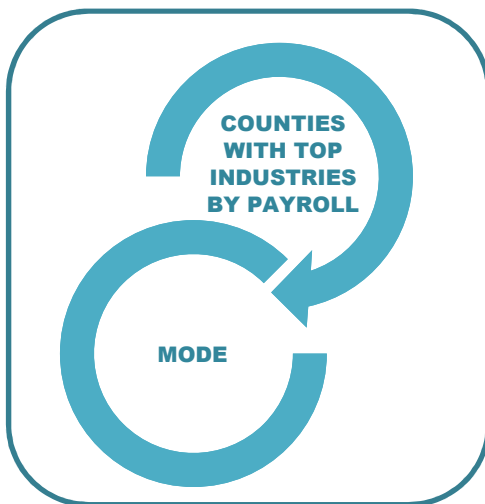
We need to understand the travel preferences of the high-payroll-industry workers to support future economic needs

% Workers Taking Transit / % Workers Working from Home (2012)



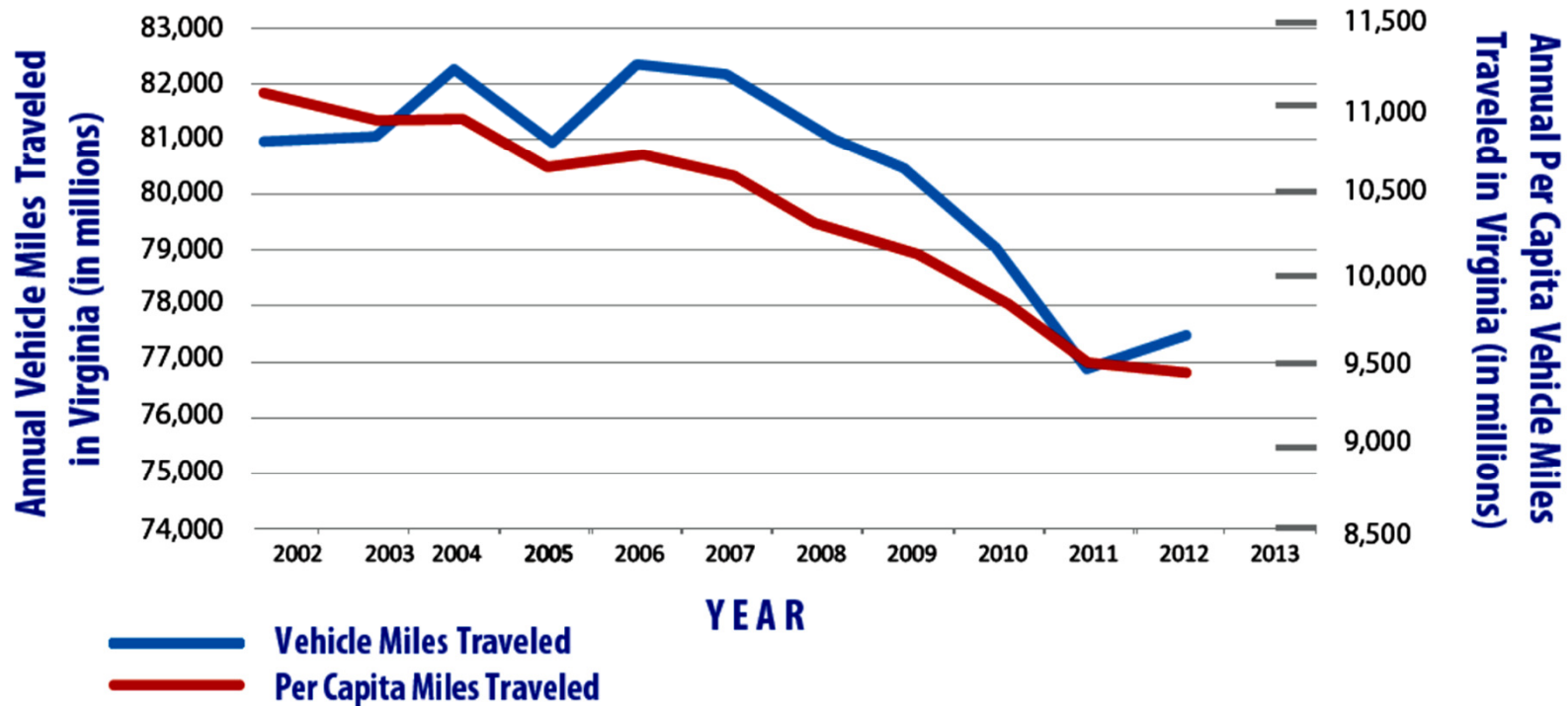
Key Mode Share Stats for Counties with Top Industries by Payroll

- 82.9% of Henrico County workers get to work in SOVs
- 15.0% of Prince William County workers carpool
- 25.2% of Arlington workers get to work using public transp.
- 4.4% of Richmond workers walk to work
- 4.0% of Richmond workers motorbike/bike to work
- 8.3% of Loudon County workers telecommute



Per Capita Vehicle Travel is Declining

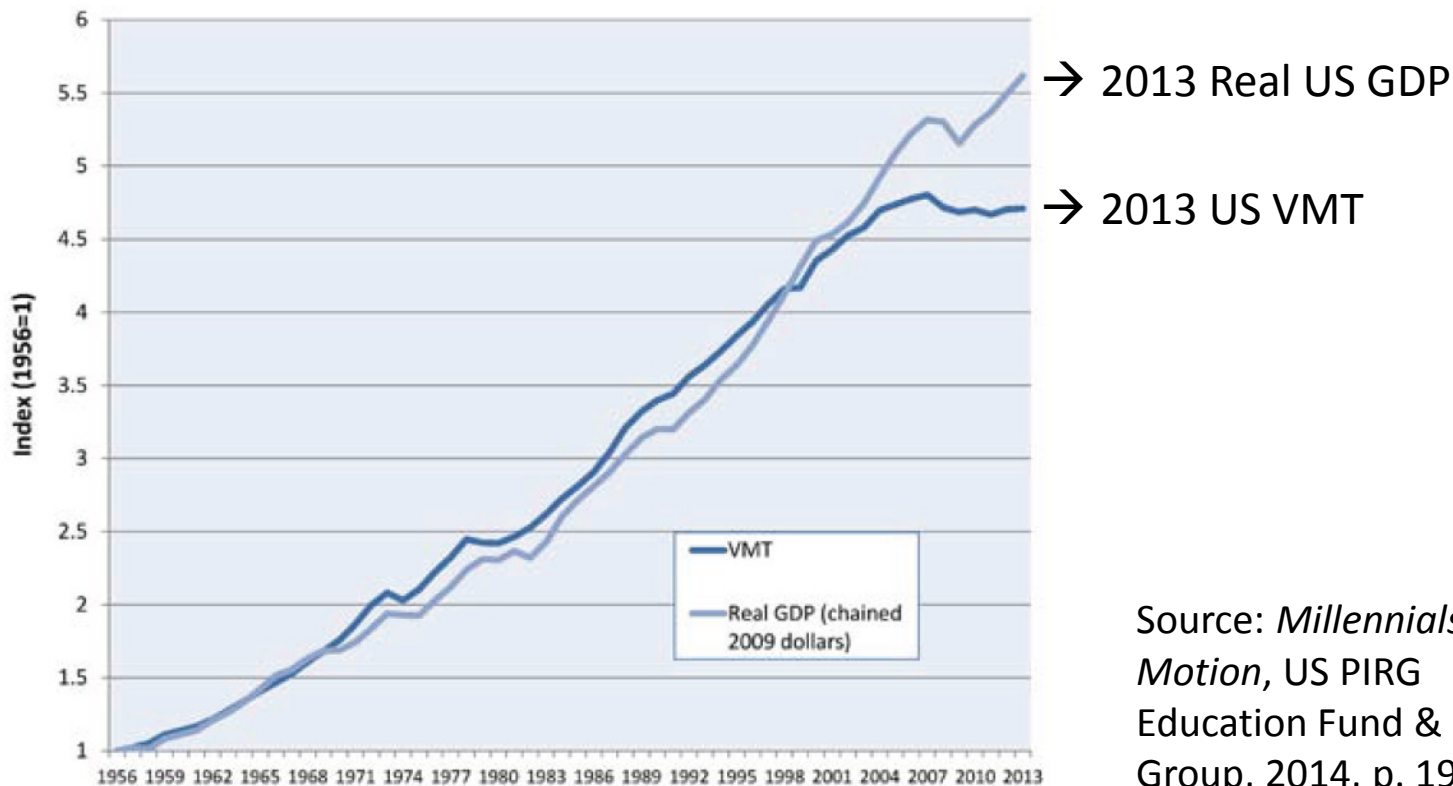
Vehicle Miles Traveled in Virginia and Per Capita Vehicle Miles Traveled, 2002-2012



FHWA Highway Statistics, Table VM-1 and CDM Smith

Per Capita Vehicle Travel is Declining

- Economic Growth is no longer directly correlated with growth in travel.



Source: *Millennials in Motion*, US PIRG Education Fund & Frontier Group, 2014, p. 19.

