Virginia's Long-Range Multimodal Transportation Plan

2007-2035

REGIONAL ACCESSIBILITY

Prepared for:
Office of Intermodal Planning and Investment
October 2009

Prepared by:
Renaissance Planning Group
Wilbur Smith Associates

ABBREVIATIONS AND ACRONYMS

DOAV	Department of Aviation
DMV	Department of Motor Vehicles
DRPT	Department of Rail and Public Transportation
CoSS	Corridors of Statewide Significance
CTB	Commonwealth Transportation Board
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GDP	gross domestic product
GHG	greenhouse gas
GIS	geographic information system(s)
HOV	high-occupancy vehicle
MWCOG	Metropolitan Washington Council of Governments
MPO	Metropolitan Planning Organization
PDC	Planning District Commission
PTAL	public transport accessibility level
RC	Regional Council
NCPA	National Center for Policy Analysis
SSAR	secondary street acceptance requirements
TDM	travel demand management
TOD	transit-oriented development
TUF	transportation utility fee
UDA	urban development area
VDOT	Virginia Department of Transportation
VMT	vehicle miles of travel
VPA	Virginia Port Authority

TABLE OF CONTENTS

WHAT IS REGIONAL ACCESSIBILITY?

Getting from A to B Within a Region

Regional accessibility is *the ability to move from A to B* within a defined region. It includes trips that are made within a community or activity center, and those that are made from one activity center to another in the same region. Highly accessible communities provide their residents and businesses a variety of choices to reach virtually any given destination. They have interconnected infrastructure that allows safe, convenient travel by all modes.

Because it affects so many daily trips -- to work, shopping, school, social events, entertainment venues, and more – the quality and reliability of a region's transportation network plays a critical role in its economic success. If the commute to work takes a half-hour one day and an hour the next, commuters and their employers pay the consequences of lost productivity and family time. In extreme situations, residents and businesses may choose to leave a community altogether rather than continuing to lose money and time dealing with poorly functioning regional networks. Conversely, communities with robust, reliable regional networks can attract growth and manage change more easily.

What Makes a Place Accessible?

There are three key components of regional accessibility: proximity of activities, multi-modal connectivity, and transportation choices.

Proximity of Activities

Providing a variety of activities within a region can shorten trip lengths, reduce the "need for speed" and create opportunities for more modal choices. When daily destinations are far apart, people have few alternatives to driving on high-speed corridors for frequent trips. As overall demand grows, longer distances between origins and destinations increase the vulnerability of all travelers to delay and bottlenecks from congestion and incidents.

Multimodal Connectivity

Connectivity is a second key component of regional accessibility. Local street networks that strategically connect to regional roadways offer a variety of route choices for local destinations, and can keep longer-distance traffic separate from local traffic, ultimately reducing congestion. Bicycle routes and sidewalks that are continuously connected to origins and destinations can encourage non-motorized travel by providing convenient and safe alternatives to walking or riding directly on busy roadways.

Within each mode, connectivity is important. For example, connected streets contribute more to regional accessibility than cul-de-sacs. Bus routes should extend to all major activity centers and residential areas. Sidewalks should be continuous, with crosswalks and curb ramps, while bicycle facilities should include seamless transitions from separate bike lanes to extended shoulders and off-road paths.

To ensure a region has adequate accessibility, it is also important to look at connectivity *among* modes. Continuity and modal linkages are key. For example, a transit service may have extensive geographic coverage and frequent headways, but if the curb at the bus stop is too high,

the sidewalk is broken or the street is unsafe to cross, the system is not easily accessible. Local bus routes connected to complete pedestrian networks and to regional mass transit make transportation without a car viable.

Transportation Choices (Modes and Routes)

Regional and local transportation systems are stronger when there are multiple choices of travel modes and routes. Good systems make it easy and convenient to transfer among modes, providing seamless networks for passengers and freight.

Transportation networks that provide multiple route options are more resilient in the face of congestion, accidents and incidents. Travelers value choices when it comes to thinking about places to shop, eat and recreate within a reasonable distance. Modal options also allow travelers to reach their destinations when their prior or usual mode of travel is unavailable or no longer desirable.

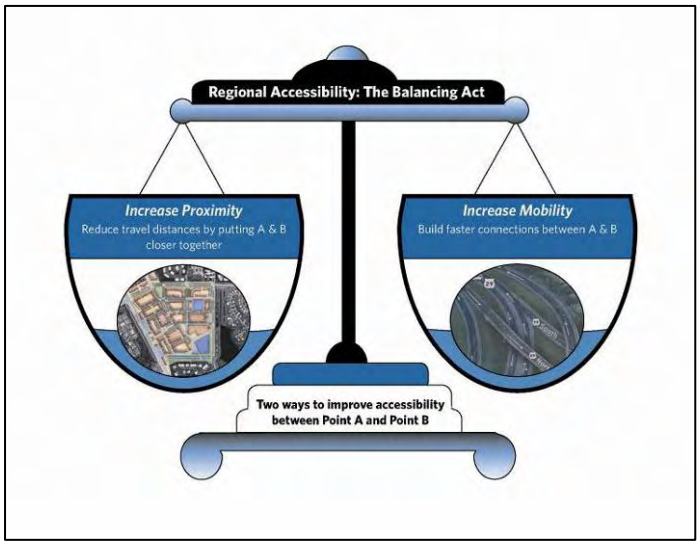
Balancing Proximity and Mobility

In order to achieve a more sustainable, cost-efficient transportation system for the residents and businesses of the Commonwealth, Virginia needs to balance high-speed mobility at the statewide scale with more proximate, connected activities at the regional scale (Figure 1).

Researchers have found that human beings across all types of cultures and communities spend, as a group, about five percent of their day traveling. "On average," says engineer Andreas Schafer, "residents in African villages, the Palestinian Territories, and the suburbs of Lima spend between 60 and 90 minutes per day traveling, the same as for people living in the automobile-dependent societies of Japan, Western Europe, and the United States." [i]

Figure 1. Balancing Proximity and Mobility

Source: Renaissance Planning Group & Wilbur Smith Associates



In order to stay within a desirable "travel time budget," people need to either live close to their destinations or use high-speed methods to reach them. When the dominant mode of transportation is on foot or by slow-moving vehicles, communities tend to be fairly compact so that people can stay within the preferred window of total daily travel time. When higher-speed transportation modes such as rail and highways are available, people can move farther away from daily destinations without spending more than about five percent of their day traveling.

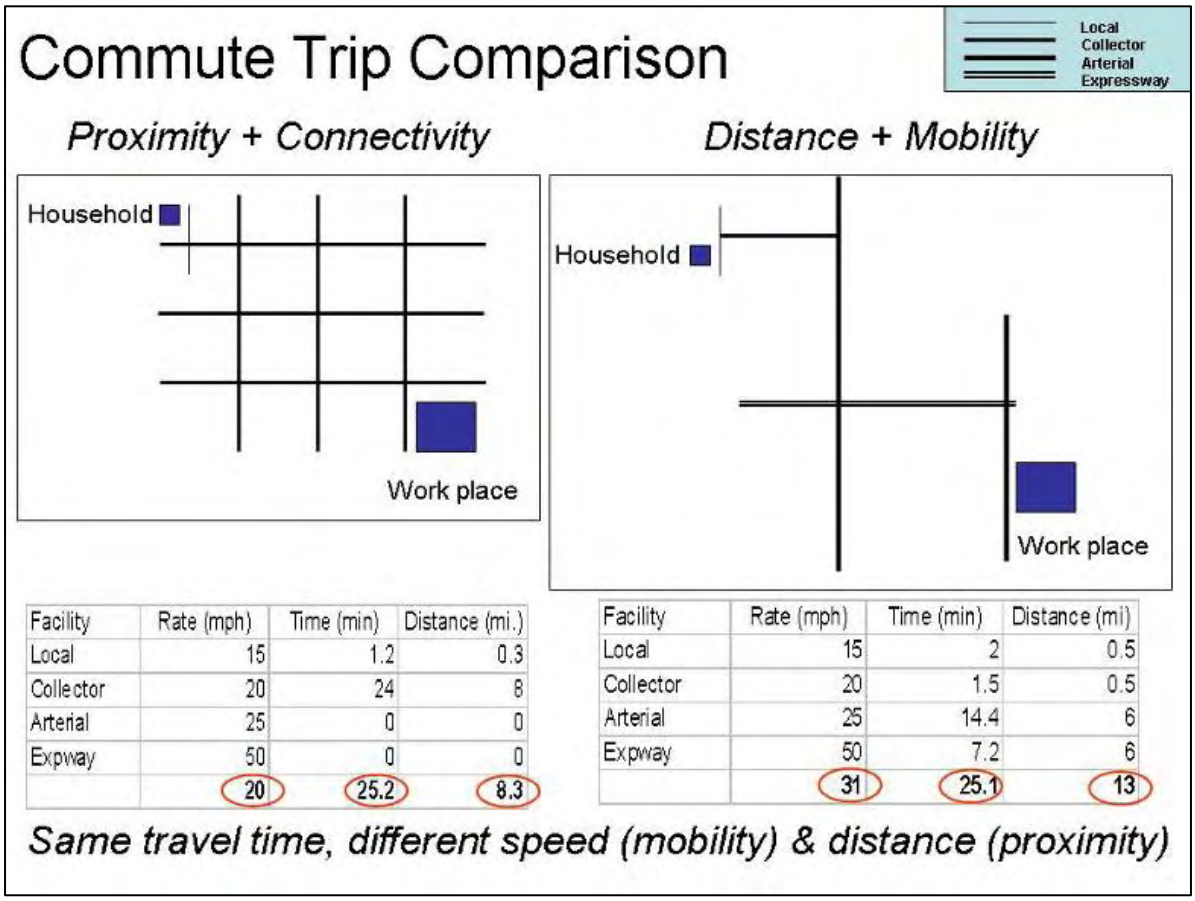
As shown in Figure 2, a person who lives eight miles from work could get there in about 25 minutes using a local street network at an average speed of 20 miles per hour. If one street is closed or congested, the commuter could use a number of alternative routes. Or, given the network's relatively compact block size and low-speed streets, the commuter may also be able to

bike or use transit to get to work. Another person might live 13 miles from his or her workplace but could also get to work in 25 minutes by using a higher-speed street network that allows for an average speed of 31 miles per hour.

However, if the high-speed facility deteriorates or becomes unreliable due to congestion, the commuter living further away may have fewer transportation choices, in terms of routes and/or modes. Ultimately his or her "travel time budget" can be stretched to the breaking point, especially if other daily destinations, such as shopping and school, are also far from home.

Figure 2. Commute Trip Comparison – Proximity Model vs. Mobility Model

Source Renaissance Planning Group



Facility	Rate (mph)	Time (min)	Distance (mi.)
Local	15	1.2	0.3
Collector	20	24	8
Arterial	25	0	0
Expway	50	0	0
	20	25.2	8.3

Facility	Rate (mph)	Time (min)	Distance (mi)
Local	15	2	0.5
Collector	20	1.5	0.5
Arterial	25	14.4	6
Expway	50	7.2	6
	31	25.1	13

American suburbs and towns built before World War II were typically organized along rail transit lines and reflected a balance of mobility and proximity. Communities featured a mix of interconnected activities within close proximity of each other as well as high-speed connections to larger urban centers. People might use the train for commuting or long trips, but usually walked or drove short distances for other daily trips.

After World War II, suburban growth across America and within Virginia was organized along high-speed highways. The resulting dispersed pattern of development is difficult to serve cost-effectively with transit, bicycle and pedestrian modes. As the automobile became the prevalent transportation mode, commercial growth gravitated toward arterial highways, which

are not usually designed to accommodate pedestrians, bicyclists, and transit riders. “Bedroom” residential growth spread along narrow secondary roads, which are also not usually designed to accommodate pedestrians, and which can be difficult to widen in order to accommodate bicycles or increased vehicle traffic.

In most of Virginia’s suburban communities and towns today, people depend upon automobiles for virtually every trip. This has led to a cycle of ever-increasing traffic on local, regional and statewide networks, and to ever-increasing household costs. Researcher Yacov Zahavi found that households throughout the world which rely exclusively on non-motorized modes of transport and public transportation spend only about 3% to 5% of their income on travel, but the percentage rises to 10% to 15% for people who own at least one motor vehicle.[ii] Strategies to “right the balance” of proximity and mobility in Virginia’s communities can help the Commonwealth stabilize increasing rates of traffic congestion and provide its residents and businesses a broader array of travel choices and costs.

WHY INVEST IN REGIONAL ACCESSIBILITY?

To Strengthen Economic Competitiveness

Virginia is in competition with other states and ports to attract and retain businesses and jobs. To improve Virginia's productivity, profitability, and competitive advantage, decision-makers should make every effort to ensure top-notch accessibility to and within its economic engines: urban regions.

Across America, the top 100 metropolitan areas contain the bulk of the assets of the national economy (college graduates, patents, US air cargo weight and public transportation miles). These areas collectively generate 75% of the nation's GDP, even though they only contain 65% of the population and 12% of its land area. [iii]

Given the importance of urban regions to our statewide and national economy, it is imperative to ensure that their transportation networks function as smoothly as possible. According to the Texas Transportation Institute, America's 439 urban areas lost $87.2 billion in wasted time and fuel during the year 2007. [iv] When travel delays on main highways and transit systems are lessened by the availability of alternative routes and modes, employers and shippers can realize significant monetary savings in congestion-related costs.

Regions with high accessibility can more easily accommodate the travel demands generated by new growth, which helps them promote and sustain higher levels of economic activity. With a diverse network of routes and mode choices, accessible regions can accommodate changes in travel demand by making incremental adjustments and expansions to connections and routes. These types of multimodal improvements to regional networks can, in many cases, be less costly than major highway expansions, especially in developed areas where right of way is scarce.

When accessibility to a given area is improved, it becomes more attractive to prospective residents and businesses. Customers are attracted to retailers that are easy to find and easy to reach. Employers want to locate their businesses in highly accessible communities, not only to support productivity among existing workers, but also to help them recruit and retain high quality employees.

As more jobs are drawn to a community, more people are attracted to that community. Land values may rise because people place a high value on having choices of locations in which they can live, work and play as well as choices among travel routes and modes. Regional accessibility thus serves as a catalyst for long-term economic growth. However, if the quality of the regional network does not keep up with growth, employers may begin to experience productivity problems and difficulty attracting top-quality new employees.

Good regional accessibility that complements strong statewide mobility allows businesses to save money and time getting their goods to market. It also improves quality of life, making it easier for employers to attract high-quality employees. As stated by the Fairfax County Economic Development Authority, "…the old rules governing business location and attraction are antiquated. Successful companies today consider moving to regions where they will find the kind of knowledge workforce they need to flourish, and not force employees to have to move to where the company is based." [v]

To Optimize Limited Transportation Resources

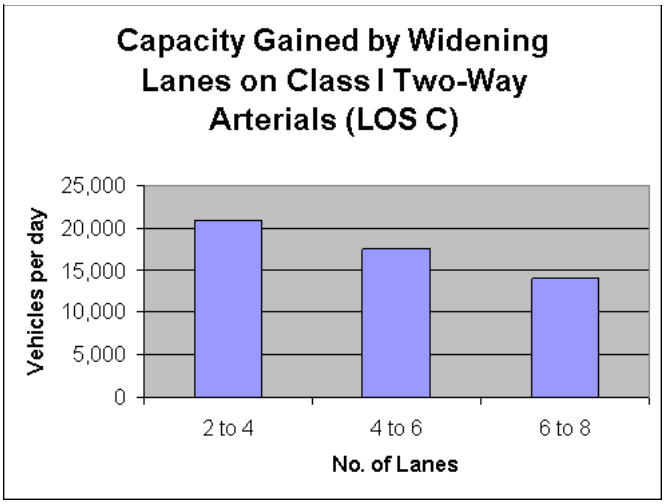
Virginia's transportation agencies, like all public agencies across the United States, are facing a funding crisis that is likely to last for many years. The need for transportation maintenance and improvement projects keeps rising, while the actual amount of funds available for transportation keeps dwindling. It is of utmost importance to optimize every transportation investment by making sure it provides the highest level of public benefit, and by managing travel demand in order to minimize the need for costly capacity expansions.

Well-designed, multimodal regional networks improve the efficiency and performance of the entire transportation system. They also provide a broader array of options for handling congestion related to regional economic growth compared to networks designed for long-distance mobility.

Striving for a better balance between mobility and accessibility is of critical importance in regions where congestion solutions are otherwise dependent upon highway expansions. Widening an arterial corridor from two lanes to four lanes does significantly increase its capacity in the short-term. However, if other regional networks, transportation modes, and development patterns are not adjusted to meet growing demands, traffic along the corridor often grows to the point where more lanes are necessary. If the community relies on the corridor as an economic "spine," land values and development usually increase along with traffic, which increases the cost of acquiring right-of-way in terms of dollars and community impacts.

To exacerbate this problem, the effectiveness of arterial highway expansion diminishes in proportion to the size of the highway. As shown in Figure 3, widening a two-lane arterial to four lanes allows it to carry some 20,000 more vehicles per day. However, adding another two lanes only increases the capacity by another 17,000 vehicles per day, and widening it again to eight lanes adds capacity for less than 15,000 more vehicles per day. In short, as the costs of additional arterial highway expansions increase, the relative benefits of these investments tend to decrease.[vi]

Figure 3. Relative Capacity Gained by Lane Expansions
Source: Renaissance Planning Group



To Preserve Statewide Mobility

Statewide mobility and regional accessibility differ in scale and purpose. Trips from one region to another, such as Danville to Washington DC, are made on highway and rail corridors designed for high-speed mobility. The Corridors of Statewide Significance (CoSS) identified in VTrans2035, for example, serve important functions of statewide mobility. Some corridors serve dual purposes, carrying both regional and statewide traffic.

The performance of statewide networks is influenced by the quality of regional networks, and vice versa. When people have a variety of locally-oriented routes and modes available for daily travel, they can more easily choose to avoid using statewide facilities for trips within their

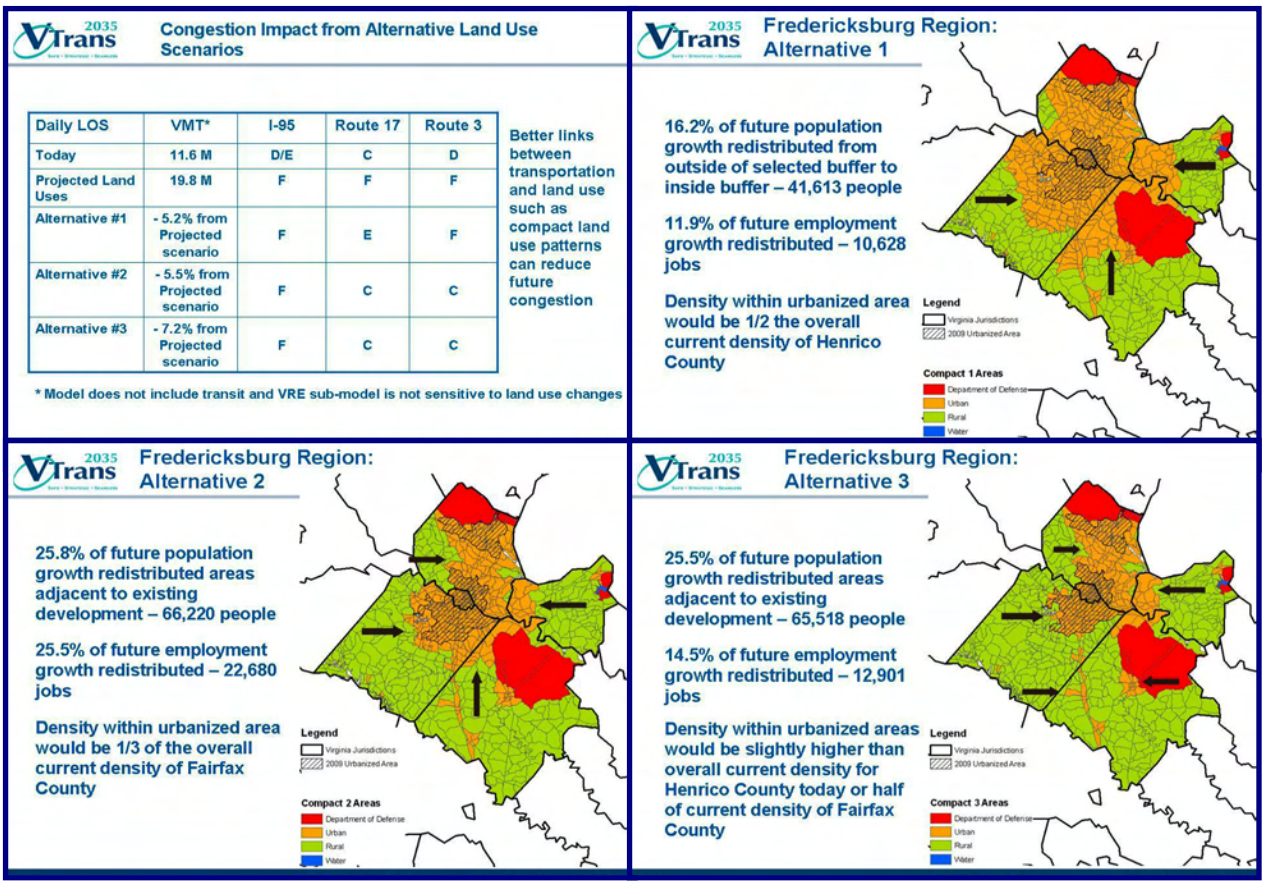
region. And when statewide facilities are functioning well, long-distance travelers and freight haulers are not pressed to look for short cuts on local roads.

Multimodal regional accessibility investments, complemented by land use strategies that bring jobs and households closer together, can help communities preserve the capacity of existing corridors by providing a more robust array of travel networks and choices. As shown in Figure 4, a recent VDOT study indicated that capacity along Route 17, Route 3 and I-95 in the Fredericksburg region is expected to fail by the year 2035. The analysis assumed that all improvements in the regional constrained long range plan were constructed, but recent funding projections indicate this will not be possible, which means alternative solutions must be considered.

The study indicated that even relatively modest shifts in the location, density and proximity of new households and jobs, could preserve or even improve the capacity of Route 3 and Route 17. If additional factors were considered, such as the potential to add transit services and local roadway, bicycle and pedestrians networks in these denser communities, traffic models would likely show even greater benefits to these corridors, and may have a more significant impact on congestion along I-95.

Figure 4. Fredericksburg Region Alternative Land Use-Transportation Scenarios

Source CTB Presentation 10/14/09, Assistant Transportation Secretary Nick Dohonue



To Preserve the Natural Environment

A 2009 report by the US Environmental Protection Agency (EPA) indicates that fossil fuel combustion for transportation is responsible for a third of America's CO_2 emissions, which are an important ingredient of the "greenhouse gases" associated with global climate change. The three most prominent factors affecting the transportation sector's emissions are the fuel economy of vehicles on the road, the types of fuels used, and the overall amount of driving by all vehicles, expressed as vehicle miles traveled (VMT). [vii]

In December 2008, the Virginia Governor's Commission on Climate Change produced a report for an action plan with aggressive goals for greenhouse gas emissions reductions. One of these goals is directly related to regional accessibility: "Virginia will reduce GHG emissions related to vehicle miles traveled through expanded commuter choice, improved transportation system efficiency, and improved community designs."

Investments in regional accessibility can directly affect VMT. When origins and destinations are closer together within pedestrian-friendly environments, people can – and do – choose to walk, bike, take transit, or carpool instead of driving alone. Studies show that improving the proximity and connectivity of activities can reduce the overall number of vehicle trips generated within a given area by as much as 25%. [viii] In addition, relieving bottlenecks on higher-speed roadways reduces the amount of time vehicles idle in traffic congestion, further reducing the amount of CO_2 released into the air.

By reducing the need for separate auto trips to all destinations (work, dry cleaners, grocery store, daycare, etc), local businesses can require less parking. By reducing the need for more roads and parking lots, communities can reduce the amount of impervious surface areas as well as reducing overall VMT and air pollution. The combined effect of these changes could improve water quality by reducing the amount of pollution washed into streams and rivers during rainstorms.

In addition, by promoting more compact, efficient development patterns, regional accessibility can help communities preserve open space and reduce the overall "footprint" of development. This is especially important in Virginia, where land consumption for development exceeds the population growth rate by 250%. [ix]

To Improve Community Quality of Life

Regional accessibility directly influences Virginia's economy and the quality of life of its residents because it affects the amount of *time and money* people and businesses spend on transportation. When daily or weekly trips are easy to access, people can spend less time traveling and more time working, relaxing, and being with their families. Strong multimodal regional networks also help people reduce household expenses on gasoline and car maintenance, and can reduce the need for costly expansions and maintenance on major arteries.

In addition to helping people save time and money spent on transportation, improved regional accessibility can provide valuable mobility options, particularly for Virginia's older adults and children. Over the coming 25 years, the number of older residents (seniors age 65 and older) in the US is expected to more than double. [x] While Virginia's population is expected to grow by 39% from 2000 to 2030, the population of seniors (age 65+) is expected to grow by 133%. Seniors now account for 11% of Virginia's population. By 2030, that proportion will grow to 19% [xi]

In order to maintain the independence and well-being of older adults, regional accessibility investments must provide a viable array of alternatives to the automobile. A 2006 study by the Northern Virginia Transportation Commission (NVTC) [xii] found that "seniors from walkable, mixed-use urban and town areas are more mobile, taking 20% more trips each week than those from suburban and exurban areas. They are also less likely to be socially isolated. Only 16% of seniors from urban and town communities were found to not have gotten out the previous day, compared to 22% of those from suburban and exurban areas."

In addition, improved regional pedestrian and bicycle networks create opportunities for everyone, especially the growing population of obese children, to get more exercise as part of everyday life. According to the Centers for Disease Control and Prevention, 17% of children aged 6-19 (over 9 million young people) are obese. That percentage has tripled since 1980.[xiii]

Research indicates that communities with multimodal regional transportation networks that encourage walking as part of daily life tend to have lower obesity rates. An international study on walking, cycling and health indicators across Europe, North American and Australia suggests that "active transportation is inversely related to obesity." [xiv] The study noted several regional accessibility factors that contribute to Europe's higher mode shares for non-motorized transportation, and its related lower obesity rates, including:

- Compact, dense cities with mixed land uses that generate short trips,
- Extensive, safe and convenient facilities for walking and cycling; and
- Coordination of public transportation with walking and cycling to transit stations and stops, including bike parking, as well as safe sidewalks and bikeways.

PLANNING FOR REGIONAL ACCESSIBILITY

To understand what makes regional accessibility function well, it is helpful to understand several of the factors of the built environment that affect travel demand and behavior. The careful integration and balance of these elements is crucial to creating centers of activity where residents, employees, goods, and visitors can move around by a variety of modes.

Land Use Patterns and Urban Form: The "Five Ds"

Over the past several years, researchers have identified five specific characteristics of urban form and regional development patterns that strongly influence travel demand, mode choices and traffic impacts such as vehicle miles traveled. Nicknamed "the Five Ds," these factors are density, diversity, design, destination accessibility and distance to transit. [xv]

Density

Density refers to the number of households, jobs and activities within a given area. It allows for a larger number of residents and/or employees to be located within close proximity (typically a quarter- to half-mile) of daily destinations. It directly influences the number of person-trips generated within an area, and is fundamental to economically viable, financially feasible transit service.

Density is often measured in terms of dwelling units per acre and floor area ratio (FAR) of commercial buildings (the total building area divided by the total lot area). Other variables that affect density include the number of housing units, lot coverage, building and structure height, open space, and parking location and supply. Generally, bus transit is supported in areas of seven or more dwelling units per acre and/or commercial FARs of 0.5. Light rail transit is supported with FARs of 2.0 or greater. Figures 5 and 6 provide illustrations of transit thresholds for FAR and for housing density.

Figure 5. Density for Different Transit Types

Source: Wikipedia

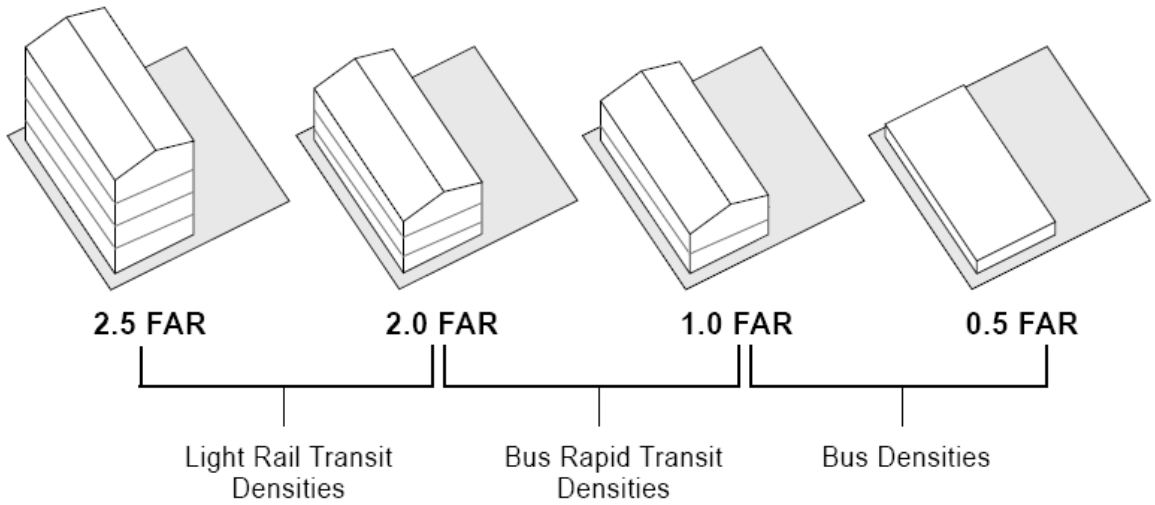
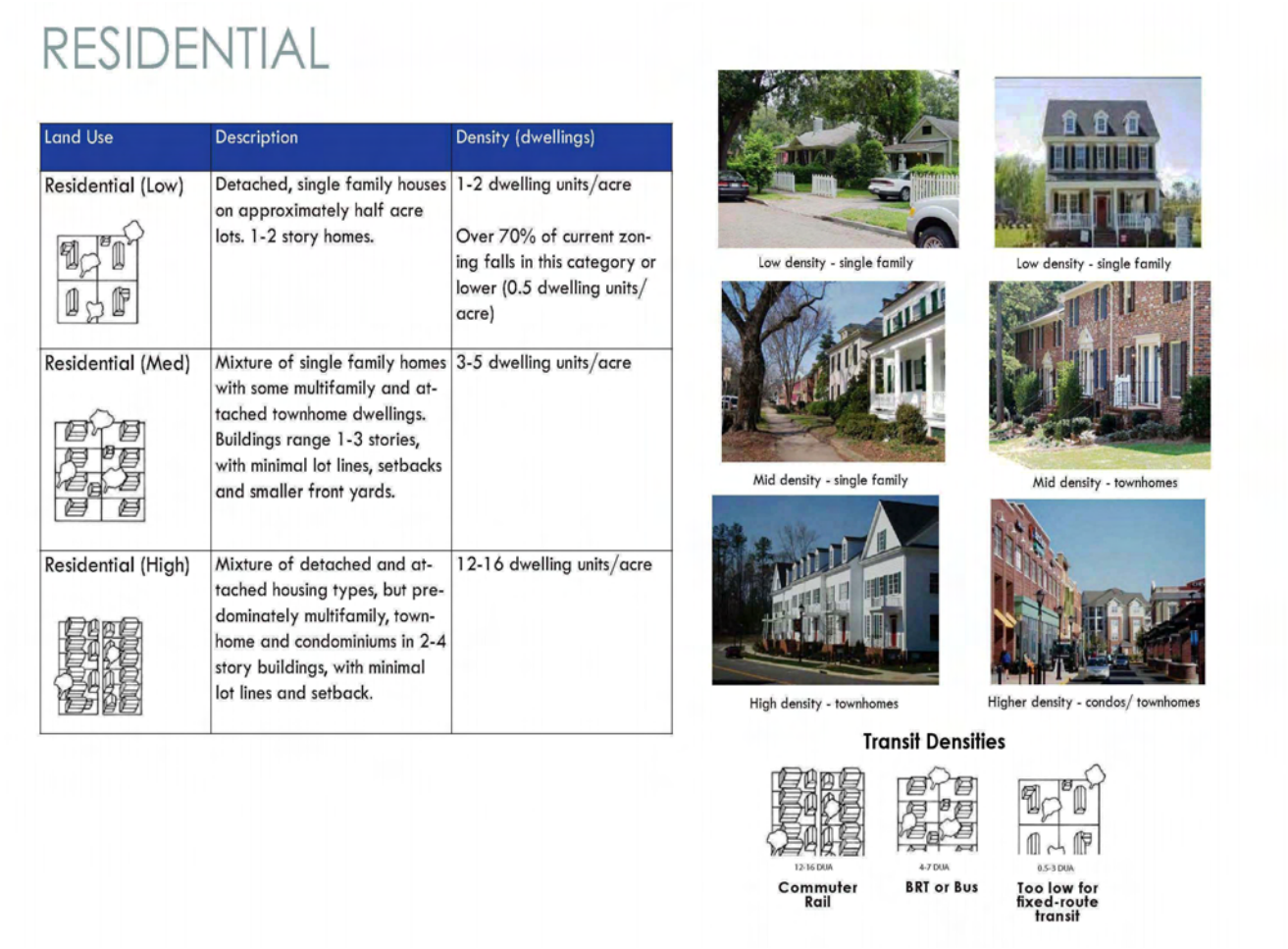


Figure 6. Housing Density Illustrations

Source: Renaissance Planning Group for the Town of Ashland



RESIDENTIAL

Land Use	Description	Density (dwellings)
Residential (Low)	Detached, single family houses on approximately half acre lots. 1-2 story homes.	1-2 dwelling units/acre Over 70% of current zoning falls in this category or lower (0.5 dwelling units/ acre)
Residential (Med)	Mixture of single family homes with some multifamily and attached townhome dwellings. Buildings range 1-3 stories, with minimal lot lines, setbacks and smaller front yards.	3-5 dwelling units/acre
Residential (High)	Mixture of detached and attached housing types, but predominately multifamily, townhome and condominiums in 2-4 story buildings, with minimal lot lines and setback.	12-16 dwelling units/acre

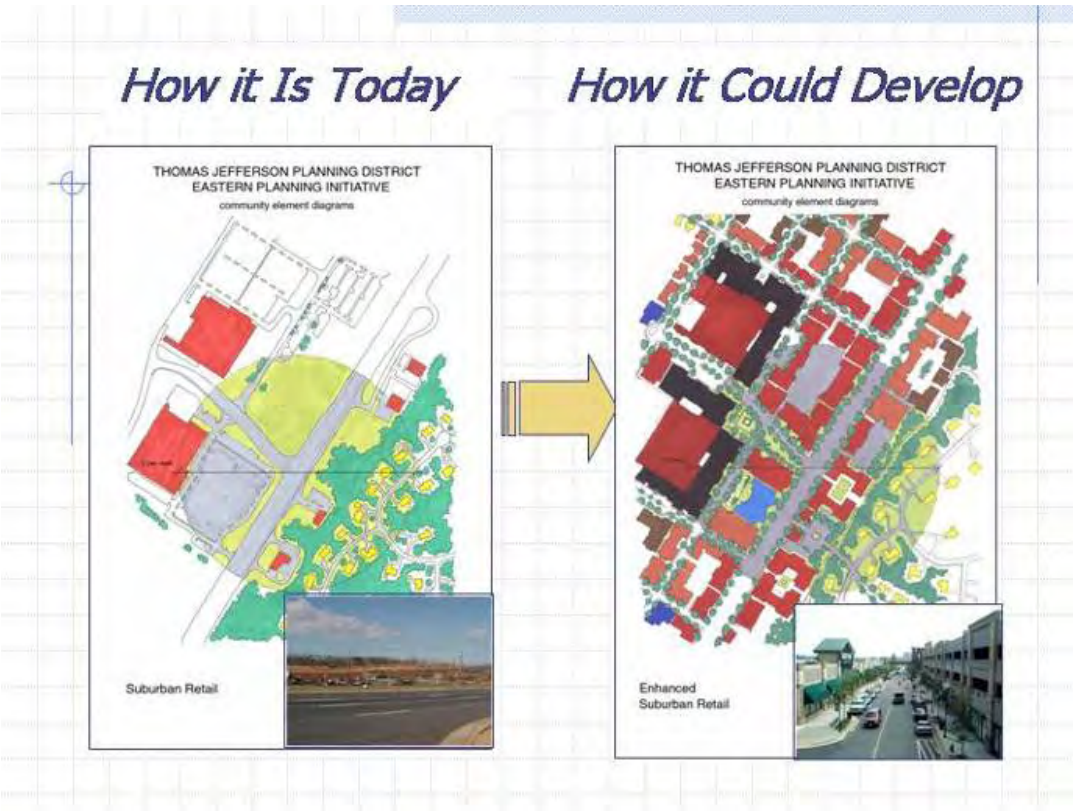
Diversity

Diversity is the presence of multiple land uses serving a variety of needs (including public open space) and the degree to which their locations are balanced across the area. Few trips are made between similar land uses; seldom does one travel from one home to another home, for example. Rather, trips are usually made between different yet complementary uses, like a trip from home to work or from work to lunch.

Diversity allows for a variety of daily needs to be met within close proximity to one another, maximizing the opportunities for linking trips together on foot or by bicycle. Trip lengths are generally shorter at locations that have higher densities and more diversity. Alternatives to the automobile claim a larger share of all trips at higher densities and in mixed-use areas. [xvi] Figure 7 illustrates a "before and after" diagram of a typical big-box shopping center fronting a major highway in Charlottesville that community residents envisioned redeveloping over time as a diverse, walkable place served by a network of local streets and sidewalks.

Figure 7. "Before and After" Shopping Center Diagram

Source: Rendering by Renaissance Planning Group for the Thomas Jefferson Planning District Commission



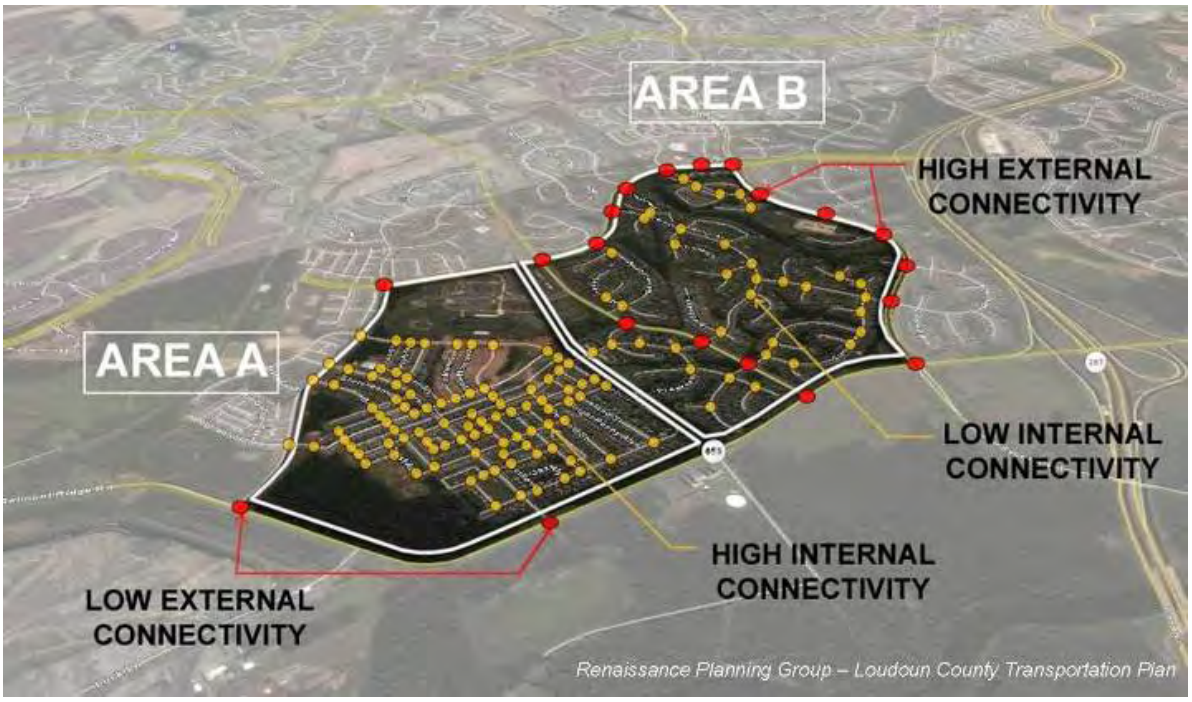
Design

While density and diversity create the opportunities to walk, bike, use transit, or make a short drive in order to reach a destination, design makes the trip possible and pleasurable. Design refers to the characteristics of the built environment that affect its overall scale and accessibility by various transportation modes. Key elements of design that affect people's travel choices include the scale and layout of the street network (i.e. short blocks versus long highways); the location and accessibility of open spaces (i.e. plazas and parks versus private yards), and the height and orientation of buildings (i.e. front doors that are oriented to the street versus those separated from the street by large parking lots).

The design element that is most influenced by transportation policies is the degree of street connectivity. As shown in Figure 8, connectivity refers to the internal networks within a given community as well as external connections between the community and the larger regional network. The benefits of regional accessibility are strongest in communities with strong internal and external connections.

Figure 8. Internal and External Connectivity

Source Analysis by Renaissance Planning Group for Loudoun County



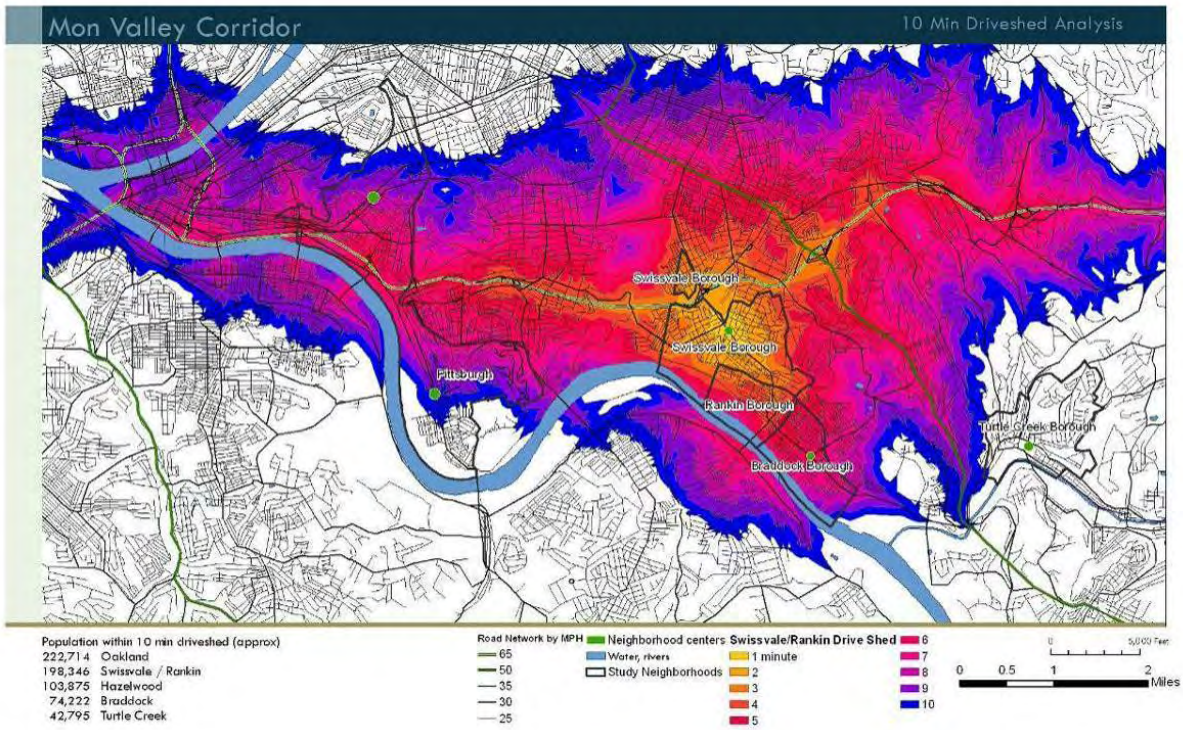
Destination Accessibility

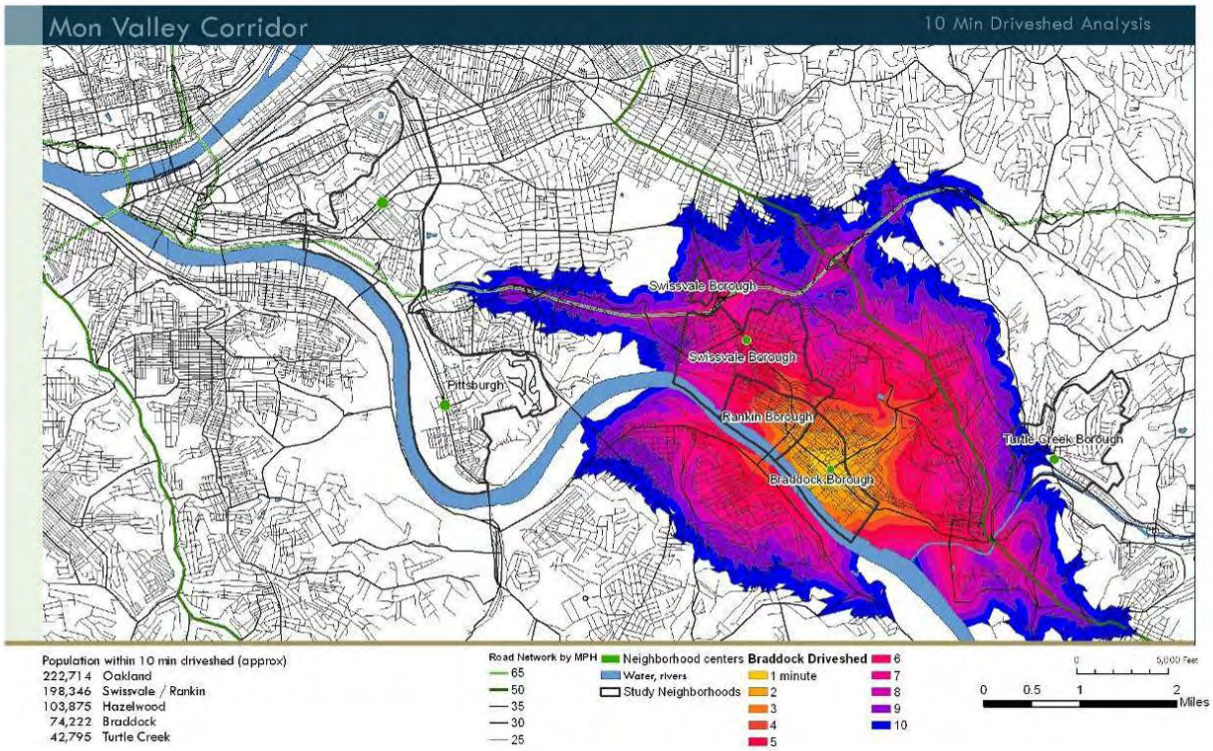
Destination accessibility describes the locations of uses within a region, relative to one another and to the transportation network. "Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones." [xvii] Because motorized travel has a range of speeds, destination accessibility is most often discussed in terms of travel time. However, because walking and bicycling have fairly fixed speeds, destination accessibility can also be discussed in terms of simple distance.

Figure 9 shows the relative accessibility of activities within a ten-minute drive for two adjacent communities in the Pittsburgh region. Because of its proximity to a variety of transportation facilities, the Swissvale/Rankin community has a substantially larger "drive-shed" than its southern neighbor, Braddock. Both communities were originally organized around the now-defunct Carrie Furnace steel production site, but Braddock was primarily oriented toward the river in order to provide direct access for barge freight. Swissvale/Rankin, located slightly upland of the river, is much more strongly connected to a variety of regional roadway and transit networks. Although both communities have suffered from the closure of the mill, the more accessible Swissvale/Rankin has maintained some stability, whereas Braddock has become a virtual ghost town.

Figure 9. Destination Accessibility Swissvale vs. Braddock, PA.

Source Renaissance Planning Group





Distance to Transit

Distance to transit is often measured by calculating the shortest-route distance between transit stations or stops and households or employment centers. It can also be expressed in terms of transit route density or stop spacing. The following pages include a series of figures to illustrate the concept of "distance to transit" and some ways in which all "five Ds" can be combined in order to support various types of transit.

Figure 10 illustrates the "bus stop service areas" located within 1/3 mile of each bus stop along select segments of TriMet Routes 14 and 15 in the Portland, Oregon metropolitan region. In order to encourage transit ridership, the city employs a number of policies and strategies to focus dense, diverse, pedestrian-oriented development in these locations.

In a similar vein, Figure 11 shows the relative densities of destinations within proximity of selected Greater Richmond Transit (GRTC) system routes. Figure 12 depicts the variety of origins and destinations within close proximity of a potential Bus Rapid Transit route on Broad Street in Richmond. Finally, Figure 13 presents an illustration of the ways in which all "five Ds" can be combined in order to support an array of transit options.

Figure 10. Tri-Met Bus Service Areas.

Source http://www.urisa.org/kimpel

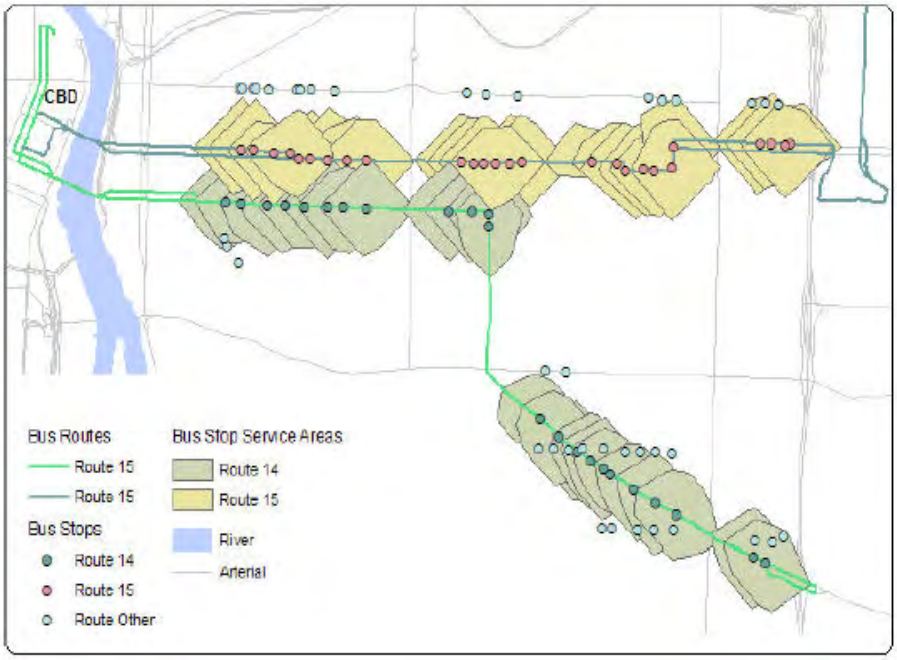


Figure 11. Destination Densities along GRTC Routes.

Source: Michael Baker, Inc.

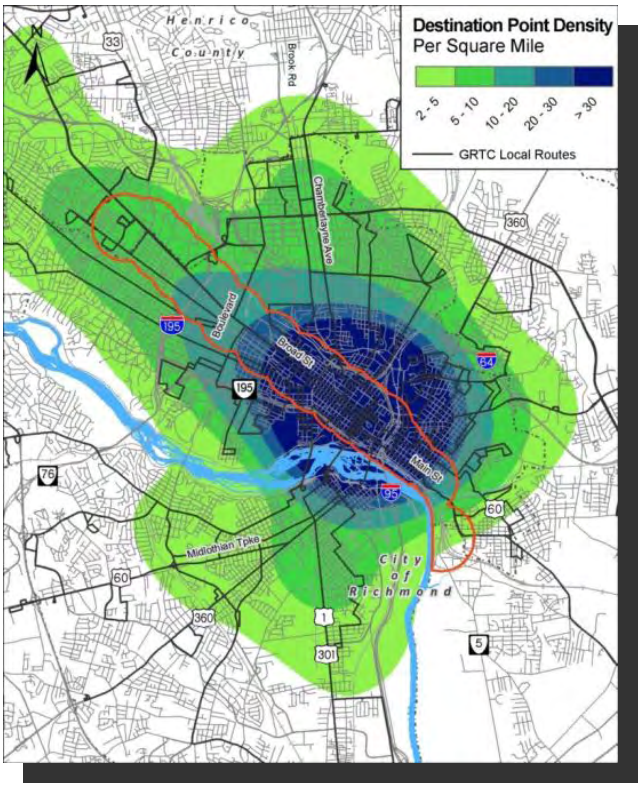


Figure 12. Land Use Assessment for Broad Street BRT Corridor.

Source: Michael Baker, Inc. for FTA Small Starts Initiation Package, Broad Street BRT

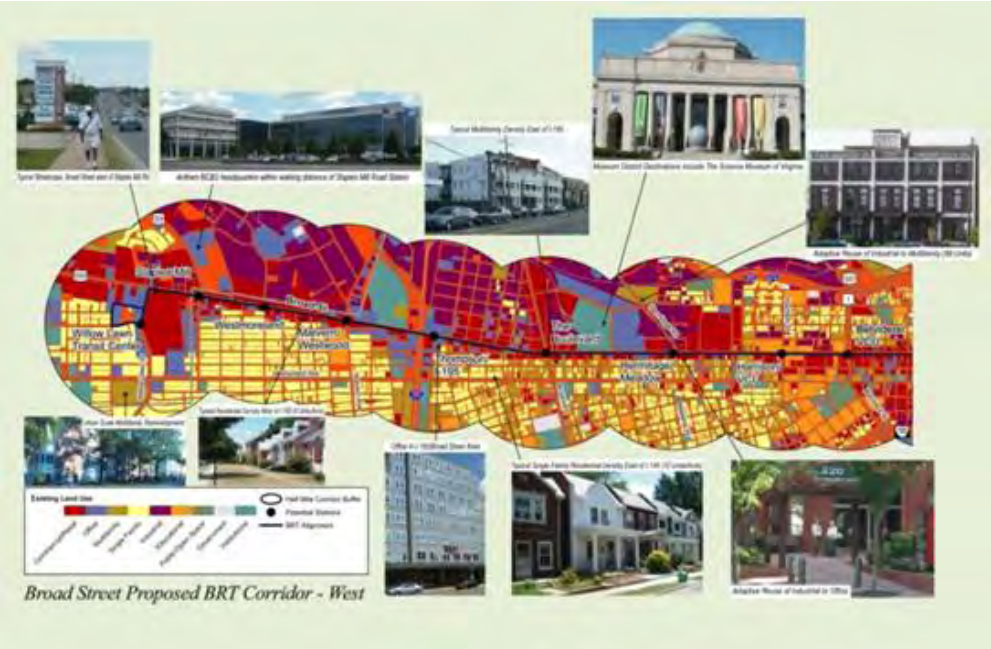
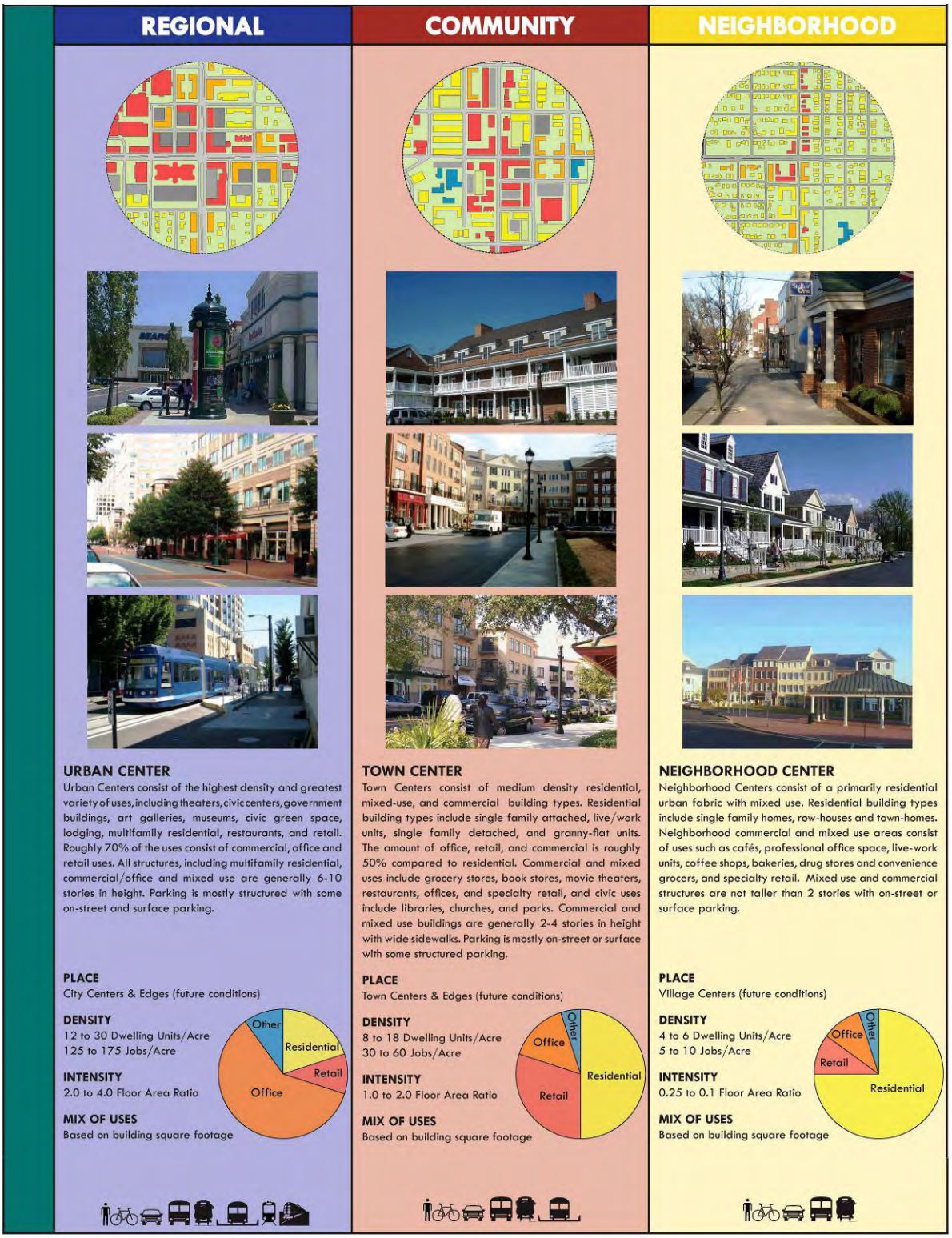


Figure 13. The "Five Ds" Summary Diagrams

Source Renaissance Planning Group for VDOT Route 29 Corridor Study



Measuring Regional Accessibility

Decision-makers at all levels of government - local, regional and statewide - influence accessibility through their land use and transportation decisions. Land use investments affect the *amount and variety of transactions* that people and businesses can make within a given area. Transportation investments affect the *amount of time and money* required to accomplish these transactions.

To plan improvements to regional networks, and to evaluate the success of regional accessibility investments, planners must identify goals and criteria that define the relationship between land use and transportation for a given region. Although these goals and criteria may differ from one community to another, a successful investment in regional accessibility generally accomplishes two things:

- It brings people and places *closer* together (either physically, by moving Point A closer to Point B or virtually, by increasing the speed with which people can move between Point A and Point B); and
- It provides people with more *choices* of travel routes and modes.

Accessibility as a Transportation Performance Measure

Accessibility is one of several important factors to consider when measuring the quality of a transportation system or in evaluating potential transportation investments and related policies. Other factors considered may include, for example, congestion and economic, safety, environmental, reliability and mobility impacts. Generally speaking, investments and policies that increase regional accessibility will produce positive economic impacts. In many cases, they can also improve mobility, system reliability, and safety, as well as reducing existing or anticipated congestion.

Regional accessibility improvements are not, of course, an instant panacea. Expanding the amount of transit services along a highly congested roadway, for example, may not significantly reduce corridor-wide travel time, at least in the short term. However, it can significantly improve the quality of life and economic stability for residents and businesses by providing all travelers with more modes and routes. It can serve as a catalyst for new development, while also providing the region with a more robust, resilient transportation network that can accommodate changes in travel demand over time.

Accessibility as an Economic and Community Development Measure

Regional accessibility measures should be aligned with, and help to balance, a community's goals for transportation, economic development and quality of life. In most cases, strategies that locate new development in proximity to transportation facilities are advantageous from an accessibility standpoint. Community, regional and statewide economic development objectives should be coordinated and aligned to encourage efficient development patterns and cost-effective transportation investments.

For example, a rural region may want to expand highway accessibility to an industrial park in order to accomplish its economic development goals. By considering the proximity of the park to existing and potential residential areas, the community can also plan ahead for roadway

and transit connections that can support the increased traffic from new commuters without putting undue strain on existing arterials and secondary roads.

By contrast, a region that is quickly growing or heavily developed might want to focus its planning efforts on promoting infill development to its highest and best use. In this case, "five D" factors such as increased densities and expanded modal choices can help planners assess and evaluate potential transportation investments and economic development policies.

Methods for Measuring Accessibility

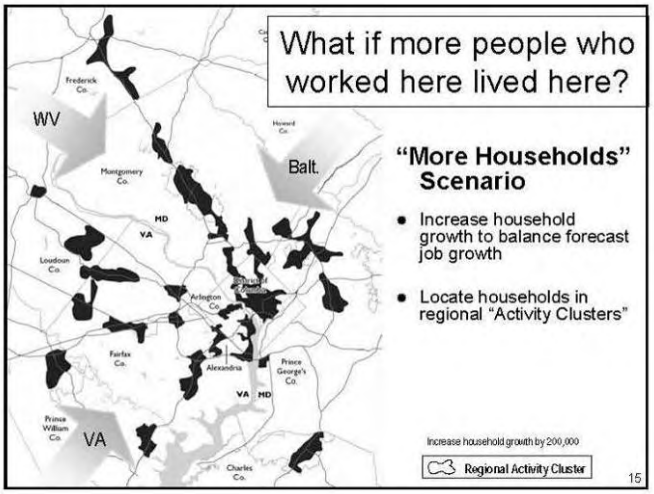
One of the most commonly applied methods to measure accessibility is to map the number of persons or workers that can reach targeted activity centers or other destinations using a given mode within a given span of time (such as 30 minutes by automobile, 45 minutes by transit, or 10 minutes on foot). A variation on this approach is to measure the number of destinations within reach of a given community or origin point given various travel times and modes.

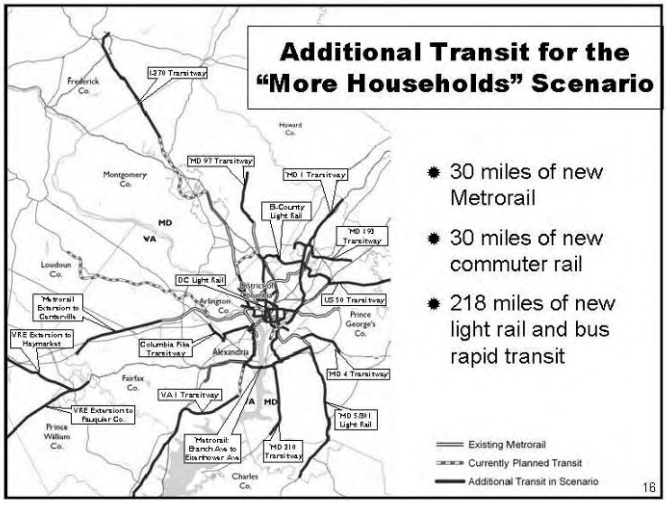
These types of measures are used in a variety of long-range transportation plans and in special studies. At a statewide scale, the Utah Department of Transportation recently incorporated travel time accessibility analyses as well as access to regionally significant public facilities into its statewide planning framework. Two regional examples are noted below:

In 2005, the Metropolitan Washington Council of Governments published a regional accessibility study that analyzed various land use and transportation scenarios that could improve the "reach" of the Washington Area's regional activity centers by auto and by transit. Figure 14 illustrates the potential additional transit markets that could be created by clustering households and jobs within closer proximity to one another and to existing transit services.

Figure 14. MWCOG Regional Mobility and Accessibility Study Maps

Source: TPB Staff Presentation to Board, January 2006





In another example, the Atlanta Regional Commission measured the difference between peak period and free-flow accessibility by auto and transit to analyze alternative long-range investment scenarios. Figure 15 illustrates the numbers of people living within a 30- to 45-minute drive of the urban centers in Georgia, excluding Atlanta.

Figure 15. Regional Employment Center Accessibility in Georgia

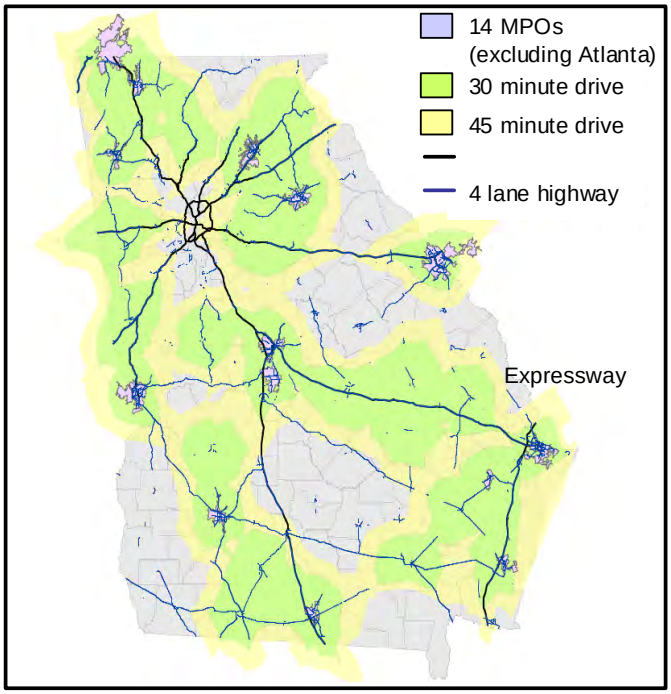
Source: Atlanta Regional Commission

SUPPORT GEORGIA'S ECONOMIC GROWTH AND COMPETITIVENESS

Objective: **Increase the labor-shed and accessibility of Georgia's regional employment centers**

Performance metric: **Percent of population within 30-45 minutes drive of a regional employment center (ex-Atlanta)**

PRELIMINARY



- For the population outside of Atlanta driving to a regional employment center:
  - **68%** can reach within **30 minutes**
  - **88%** can reach within **45 minutes**

- Employment centers were selected by using the following criteria:
  - 14 MPOs (excluding Atlanta)
  - Technical and adult education college locations in counties with >10,000 jobs
  - Additional counties with >25,000 jobs
- Interstates and 4-lane highways do a reasonable job connecting employment centers

Source: Census 2005; Department of Technical and Adult Education; team analysis

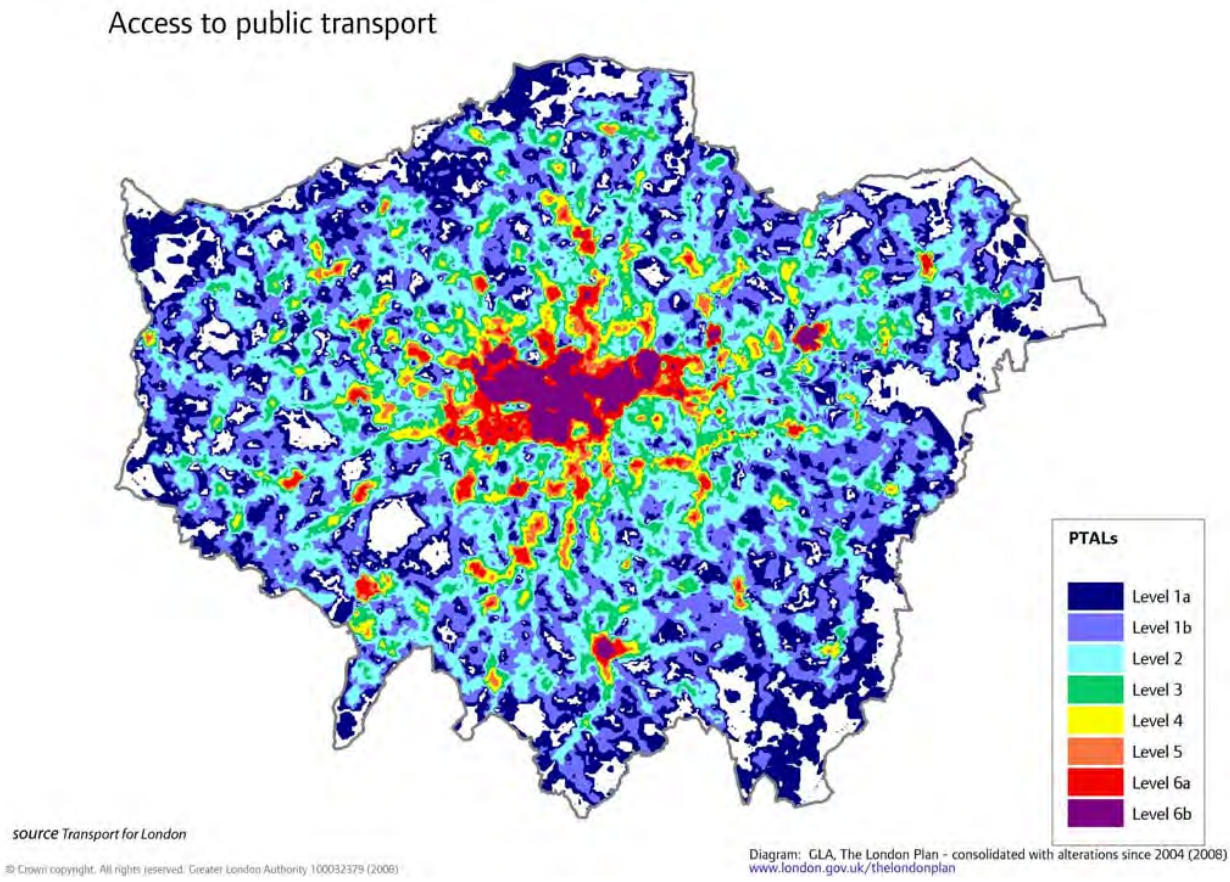
Accessibility Indices

By using an accessibility index, planners can combine several accessibility factors or variables to produce a single score. These measures may reflect the collective accessibility of an entire region and may consider multiple modes. They usually incorporate formulas that provide weights for each of the various components considered in the calculation. For example, a "gravity-based" index identifies not only the number of opportunities accessible within a given window of time, but also their relative levels of attractiveness given their distance from a point of origin. A "maximum utility" index can be used to predict regional travel demand based on a combined analysis of travel times, distances, and costs for all modes.

An example of a local transit accessibility index shown in Figure 16 is England's Public Transport Accessibility Level (PTAL), which covers several geographic areas across London and southeast England. Used as a land use and transit development planning tool, the PTAL generates numeric grades for various geographic points based on the average walking time to the station, the average wait time at the station, and the service frequency. A maximum walking time of eight minutes to a bus stop and 12 minutes to a rail station is considered adequate.

Figure 16. England's Public Transport Accessibility Level Map

Source: Transport for London

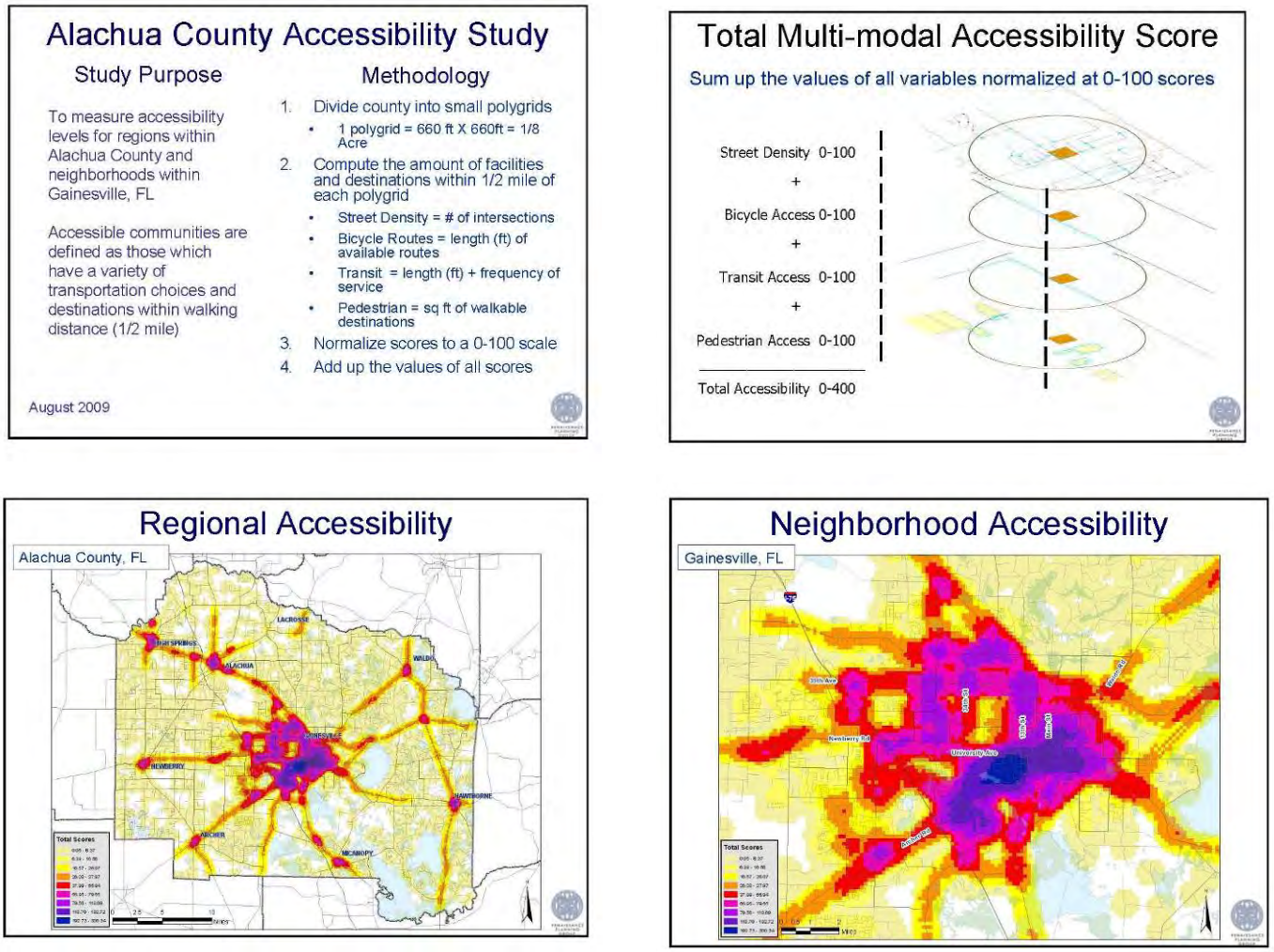


Geographic Scale

The types of activities and mode choices that are appropriate to measure differ according to the geographic scale of the region. At a multi-state and statewide level, where major economic development and transportation investments are very closely linked, access to trade (activity) centers, as well as to specific facilities, such as airports, ports, and distribution centers are typically measured. As show in Figure 17, local and regional accessibility measures are generally focused more on access to jobs and services, with an emphasis on the variety and network connectivity of modes and routes.

Figure 17. Multimodal Accessibility Maps for Alachua County and Gainesville City

Source: Renaissance Planning Group



Tables 1 and 2 on the following pages present two sets of potential performance measures that the Commonwealth could use to evaluate existing and potential regional accessibility at statewide and local/regional levels. For each performance measure, the tables list the modes of travel that may be included, the planning context in which the measure may be applied, potential sources of data, and the relative level of effort that may be needed to develop the measure.

The statewide regional accessibility measures cover large areas and are relatively insensitive to small changes in travel times or land use changes – it is hard to "move the needle" with these measures. For this reason, we recommend using these measures for large scale studies and plans, most appropriately for long-range plans. These measures could be implemented statewide with a modest investment in GIS and land use information from existing sources.

The regional/ local accessibility measures address network connectivity and redundancy, and access to services. They are more sensitive to small changes in the input values than statewide measures, and they are suitable for shorter-timeframe initiatives, such as local development and project prioritization. These measures could be implemented at the local level and require local data and resources. They could be used for local selection of 6-year improvement program projects, local development reviews and in comprehensive plan development.

Table 1. Potential Statewide/Regional Accessibility Measures

Measure	Modes	Potential Application	Data Source (Comments)	Estimated Resource Commitment
1. Population or households within X minutes of Virginia activity centers: (e.g., Tysons Corner, Richmond, Hampton Roads)	Highway passenger travel, rail/bus transit	Long-range plan (update every 4 years)	Land use and travel time data from regional travel demand model	Low
2. Population or households within X minutes of Virginia airports	Highway passenger travel, rail/bus transit	Long-range plan (update every 4 years)	Land use and travel time data from regional/ statewide travel demand model; airport locations from GIS	Low-Moderate
3. Virginia and other employment within X minutes of Virginia airports and ports	Freight	Long-range plan (update every 4 years)	Land use and travel time data from regional/ statewide travel demand model; airport locations from GIS	Low-Moderate
4. National population within X hours of major Virginia tourist attractions	Air Highway Rail	Long-range plan (update every 4 years)	Land use and travel time data from regional/ statewide travel demand model; airport locations from GIS	Low-Moderate
5. Percentage of Virginia population within X minutes of interstate interchange	Highway	Long-range plan (update every 4 years)	Land use, travel time and interchange locations from regional travel demand models;	Low-Moderate
6. Percentage of employment by industry within X minutes of interstate interchange	Highway	Economic Impact study, other special studies, Long-range plans (update every 4 years)	Employment data from InfoUSA or comparable source; travel times from State GIS or travel demand models	High
7. Percentage of state population within 60 minutes of major park or paved recreational trail.	Highway	Long-range plan (update every 4 years)	Travel times from State GIS or travel demand models. Park and trail locations from local/ regional GIS	Moderate
8. Number of regional parks within 60 minutes of major activity centers	Highway	Long-range plan (update every 4 years)	Travel times from State GIS or travel demand models. Park and trail locations from local/ regional GIS	Moderate

Table 2. Potential Regional/ Local Accessibility Measures

Measure	Modes	Application	Data Source (Comments)	Estimated Resource Commitment
1. Airline distance/Shortest over network distance between communities and local activity centers	Highway	Development review, Long-range plans, 6-year programs	Detailed network data in GIS	Moderate
2. Percentage of population within ¼ mile of a bus stop	Bus, Pedestrian	Corridor analysis, Comprehensive transit operations analysis, Long-range plans,	Detailed bus stop information; detailed population information	Moderate-High
3. Percentage of population within ½ mile of a rail station	Rail, Pedestrian	Comprehensive transit operations analysis, Long-range plans,	Detailed population information, rail station locations	
4. Number of public facilities (parks, libraries, fire stations, universities, schools) within 10- 20 minutes of residential areas.	Highway, Transit, Bicycle, Pedestrian	Long-range plan, local development review	Need detailed facility location information	Moderate-High
5. Percentage of population within 20 minutes of a major public facility (hospital, university, regional park)	Highway, Transit, Bicycle, Pedestrian	Long-range plan, local development review	Need detailed population and facility location information	Moderate-High

ACCESSIBILITY ISSUES ACROSS VIRGINIA'S REGIONS

As part of VTrans2035, Virginia has identified investment strategies and policies for eleven Corridors of Statewide Significance (CoSS). By strengthening regional accessibility within the areas directly connected to the CoSS, the Commonwealth may be able to reduce some of the pressure on these major facilities, thus furthering its goals for statewide mobility.

In addition, some of Virginia's regions and communities that are "off the grid" of the CoSS are experiencing growth rates that portend potential transportation issues in the near- or long-term. By addressing these potential issues proactively through coordinated land use and transportation planning and strategic investments, the Commonwealth may be able to avoid pressure on its extensive network of primary and secondary roads and improve the "rate of return" on its transit investments.

By looking not only at projected population and employment growth, but also at the *rates* of population and employment growth, and at the locations and concentrations of major distribution centers throughout the state, we can identify emerging suburban and rural growth areas that may be experiencing a growing level of traffic pressures and transit demand. In some cases the sheer numbers of population and job growth make these pressures obvious. In many other cases, the numbers may not yet be high enough to make a significant impact on highway or transit levels of service, but their relatively high rate of growth indicates that they may suddenly reach a "tipping point" of traffic congestion and/or transit demand during the coming years.

The following series of maps identifies three types of regional growth areas based on projections of population and jobs through the year 2035. [xviii] Figures 18-20 show "Fast growing" areas that are expected to grow by 50% or more; "Emerging Areas" expected to grow by 25% to 50%; and "Future Emerging Areas" may grow by 12% to 25%.

In all types of areas, there is some level of spatial separation between areas that are experiencing population growth and those that are experiencing job growth. This anticipated distance is greatest in emerging suburban and rural areas, which could portend growing commute times and vehicle miles traveled on Virginia's highways.

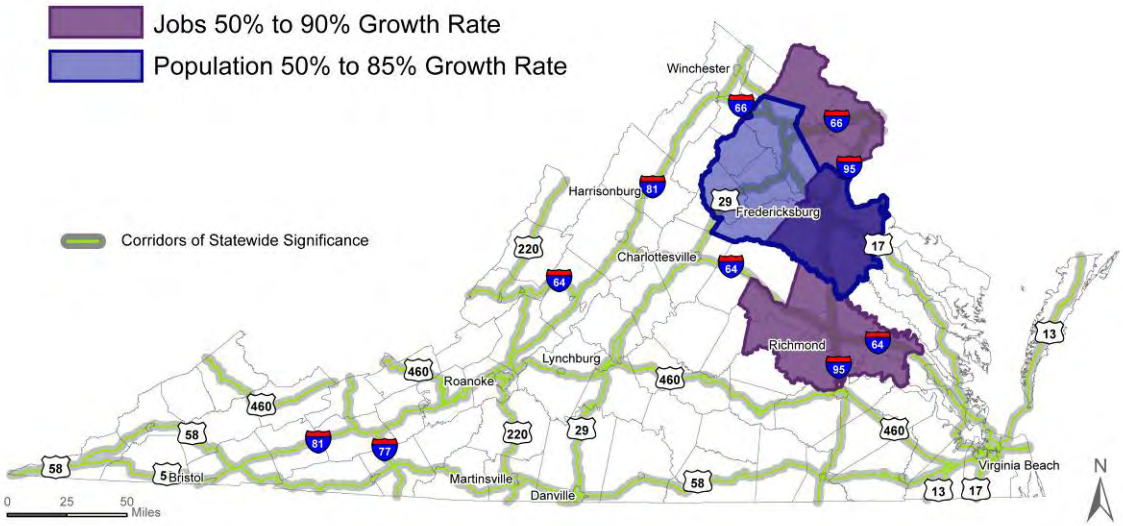
Figure 21 provides a more detailed look at county population growth estimates. The key issue revealed by these maps is the concentration of residential growth in suburban and rural areas outside of central cities. Growth within these "bedroom" communities can put a severe strain on secondary roadway networks as well as primary corridors, and may be difficult to serve with transit.

Figure 22 shows the relative density of distribution centers across the state. Many of these centers are located in emerging growth areas, while others are located in areas that are not growing or are even losing population. In any case, each of these regions has a particular need to plan and implement investments that promote statewide mobility for truck and freight rail traffic *and* that improve regional multi-modal accessibility for residents, commuters, and businesses.

Fast Growing Areas

Figure 18. Fast Growing Areas (50%-90% Increase Between 2010-2035)

Source: Renaissance Planning Group



The fast-growing areas shown in Figure 18 are anticipated to experience the most dramatic rates of growth in the Commonwealth over the coming 25 years. Population growth is anticipated in "bedroom" communities around the Washington DC region, while job growth is anticipated to grow along the I-95 corridor. Traffic congestion along primary and secondary roads is likely to increase, as will the market for transit.

Population growth rates of 50%-85% are anticipated for the regions south and west of the Washington DC metropolitan area, including the George Washington Regional Commission and the Rappahannock-Rapidan Regional Council.

Job growth rates of 50%-95% are anticipated for the regions along the I-95 corridor. These include the Northern Virginia PDC, George Washington Regional Commission and Richmond Regional PDC.

The only fast-growing area with a 50%-75% rate of both population and job growth is the George Washington RC.

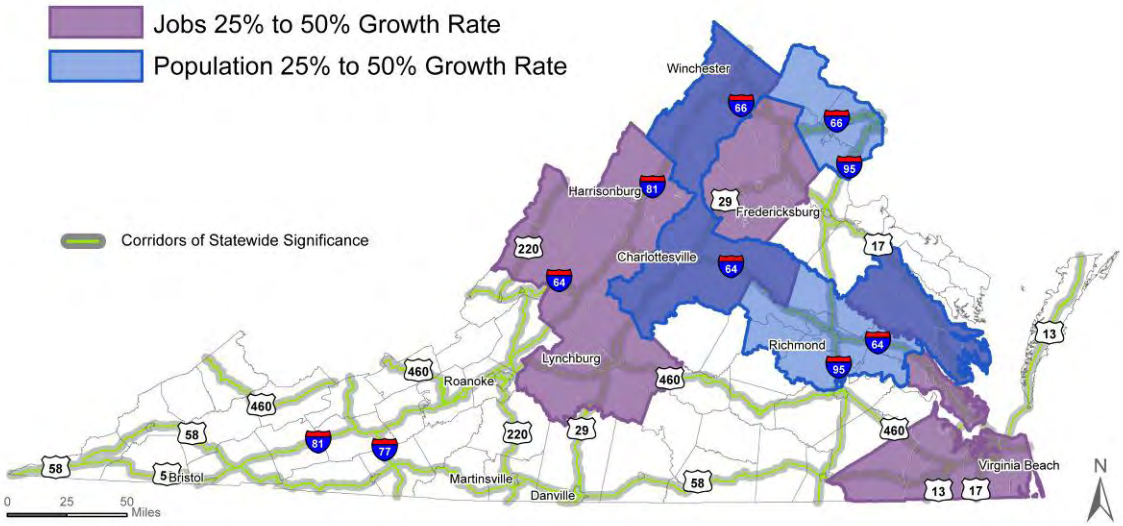
For these fast growing areas, decision-makers and planners must consider the following:

- How is our supply of multi-modal transportation?
- How can we encourage more density, diversity and overall proximity between households and jobs?

Emerging Areas

Figure 19. Emerging Areas (25%-50% Increase Between 2010-2035)

Source: Renaissance Planning Group



"Emerging" areas may experience a faster rate of growth than in the past, with some communities transitioning in character from rural to suburban, and others approaching a more urban character. Population growth is anticipated in "bedroom" communities outside of major urban centers, while job growth tends to follow major corridors. Traffic congestion along suburban arterials and secondary roads may increase, as could the market for transit.

Population growth rates of 25%-50% are anticipated for the regions surrounding the highest-growth areas, fanning out from the major metropolitan centers in Washington DC and the Richmond region. These include Northern Virginia PDC, Northern Shenandoah Valley RC, Thomas Jefferson PDC and Richmond Regional PDC.

Job growth rates of 25%-50% are anticipated for northwest and central regions (Northern Shenandoah Valley RC, Rappahannock-Rapidan PDC, Central Shenandoah PDC, Thomas Jefferson PDC, and Region 2000 PDC) as well as coastal areas (Hampton Roads PDC and Middle Peninsula PDC).

Regions with a growth rate of 25%-50% for both population and employment include the Northern Shenandoah Valley RC, the Thomas Jefferson PDC and the Northern Neck PDC.

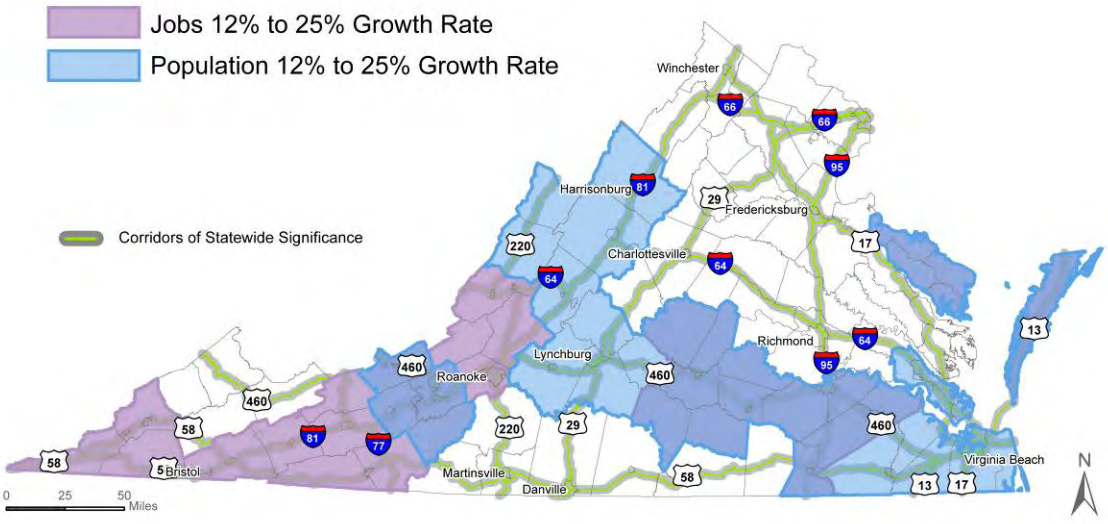
For these emerging areas, decision-makers and planners must consider the following:

- How can we preserve roadway capacity and expand transit?
- How can we focus growth in high-accessibility locations and improve accessibility in desired growth areas?

Future Emerging Areas

Figure 20. Future Emerging Areas (12%-25% Increase Between 2010-2035)

Source: Renaissance Planning Group



As shown in Figure 20, "future emerging areas" include regions where growth is occurring more slowly than elsewhere in the Commonwealth. However, given the existing rural nature of these areas, even a small rate of growth could have a substantial impact on development patterns, travel demand and community character. The anticipated spatial separation of jobs and households is most acute in these areas, which may lead to longer commutes and higher VMT. This type of dispersed growth pattern, particularly over such large land areas, is difficult to serve with transit. This is of particular concern in rural communities, which tend to have higher proportions of older adults and low-income residents.

Population growth rates of 12%-25% are anticipated in the Central Shenandoah PDC, New River Valley PDC, Region 2000 PDC, Commonwealth RC, Crater PDC, Hampton Roads PDC, and Northern Neck PDC.

Job growth rates of 12%-25% are anticipated in the Northern Neck PDC, Accomac-Northampton PDC, Commonwealth RC, Crater PDC, Roanoke Valley-Alleghany RC, New River Valley PDC, Mount Rogers PDC and Lenowisco PDC.

Regions with a growth rate of 12%-25% for both population and employment include the Northern Neck PDC and the Commonwealth RC.

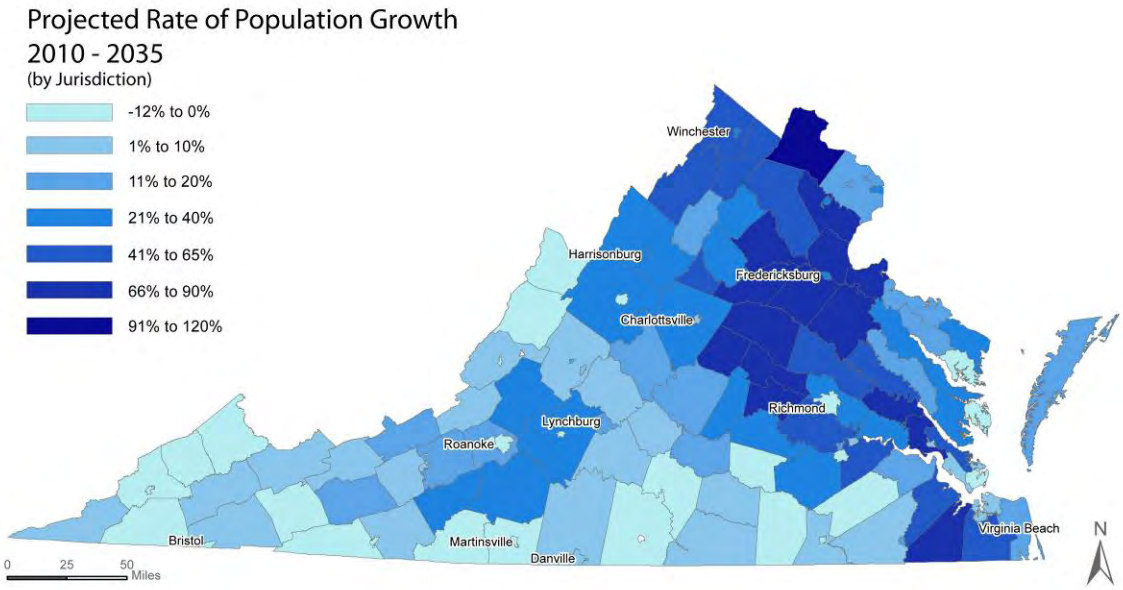
In the future emerging areas, decision-makers and planners must consider the following:

- What can we do to preserve future roadway capacity?
- How can we expand multi-modal options?
- How can we bring jobs and households closer together?

Fast-Growing Localities

Figure 21. Population Growth Projections by Locality

Source: Renaissance Planning Group



"Top Ten" Localities - Total Growth					
Jurisdiction	**PDC**	**Total Growth 2010-2035**	**Percent Increase 2010-2035**	**2010 Projected Population ***	**2035 Projected Population ****
Loudoun County	Northern Virginia	388,628	120%	324,189	712,817
Prince William County	Northern Virginia	292,810	73%	401,323	694,133
Fairfax County	Northern Virginia	162,881	16%	1,038,918	1,201,799
Chesterfield County	Richmond Regional	149,167	47%	318,810	467,977
Spotsylvania County	George Washington RC	118,013	88%	134,163	252,176
Stafford County	George Washington RC	116,741	86%	135,806	252,547
Henrico County	Richmond Regional	101,369	34%	301,658	403,027
Chesapeake City	Hampton Roads	95,448	40%	236,683	332,131
Suffolk City	Hampton Roads	81,117	86%	93,830	174,947
Virginia Beach City	Hampton Roads	57,574	13%	447,836	505,410

"Top Ten" Localities - Rate of Growth (as shown on Fig 21 map)					
Jurisdiction	**PDC**	**Percent Increase 2010 - 2035**	**Total Growth 2010 - 2035**	**2010 Projected Population ***	**2035 Projected Population ****
Loudoun County	Northern Virginia	120%	388,628	324,189	712,817
Spotsylvania County	George Washington RC	88%	118,013	134,163	252,176
Fluvanna County	Thomas Jefferson	87%	25,214	28,971	54,185
Suffolk City	Hampton Roads	86%	81,117	93,830	174,947
Stafford County	George Washington RC	86%	116,741	135,806	252,547
King George County	George Washington RC	81%	19,076	23,613	42,689
New Kent County	Richmond Regional	80%	14,934	18,681	33,615
Culpeper County	Rappahannock-Rapidan	78%	37,681	48,074	85,755
Prince William County	Northern Virginia	73%	292,810	401,323	694,133

* 2010 Projection by Virginia Employment Commission
** 2035 Projection by Renaissance Planning Group

At the local level, total residential growth is anticipated to be highest in suburban counties outside of Washington, DC, Richmond, and Fredericksburg. There are some adjoining cities on the "top ten" list of total growth in the Hampton Roads region, but they encompass a land area similar to that of a typical suburban county. The picture of comparative population growth *rates*, however, is a bit different. Some of Virginia's fastest-growing counties are also the most populous, such as Loudoun and Spotsylvania. But several rural counties are also expected to experience exponential growth, such as James City County and New Kent County outside of Williamsburg; Fluvanna County, which lies between Charlottesville and Richmond; and Culpeper County, which bridges Charlottesville and Warrenton.

Residents in these rural "bedroom" communities are likely to experience quickly growing traffic on secondary roads as well as primary corridors, and are less likely to have access to transit. To exacerbate the problem, smaller counties also tend to have fewer staff and less funding to support the sort of proactive land use and transportation planning that could help them shape this unprecedented growth into efficient patterns that optimize transportation resources.

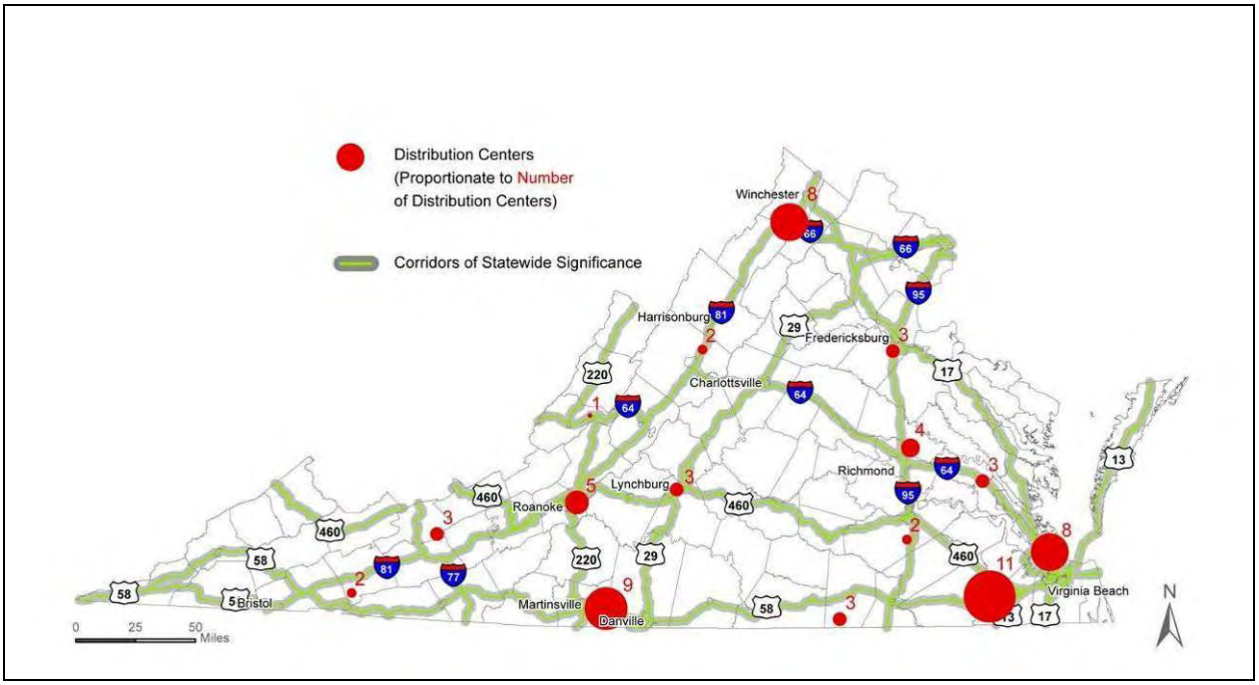
To improve regional accessibility in Virginia's fast-growing suburban and rural areas, decision-makers and planners need to consider issues and opportunities such as the following:

- What types of tools can Virginia counties and cities use to plan and implement more efficient growth patterns?
- How can state transportation investments improve regional accessibility to fast-growing areas in ways that also encourage efficient development patterns?
- What resources can be assembled to assist smaller localities in developing plans and policies for regional accessibility to fast-growing residential areas?

Distribution Centers

Figure 22: Major Virginia Distribution Centers

Source: Renaissance Planning Group based on information from VA Port Authority



Virginia is home to many major distribution centers that affect the traffic patterns of roads and rail statewide. Figure 22 above shows the relative intensity of distribution centers throughout the state.

Areas with concentrations of distribution centers include Winchester and Front Royal along I-81; Martinsville and Danville along US 58 and US 220; Franklin, Chesapeake and Suffolk County along US 58 and US 460; and Portsmouth, Norfolk and Hampton roads along I-64, I-664, I-564 and I-264 near the Port of Virginia.

There are also smaller concentrations of distribution centers in southwest Virginia, Harrisonburg, Roanoke, Lynchburg, and along the I-95 corridor south of Fredericksburg and south of Richmond. With the exception of the Martinsville-Danville region, which is growing at a rate less than 12%, most of the Commonwealth's distribution centers are located in "emerging" or "future emerging" areas.

For areas with major distribution centers, decision-makers and planners must consider the following:

- How can we balance major investments to support freight mobility with regional accessibility investments designed to support desired regional growth and enhance quality of life? Do these investments complement or conflict with one another?
- What issues, opportunities and strategies should be considered for urbanizing, higher-growth areas, and what should be considered for rural and slower-growing communities?

STRATEGIES TO IMPROVE REGIONAL ACCESSIBILITY

This chapter includes a series of suggested programs, policies, initiatives, and investments that could improve multi-modal accessibility in Virginia's regions over the coming years. The recommendations encompass strategies to promote the "five Ds" and to expand multimodal transportation infrastructure that would increase regional accessibility. Following the summary below, specific ideas are listed for each recommendation.

Recommendations to Improve Regional Accessibility

- Foster "The Five Ds:" Density, Diversity, Design, Destination and Distance to Transit
  - Encourage localities to focus growth in higher-density communities that offer a mix of activities within close proximity of each other as well as safe, convenient connections for all transportation modes.
  - Work with local and regional agencies to promote strategic locations for residential and commercial development that optimize regional and local transportation networks.
- Expand Multimodal Regional Transportation Networks
  - Improve existing regional and local networks and services to serve all modes efficiently and safely.
  - Make more efficient use of existing regional roadway and transit systems through Travel Demand Management (TDM) strategies

Foster "The Five Ds:" Density, Diversity, Design, Destination and Distance to Transit

Encourage localities to focus growth in higher-density communities that offer a mix of activities within close proximity of each other as well as safe, convenient connections for all transportation modes.

- Create programs to reward land uses that reduce the overall transportation needs and costs of a community. These could include, for example, competitive grants for transportation projects that hinge upon local land use commitments that reduce need for additional transportation improvements; or, more specifically, competitive grants for expanded transit services hinged upon supportive land uses.
- Encourage public-private partnerships at the regional and local level such as joint development around transit stations, interconnected street and sidewalk networks related to major regional development projects, or general market-based regional accessibility improvements. For example, several private development initiatives have combined the convenience and bargains of "big-box" stores with the accessibility of neighborhood shops and housing, such as Harris Teeter in Tyson's Corner and Target at the Columbia Heights Metrorail Station in the District of Columbia.

- Assist regional and state agencies with developing and applying jobs-to-housing ratios and other performance measures (such as jobs within ¼ mile radius of major transit stops) to assess potential imbalances between jobs, housing, and transportation links for commuters to and from major employment centers. Within policy documents, agencies should set goals for these performance measures to ensure regional accessibility issues and strategies are considered.
- Assist localities with updating local comprehensive plans and regulatory tools to support "the Five Ds." For example, the Office of Intermodal Planning could provide research, tools and technical assistance through resources such as the Urban Development Areas (UDA) Technical Assistance program to help localities -
    - Concentrate growth and promote proximity of jobs and households. The Rosslyn-Ballston corridor in Arlington is an excellent example of high density concentration in Virginia. Tysons Task Force's recommendations are another good illustration of higher density in a concentrated center with surrounding lower densities.
    - Compose and enforce zoning codes and overlay districts that promote proximity, connectivity and multi-modal transportation choices. Form-based codes provide an alternative to traditional zoning, with design guidelines that address many of the "Five Ds" such as building mass and form and street type and scale. Arlington County has adopted a form-based code for Columbia Pike.
    - Update local subdivision development ordinances to endorse higher density development within designated development areas while preserving rural areas. The new Virginia Department of Transportation (VDOT) secondary street acceptance requirements (SSAR) include policies consistent with regional accessibility priorities, including designated area types, connectivity, pedestrian accommodations and context sensitive street design.
    - Implement parking maximums in ordinances instead of traditional minimums to reduce pavement footprints and increase efficiency. The Fairfax Tyson's Task Force developed ordinance language that could serve as a Virginia model.

Work with local and regional agencies to promote strategic locations for residential and commercial development that optimize regional and local transportation networks.

- Encourage localities to make urban and suburban housing more affordable in order to reduce the need for commuters to locate far from urban centers. For example, by dramatically increasing the amount and types of housing options in a suburban activity center, Tyson's Task Force created a broader range of opportunities for people of various income levels and needs to locate near transit, jobs, and services.
- Through funding and planning programs, encourage localities to focus higher-density development around existing transit services. For example, state agencies could consider establishing incentives such as density requirements in order to qualify for new state transit investments in urban areas. Or, through the Urban Development Areas technical assistance program, the Office of Intermodal Planning could

encourage localities to consider carefully the implications for transit demand and roadway infrastructure when designating areas for future growth.

- Provide localities and transportation providers with guidance on how to plan, design and build transit-oriented development (TOD). The Department of Rail and Public Transportation (DRPT) is currently working on statewide TOD guidelines.
- Promote access management to preserve highway capacity and to support growth management goals, particularly along statewide CoSS and within regions that are beginning to experience suburban growth.

Expand Multimodal Regional Transportation Networks

Improve existing regional and local networks and services to serve all modes efficiently and safely.

- Add strategically located regional roadways to improve connectivity and reduce pressure on major arterials. For example, the connected networks proposed in Albemarle County's Places29 will improve mobility on US 29 while providing increased access to local commercial and residential areas. Similarly, the Fairfax County Parkway interchange improvement at the Fair Lakes Parkway will improve performance of the entire network.
- Make existing transit services more accessible. Specific improvements can include increased frequency, reduced headways, expanded route coverage, and expanded service times, such as 24-hour, 7-day services. To support transit investments, cities such as Norfolk, VA and Washington, DC have car-sharing programs, filling the need for occasional vehicle trips among people who usually choose not to drive.
- Promote local, regional and state agencies policies and programs that encourage multi-modal planning, design and funding for all corridors throughout the Commonwealth, such as the 2004 VDOT policy on bicycle and pedestrian accommodations or local "Complete Streets" policies such as the those in Arlington County and the City of Roanoke.

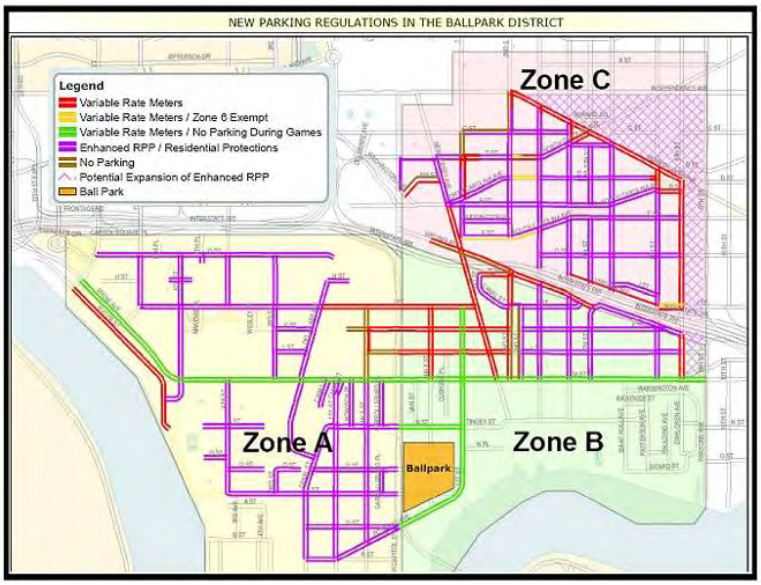
Make more efficient use of existing regional roadway and transit systems through Travel Demand Management (TDM) strategies

- Apply tolling and congestion pricing strategies along congested corridors to discourage unnecessary trips and encourage commuting at off-peak times, while simultaneously generating revenues for transportation improvements.
- Add transit prioritization measures along key corridors, such as signal pre-emption, bus-only lanes, and queue jumping techniques. The Dulles Access Ramp is a queue jumping example, where the strengthened road shoulder allows buses to travel on the shoulder to reach the West Falls Church Metrorail Station.
- Expand and connect HOV/ HOT lanes and park and ride lots into seamless commuter networks.

- Continue to invest in Intelligent Transportation Systems (ITS) strategies to improve roadway and transit operations. ITS improvements, such as electronic toll and fare collection systems and "real-time" traffic light synchronization.
- Promote bike sharing programs, such as those in Arlington County and Washington DC. These programs can allow an easy and convenient transfer from transit to bicycle.
- Encourage localities to consider establishing parking management strategies such as –
  - Parking benefit districts to support improvements in downtown areas while also addressing traffic congestion and parking constraints. Under these programs, funds collected from parking meters are targeted toward improvements to the district, such as sidewalks, transit, landscaping, and amenities. Studies show that traffic congestion in parking benefit districts can be reduced by as much as 30% because downtown shoppers and employees no longer circle blocks in search of free on-street parking spaces. [xix] Washington D.C. established a pilot parking district program in 2008.
  - Parking congestion metering, whereby parking requirements and prices vary depending on the time of day. This strategy minimizes the necessary amount of space allocated for parking, discourages unnecessary travel during peak periods and encourages a "park once" mentality. The parking congestion metering program illustrated in Figure 23 has been successfully applied at the National Stadium in the District of Columbia.

Figure 23. Parking Congestion Metering at the Nationals Stadium

Source: DDOT, June 2008



Develop resources and incentives for state, regional and local investments in regional accessibility.

- Encourage the use of local bonds, general funds and taxes for transportation purposes. For example, several counties in northern Virginia have put significant local dollars into transportation with local bonds, expenditure of general funds, commercial and industrial property tax.
- Support localities in coordinating and negotiating regional accessibility improvements with developers through proffers, impact fees, Chapter 527 review, and joint development of transit stations. Encourage localities to "think outside the box" in order to negotiate contributions such as off-site improvements or participation in Transfer of Development Rights programs.
- Assist local and regional agencies with coordinating regional transit planning and (particularly) funding programs, with a goal to improve the balance of financial responsibility for regional transit services between cities and counties.
- Issue competitive state-funded grants to plan and implement services supported by transit-oriented development. For example, Caroline County used a VDRPT Amtrak land use study to support rezoning for proposed new station areas.
- Educate localities about innovative alternative financing strategies such as Transportation Utility Fees (TUFs) as a way to engender public fiscal responsibility of transportation systems. A TUF is collected from residential and commercial property owners through a regular local utility bill. The funds are used for transportation investments and maintenance within the district. Twelve Oregon communities have adopted TUF programs to date.

Coordinate planning and project development among local, regional and state agencies to encourage regional accessibility investments.

- Provide support for multimodal planning. Initiatives already in place include the UDA Planning Technical Assistance program, VDOT Rural Transportation planning programs, and matching funds for federal MPO highway and transit planning programs.
- Within regional and state plans, promote a balance of multi-modal investments that support regional accessibility while also ensuring statewide mobility. At the corridor level, ensure coordination with local land use and economic development goals, plans and policies.
- Integrate a policy framework to encourage multi-modal regional accessibility as part of the Chapter 527 impact analysis for proposed major developments.
- Incorporate regional accessibility measures into long-range statewide, regional and local transportation plans by including analyses of how proposed projects would encourage closer proximity between jobs and households and/or expand modal or route choices.

REFERENCES

[i] Schäfer, A. (2006). Long-Term Trends in Global Passenger Mobility. The Bridge, 36(4), 24-32

[ii] Zahavi, Y., & Talviitie, A. (1980). Regularities in travel time and money expenditures. Transportation Research Record, 750, 13–19. ISSN:0361-1981

[iii] Liu, A. (2008). Blueprint for American Prosperity: Unleashing the Potential of a Metropolitan Nation [PowerPoint slides]. Retrieved from Metropolitan Washington Council of Governments Web site: http://www.mwcog.org/uploads/committee-documents/l15fWl9d20080226155742.pdf

[iv] Schrank, D. & Lomax, T. (2007). 2009 Urban Mobility Report. Texas Transportation Institute.

[v] Fairfax County Economic Development Authority. (2006). How to Attract and Motivate a Creative Workforce. Retrieved September 11, 2009, from Fairfax County EDA: White Papers Web site: http://www.fairfaxcountyeda.org/how-attract-and-motivate-creative-workforce

[vi] The FDOT Generalized Service Volume Tables provide a solid planning level indication of the level of service of roadways based upon several factors like number of travel lanes, medians, left turn lanes, frequency of signals and roadway classification. The tables provide ADT thresholds for each level of service depending on roadway characteristics. Renaissance Planning Group calculated the difference in the ADT thresholds for LOS C for a typical Class I state two-way arterial in an urbanized area.

[vii] U.S. Environmental Protection Agency. (2009). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007. Washington, DC: National Service Center for Environmental Publications.

[viii] Transit Cooperative Research Program (2003). TCRP-95, Land use and Site Design, Traveler Response to Transportation System Changes. Washington, DC: Transportation Research Board.

[ix] Pollard, T. (2007). New Directions: Land Use, Transportation, and Climate Change in Virginia. Charlottesville, VA: Southern Environmental Law Center.

[x] US Census Bureau. (2008). Projections of the Population by Selected Age Groups and Sex for the United States: 2010. Retrieved October 1, 2009 from http://www.census.gov/population/www/projections/summarytables.html

[xi] US Census Bureau. (2005). Population Pyramids of Virginia. Retrieved October 1, 2009 from http://www.census.gov/population/www/projections/statepyramid.html

[xii] Lynott, J. et al. (2006). Meeting the Transportation Needs of Northern Virginia's Seniors: Recommendations for Public Transit Systems and Other Mobility Providers. Arlington, VA: Northern Virginia Transportation Commission.

[xiii] Centers for Disease Control and Prevention. (2008). Preventing Obesity and Chronic Diseases Through Good Nutrition and Physical Activity. Retrieved October 1, 2009, from http://www.cdc.gov/nccdphp/publications/factsheets/Prevention/obesity.htm

[xiv] Basset, D. R., Pucher J., Buehler, R., Thompson, D. L., & Crouter, S.E. (2008). Walking, Cycling, and Obesity Rates in Europe, North America, and Australia. Journal of Physical Activity and Health. 5(6), 795-814.

[xv] Ewing, R., Bartholomew, K., Winkelman, S., Walters, J., & Chen, D. (2008). Growing Cooler: The Evidence on Urban Development and Climate Change. Washington, DC: Urban Land Institute.

[xvi] Ewing, et al. (2008).

[xvii] Ewing, at al. (2008).

[xviii] For the series of "emerging area" maps, Renaissance Planning Group generated and overlaid maps of population and employment growth at the regional level using source data from The Virginia Transportation Research Council's VTrans2035 issue paper entitled "Socioeconomic and Travel Demand Forecasts for Virginia". For the map and tables of population projections by locality, Renaissance Planning Group developed year 2035 population projections by calculating the average annual growth rate between the Year 2000 Census and the Virginia Employment Commission 2030 projection in order to extrapolate the projection to the year 2035. Renaissance Planning Group developed the Distribution Centers map by aggregating data from a map of distribution centers provided by the Virginia Port Authority.

[xix] Shoup, D. C. (2005). The High Cost of Free Parking. Chicago, IL: Planners Press, American Planning Association.