

TRANSPORTATION ASPECTS OF SMART GROWTH IN THE RESEARCH TRIANGLE
REGION (NC): CURRENT CONDITIONS AND FUTURE PROSPECTS

by

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This study ascertains the current state of transportation aspects of smart growth in the Research Triangle Region of North Carolina. This study uses content analysis to analyze the contents of plans, programs and regulations pertaining to transportation and land development. A smart growth audit instrument specifically tailored to transportation considerations was developed and used, which is based on generally accepted principles of transportation aspects of smart growth. After completion of the audit, the results of the audit are discussed, focusing on projects, policies, and financial aspects. The current and planned state of transportation aspects of smart growth are discussed and recommendations for the Research Triangle Region are made.

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CHAPTER 1: INTRODUCTION

What is the problem?

Sprawl has been a benchmark of urban design in America over the past 60 years or more, and it has deep roots in automobile dependence and suburban development. However, urban sprawl is not a form of suburban development, merely the effect from excessive spatial growth of cities (Brueckner, 2000). Handy (2005) defines urban sprawl as low-density, auto-oriented spread of metropolitan regions pervasive throughout the United States. Still others define sprawl as the process in which the spread of development across the landscape far outpaces population growth (Ewing et al., 2002). Whichever definition is used, the main problems are clear: sprawl is not an efficient use of land and is not sustainable for the long-term future. It is one of the greatest challenges to planners and policy makers of the 21st century, and represents a unique aspect of American history (Brueckner, 2000).

Smart Growth

Smart growth has been one of the fastest growing planning techniques of the past 20 years, and encourages dense, mixed-use development to build integrated neighborhood systems. Smart growth incorporates many sustainability-oriented techniques to improve the quality of living for those in smart growth areas. One popular aspect of smart growth that has been increasingly emphasized in the past 10 years has been transportation. Many smart growth projects now are focused on increasing transportation options and their availability, as increased transportation options generally encourage other smart growth principles. This has led to the development of distinct sub-categories of smart growth, including complete streets and transit-oriented development, both of which emphasize alternative means of transportation and public transit as the focus of smart growth projects. Significant research has been done looking into the

effects and success of smart growth practices on individual municipalities and large, centrally oriented regions, but little to no work has been done on the interaction of different localized municipalities within a distinct region which may have multiple Metropolitan Planning Organizations (MPOs). MPOs are federally mandated and funded organizations made of local government authorities that handle transportation policy and planning. MPOs usually deal with traditional transportation issues like roads and highways, but there has been a push in recent years to have them be more involved in alternative transportation and public transit. Most research has been done on regions with one MPO and one major municipality, not a conglomerate of two or more MPOs and multiple similar-sized municipalities. This study assesses the interaction of planning in a region with more than one MPO and multiple closely located municipalities in regards to how they work together on smart growth practices, specifically those in regards to transportation.

Research Questions

This study determines the state of transportation aspects of smart growth in the Research Triangle; as such, this entails looking at the policy and planning aspects of each major municipality in the region and seeing if they interact well, as well as the state of transportation aspects of smart growth in each selected municipality and the region as a whole. Another purpose of the research is to ascertain if the municipalities encourage working together or separately on transportation aspects of smart growth. This study also analyzes if MPOs adequately provide guidance for transportation aspects of smart growth, as some of the municipalities may adopt these organizations' direction as standard practice.

The primary objective of this research is to ascertain the current state of transportation aspects of smart growth in the study area, and to determine the future prospects for transportation

aspects of smart growth in the study area. This research analyzes the challenges that municipalities and MPOs in this region have working together and some of the strengths they have in addressing transportation aspects of smart growth. Coordination challenges and successes between equal levels of government can be translated for use by different levels of government in some cases when dealing with smart growth projects. One important aspect that can be gained from this research is how different governing bodies work together on these sorts of projects and the level of coordination required to carry out effective projects. To do so, one has to have some understanding of the region studied, its characteristics, and existing and planned infrastructure.

Research Triangle Region

The Research Triangle Region in North Carolina provides an ideal study area to address the interaction between multiple MPOs and similar-sized municipalities in terms of transportation-focused smart growth projects. It is characterized by its four main urban clusters, namely Raleigh, Durham, Chapel Hill, and Cary. The Research Triangle Region stretches across Durham, Orange and Wake County, but also extends into Chatham County, Harnett County, Johnston County, and Franklin County. Some of the smaller towns that encompass the Research Triangle Region include Apex, Morrisville, Clayton, and Wake Forest. Figure 1.1 illustrates the study area which includes two MPOs with jurisdiction in the region. Municipalities often work together and define themselves as a region and deal with unique challenges that a region with one main MPO would not have to deal with.

The triangle area is one of the fastest growing areas in the country and is going to need dense development to effectively use the dwindling space available in the region. According to the US Census Bureau, the population in Raleigh jumped from 276,093 to 403,892 between 2000 and 2010, which is an increase of 46 percent, one of the largest population increases for a large central city in the United States during that time (US Census Bureau, 2013). Between 2000 and 2009, the Research Triangle Region was the fastest growing metro area in the United States at 40 percent growth (US Census Bureau, 2013). In March 2014, Cable News Network indicated that the Research Triangle Region was the second fastest growing area in the country. The Research Triangle Region is in a unique position, not only because of its largely growing population base, but also because of its large university and research population (from the various colleges and Research Triangle Park).

The Research Triangle Region has Interstate 40 running through it as the main thoroughfare, with several offshoot interstates to provide access around the Raleigh area. The triangle area experiences extremely heavy traffic on most of its highways and major thoroughfares during rush hour, and has expanded lanes on most of the thoroughfares over the years, but the volume of traffic is still excessive. According to the Capital Area Metropolitan Planning Organization (CAMPO) and the Durham Chapel Hill Carrboro Metropolitan Planning Organization (DCHCMPO) Metropolitan Transportation Plan, Wake County to Durham County is the largest cross-county commute in the state. According to studies done by CAMPO, if current levels of transportation infrastructure investment are kept, there may be a jump in regional aggregate travel delay per employee from 8 minutes in 2005 to 35 minutes per day in 2035. According to a national study, the Research Triangle Region ranked as the third-most sprawling region among 83 regions studied (2040 MTP, 2013). Despite the rapid growth, there is

no rail-based public transit in the area, and public bus transit has low ridership levels (except for Chapel Hill Transit). No region has been able to “build its way” out of congestion using automobile-oriented transportation systems. The currently planned transportation infrastructure investments will not be able to keep up with expected growth in the region, and significant changes must be made to combat sprawl in the region.

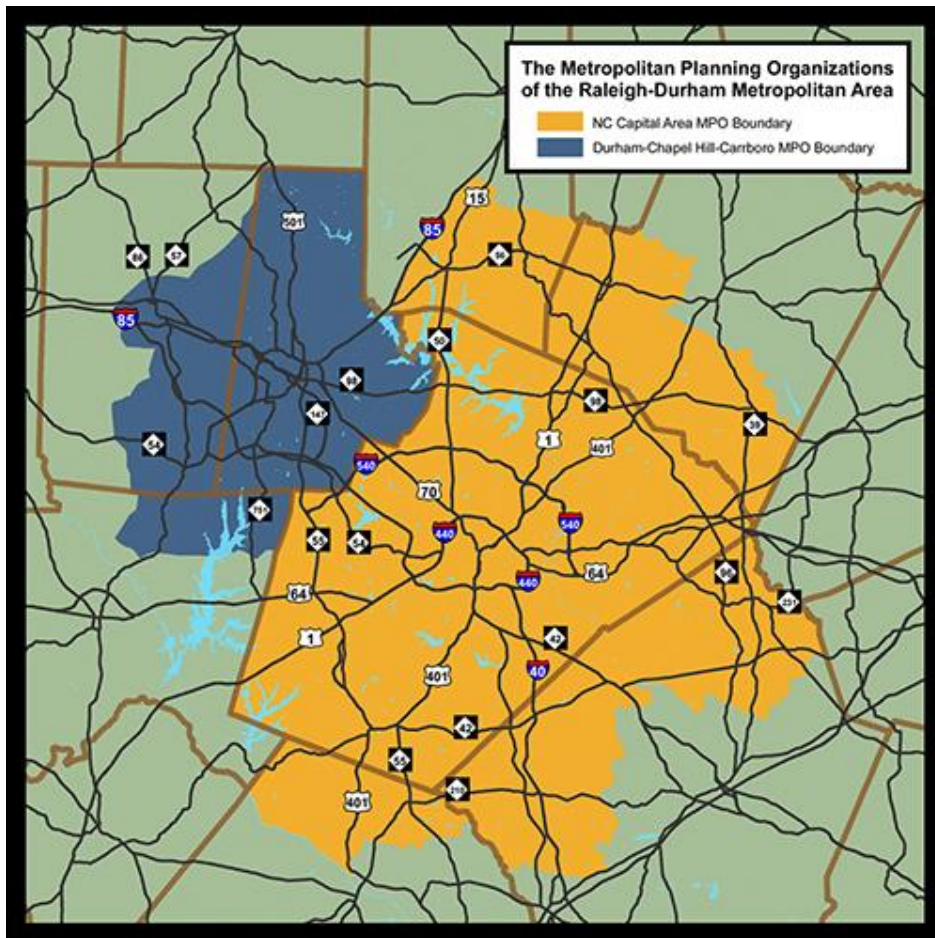


Figure 1. Boundaries of Study Area (NC Capital Area MPO and Durham-Chapel Hill-Carrboro MPO).

Source: NC Capital Area Metropolitan Planning Organization.

There has not been any comprehensive assessment of the state of smart growth in the area. As stated before, there has also been little to no work done on analyzing smart growth implications on regions with more than one MPO. The Research Triangle Region itself has

unique sub-areas, so integration among these is going to be key in responding to rapid growth in the region. Transportation aspects of smart growth is the focus here because of integration concerns among the various sub-areas (Raleigh, Durham, Chapel Hill, Cary), as well as the increased congestion and traffic density that will come with population growth. Transportation projects are also one of the easiest improvements to rally around for future smart growth projects and applications.

This research is broken down into local governments and then the region as a whole; local governments include Cary, Chapel Hill, Durham, Morrisville, and Raleigh. Research is broken down into cities because the majority of the population in the region is in these cities; there is no feasible way to conduct research on all the municipalities in the region. Smaller towns are out of the scope of the research, and counties were not at the appropriate scale for the aim of this research; Durham is the one exception because many documents related to Durham are combined city/county documents.

This research is aimed at policymakers, city planners, and transportation specialists in managing growth in the Research Triangle Region and fostering smart growth in areas where it makes sense, as well as looking at areas that need improvement, if planning and implementation do not match up. The MPOs in the area, the local governments and the Triangle J Council of Governments are considered a potential audience for this research. An audit would confidently provide a snapshot of the region, and point out any flaws or gaps in the region. This research can be used as a tool by stakeholders to help guide land use planning and transportation investments in the Research Triangle Region in the future.

CHAPTER 2: LITERATURE REVIEW

To understand transportation aspects of smart growth, one needs to comprehend smart growth more generally. To understand the need for smart growth, one needs to also comprehend the problem it intends to confront: sprawl.

Urban Sprawl

Historically, the beginning of urban sprawl was the result of soldiers returning home after World War II. An economic boom after the war, coupled with the return of soldiers with affordable mortgages and income tax deductions provided by the Federal Housing Administration and the Veterans Administration, made it preferable to purchase a single-family home on the outskirts of the city rather than rent an apartment (Duany et al., 2000). The private cost savings of having a bigger, cheaper living space versus having a longer commute led to an explosion of urban sprawl. The distance from the cluster of jobs in the downtown, along with the convenience of owning an automobile, placed precedence on the automobile as the main form of transportation in these areas; automobile oriented development became standard practice due to the convenience of the automobile. The reliance on the automobile intensified after the Interstate Highway and Defense Act of 1956, opening the floodgates for urban sprawl to take place (Barnett, 2011). Local, state, and federal policies encouraged this type of low-density, automobile-oriented development; influences on these policies included large-scale land developers, the oil industry, and housing contractors (Gonzalez, 2009). This development became the norm for much of the second half of the 20th century, encouraging building on cheap land and using the highway systems as arteries of travel for people on the outskirts of cities. Government and private investors neglected mass transit for a large portion of this time, due to desires to shift traditional urban jobs out to new suburban offices and industrial parks, which

would be more easily accessible from highway interchanges (Barnett, 2011). Urban sprawl and the highway system had a snowball effect, making the automobile necessary for any sort of transportation. Land use became dispersed in many areas, making mixed-use developments a thing of the past. Mixed-use developments include varied types and prices of housing integrated with commercial shops, schools, community facilities and jobs (APA, 2002). Streetcars, for example, were commonplace before World War II, mostly due to the fact that dense development encouraged private developers to build their own streetcar lines to service their customers (Belzer and Autler, 2002). Streetcar stops often had small retail clusters around them to encourage development around these areas. The advent of sprawl and low-density areas brought this development style to a halt. Most transit projects became a last resort rather than a viable transportation option tied to development (Ewing et al., 2002). The few transit systems that were built in the last half of the 20th century were built to alleviate congestion on highways rather than being a viable transportation alternative.

Urban sprawl is a concern for a wide variety of reasons, the most glaring being the impact on quality of life. Quality of life, or livability, refers to the environmental and social quality of an area as perceived by residents, employees, customers, and visitors (Burden and Litman, 2011). A higher rate of driving and vehicle ownership is a primary attribute of sprawl. According to research by Ewing et al. (2002), in the ten most sprawling metropolitan areas in the US, there are on average 180 cars for every 100 households, while in the least sprawling metro areas, there are 162 cars to every 100 households. Ewing et al.'s (2002) research also found that this was not an issue of affordability or affluence, but merely that individuals living in sprawling areas were more likely to bear the expense of additional vehicles. More cars also mean more traffic congestion. Traffic congestion refers to conditions where vehicle speeds are reduced

below normal rates, increasing travel times. Smart Growth America (2010) estimated that 69 percent of increased traffic can be attributed to factors associated with urban sprawl.

Additionally, from 1980 to 1997, vehicle miles traveled in the United States increased by 63 percent, which was three times the rate of population growth over the same period (Institute of Transportation Engineers, 2003). This can be attributed to the fact that low-density development means it takes longer to get to your destination. Congestion contributes to increased air pollution due to increased automobile usage. The study by Ewing et al. (2002) found that the highest residential densities in the study areas have 51 ppb (parts per billion) lower ozone levels than the lowest residential density areas. Parts per billion refers to the concentration of gas in a container. For reference, the Environmental Protection Agency's standard for ozone concentration in the lower atmosphere is 80 ppb. Ozone levels are important because emissions from vehicles contribute to higher ozone levels in the lower atmosphere, which have shown to cause health problems (Ewing et al., 2002). Lower atmosphere ozone is a primary contributor to smog, which can cause lung and respiratory system damage and reduce cardiovascular functioning (Behan et al., 2008).

Sprawl contributes to other health and safety issues as well. Research shows that residents of more sprawling areas are at a greater risk of dying in a car crash (Ewing et al., 2002). There tends to be higher concentrations of cars in sprawling areas, and the car speeds are usually faster. The study by Ewing et al. (2002) showed that areas of the highest residential densities are expected to have up to 18 fewer fatalities per 100,000 individuals than their low-density counterparts. Higher density areas tend to be more pedestrian friendly, and as a result have safer pedestrian infrastructure and lower automobile speed limits. Urban sprawl also discourages alternative transportation and walking. The low density and increased travel distances and times

means that it is more difficult to either bike, take bus or transit, or walk to destinations; the design of these areas also usually does not have infrastructure in place to support walking or alternative forms of transportation. According to Ewing et al. (2002), areas with more urban sprawl have an average of 2.3 percent of workers taking public transit and 2 percent walking to work, as opposed to areas with less urban sprawl which have an average of 5.1 percent of workers taking public transit and 3.1 percent walking to work. While these numbers may not seem that significant, small differences can have large impacts on traffic congestion and other associated attributes. Ewing et al.'s (2002) study suggests that the connotation that sprawl reduces traffic congestion, one of the proposed benefits of sprawl, appears to be wrong. One possible reason for this is that in areas that have high urban sprawl, the job density has shifted partially to the suburban areas, meaning that the traffic density has become equally distributed to keep the same levels of traffic congestion. Another explanation is that areas that are denser and have had to deal with traffic congestion have developed ways to mitigate it (Ewing et al., 2002). Some of the other problems with urban sprawl commonly cited are inability to provide adequate infrastructure, shortages of affordable housing near new jobs, suburban labor shortages, and wasteful use of resources and energy consumption (Johnson, 2001; Plevak, 2012).

Smart Growth

One of the most popular ideas for combatting urban sprawl has been coined “smart growth.” Smart growth is an umbrella term for methods and approaches that create high density, mixed-use areas that encourage mass transit and alternative transportation (Calavita et al., 2005). Smart Growth BC (2012) defines smart growth as “a collection of land use and development principles that aim to enhance our quality of life, preserve the natural environment, and save money over time.” The American Planning Association (2002) describes smart growth as not a

single tool, but a set of cohesive urban and regional planning principles that can be blended together and melded with unique local and regional conditions to achieve a better development pattern. Despite being a relatively broad term, smart growth strives to build communities that are sustainable in terms of social, economic, and environmental attributes.

The principles of smart growth started to arise in mainstream planning and policy work during heightened environmental awareness in the 1970s. As environmental issues started becoming relevant in the public eye, attention was given to reversing sprawl and revitalizing urban areas (Leigh and Hoelzel, 2012). The effects of deteriorating air quality, rising infrastructure costs and reduced quality of life from increased sprawl and traffic congestion caused smart growth to be established as a response (Downs, 2001). With the establishment of the Smart Growth Network in 1996 and Smart Growth America in 2000, smart growth was used as an umbrella term to describe ways to combat sprawl and repurpose urban areas (Leigh, 2012). The American Planning Association (APA) and the US Environmental Protection Agency (EPA) began publishing reports and information on smart growth soon after the founding of Smart Growth America to help facilitate its establishment as a core approach of urban planning and development. Smart growth policies have now been integrated in many federal, state, and local regulations. The set of key smart growth guidelines that are generally accepted are:

- Mix land uses
- Take advantage of compact building design
- Create a range of housing opportunities and choices
- Create walkable neighborhoods
- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty, and critical environmental areas
- Strengthen and direct development towards existing communities

- Provide a variety of transportation choices
- Make development decisions predictable, fair, and cost effective
- Encourage community and stakeholder collaboration in development decisions (Smart Growth Network, 2006)

One of the key principles of smart growth is integrating land use with transportation.

Dense mixed-use developments are disadvantaged if there is no way for people to efficiently and effectively get to where they want to go. These transportation services must be competitive with the automobile in terms of speed and comfort (Filion and McSpurren, 2007). A common misconception of smart growth is that it forces alternative means of transportation on residents and workers. This is not true; smart growth is designed to provide greater options for individuals in how they live and travel (APA, 2002). Offering more choices for how people live, work and travel benefits everyone and allows people to choose areas that suit them best. Many smart growth projects do not reach their full potential because they do not effectively integrate transit options into their development. It is impossible to have land use development without transportation options, and vice versa. Transportation is the primary focus of this thesis, and will be discussed in further detail later.

Health benefits and economic viability are important in the development of smart growth projects. Low-density developments typical of urban sprawl encourage automobile use rather than alternative forms of transportation including walking and bicycling, which provide exercise. Quality of life is an important aspect of smart growth, and having transportation options that enhance personal health and fitness is a plus (Behan et al., 2008). These quality of life improvements have far reaching effects beyond planning and policy benefits. Research shows that during the 1996 Olympic Games in Atlanta, GA, the city discouraged driving and increased

public transportation; rush hour traffic decreased substantially and ozone levels fell, resulting in asthma-related medical emergencies falling by 42 percent (Jackson and Kochtitzky, 2001).

Having mixed-use development with higher employment clusters has been shown to provide economic boosts. Research by Robert Cervero (2001) shows that areas in San Francisco with good labor accessibility and high employment densities were economically the most productive. From a public infrastructure standpoint, research has shown that more densely populated areas are more cost efficient to manage (Bunce, 2004). Reduced infrastructure requirements can lower public sector expenses in the area, leading to potentially beneficial fiscal and economic development consequences; the increases in tax revenue for the area from increased densities also allow tax revenue to be spent on other worthwhile projects and programs (Behan et al., 2008). The efficient use of public and private infrastructure is an important principle of smart growth, and it often starts with repurposing or maximizing the use of existing infrastructure (American Planning Association, 2002). A recent smart growth project in the Barracks Row area of Washington, DC repurposed older vacant buildings into new shops and residencies without driving out longtime residents and businesses (Smart Growth Network, 2006). Not having to build new buildings or renovate or extend existing buildings provided extensive cost-savings for the project.

Two of the biggest questions and challenges raised about smart growth are how affordable housing and rural communities are handled. Providing affordable housing is an important aspect of smart growth because it promotes a wide variety of housing; choice is stressed in smart growth policy (American Planning Association, 2002). Neighborhoods with lots of amenities like public transit, shops, and parks are often expensive because people want to live there (Smart Growth Network, 2006). The neighborhood of Stapleton in Denver, Colorado,

dealt with this challenge. When it began to be developed as mixed-use with homes, offices, schools and shops all close by each other, citizens wanted the neighborhood to have a wide variety of homes at different prices so many different people could enjoy the benefits of a smart growth project (Smart Growth Network, 2006). Many of the residents walk to work, and many of the children living in the neighborhood walk to school.

In terms of rural communities, smart growth is just as much about reducing urban sprawl as preserving rural farmland and communities so they remain viable. The preservation of small towns and rural communities in the face of pressure from urban sprawl is often times more economically efficient (American Planning Association, 2002). The high cost of basic infrastructure and services in rural communities means that the use of existing infrastructure and compact development will be more economically efficient (American Planning Association, 2002).

Another common criticism of smart growth is that it ignores industrial uses. According to Leigh and Hoelzel (2012), most smart growth policy and publications fail to mention specific policies encouraging industrial uses or reinvesting in industrial land for new manufacturing. Fostering dense, compact infill and redevelopment is a core tenet of smart growth policies, and the majority of smart growth publications promote this urban form. Infill development refers to building a residential structure on a vacant lot or parcel of land that is underutilized, in an area where additions or new structures have been built (Behan et al., 2008). A number of important economic factors may be overlooked when simply relying on the use of density criteria. These include the fact that manufacturing has higher value and employment multiplier effects than many other land uses, and that local tax revenue generated by manufacturers may be greater than providing them with basic public services (Leigh and Hoelzel, 2012). It is important to remember

that smart growth techniques should be tailored to each individual scenario to best meet the needs of that community.

Obstacles to Smart Growth

Downs (2005) explores some of the challenges and obstacles to implementation of smart growth practices and strategies. One of the obstacles to implementation is the power shift of planning from local authorities to state and federal levels. Land use decisions that affect development patterns are usually controlled by local powers, and smart growth ideas are generally on regional and federal levels; when multiple local governments each have their own agenda, lack of cohesion and cooperation encourages the prevalent development at the time, i.e. sprawl (Downs, 2005). Implementing smart growth practices and policies may put more power into regional planning, which takes away from the idea of disjointed incrementalism, which is popular with developers and homeowners, as it allows one to develop areas as they want without excessive oversight (Downs, 2005). Increased power in regional planning may meet opposition from both private and governmental powers.

Another obstacle is the tendency of smart growth policies to raise housing densities. Homeowners in existing areas may not want further residential development if new units sell for less than their home is worth, which could bring their home's value down (Downs, 2005). The opposite is also true, as smart growth projects have a tendency to raise the overall property values where they are located. Smart growth developments and policies may in some instances fail to reduce traffic congestion, which may allude to a larger, regional problem (Downs, 2005).

These obstacles plus others limit the effectiveness of certain principles of smart growth, making some practices very likely while others will seem unclear or unlikely to be implemented.

Transportation Aspects of Smart Growth

Transportation is an essential component to any smart growth policy or project. Smart growth projects aim to reduce dependence on automobiles through increased compactness of development, which allows more efficient use of existing infrastructure, reduces the need to expand transportation and encourages the use of public transit, bicycles, and walking (Institute of Transportation Engineers, 2003). As stated before, smart growth is all about providing a wealth of choices to residents and workers to allow better freedom in how we live and travel.

Transportation is the second highest expense for individuals after housing, with the average household spending 19 percent on transportation; households with good transit access spend only 9 percent (Center for Transit-Oriented Development, 2007).

In terms of automobiles, this means devising an effective grid pattern. Well-connected, grid systems allow traffic to use multiple routes, rather than concentrating it on a few streets (Institution of Transportation Engineers, 2003). When we increase the amount of pathways that one can take, we devise more efficient traffic patterns. Venice, Italy has about 1500 intersections in a square mile, while Los Angeles, California has about one-tenth of that (Jacobs, 1993). The walkability of Venice would be widely considered better than Los Angeles. Studies have generally found a positive relationship between density, a tight street grid, mixed use and walking and transit use (Handy et al., 2005). Automobiles will continue to be integrated into smart growth as an option available to residents and workers, but not as the primary transportation focus.

The idea of mobility versus accessibility is important for transportation planning. Mobility refers to how fast we get around and how we do that, whereas accessibility refers to the physical access of reaching goods, services, activities and destinations (Litman, 2012). In other words, mobility refers to the freedom or ease of movement people experience through traveling among multiple modes of transportation, while accessibility refers to the ease with which people can reach their destinations (Institute of Transportation Engineers, 2003). Making more efficient traffic patterns and grid designs will increase accessibility. Historically, transportation meant mobility. This meant getting to where we needed to go as fast and as cheaply as possible, which meant automobile travel. This leads to other costs- most notably in the form of the negative effects of sprawl. Transportation's goal should be accessibility, the ability to reach desired goods, services, and activities safely (Litman, 2003). When encouraging multi-modal transportation, we need to encourage accessibility for all modes. The historical norm has been to increase accessibility for automobiles in the form of highways, which decreases accessibility for other forms of transportation (Burden and Litman, 2011).

Walkability is a major concern of transportation aspects of smart growth. Walking constitutes an alternative means of transportation and benefits from density, as well as providing health benefits. In Jane Jacobs' (1961) work *The Death and Life of Great American Cities*, Jacobs spent considerable time emphasizing the importance of walkability and sidewalks for neighborhood cohesion, street security, and assimilation of children into adult society. Dense street networks typical of smart growth encourage increased pedestrian walkability, as blocks are shorter and destinations are easier to reach (Institute of Transportation Engineers, 2003). A model used in Austin, Texas predicted that walking increases with higher housing, retail, and intersection densities and when jobs and housing are balanced, all qualities of smart growth

(Marshall and Grady, 2005). If walking is so great, why has it not been integrated in development for the second half of the 20th century? It is important to remember that demand for walking may be rationed not by design but by municipal development and zoning codes that favor low densities, wide streets, and segregated land uses; all hallmarks of urban sprawl (Crane and Schweitzer, 2003).

Perhaps the largest attribute of transportation in smart growth is the inclusion of public transit. Public transit commonly refers to any sort of mass transit that is either free or offered at a reduced price, such as light rail, street cars, and buses. 40 percent of the people who live in the country's subway corridors commute by public transit, compared with a national average of about 5 percent (Smart Growth Network, 2006). We can make conclusions that having public transit nearby and easily reachable encourages its use dramatically. A study in Toronto found that density increments tied with smart growth must be associated with the presence of quality public transit services to be utilized correctly (Filion and McSpurren, 2007). Another study found that rail transit can have a significant effect on shaping urban form and land activities only if it is integrated with local pro-development policies (Knight and Trygg, 1977).

Two of the most common smart growth strategies for transportation, “complete streets” and transit-oriented development, incorporate most of the transportation-related aspects of smart growth projects.

Complete Streets

Complete streets is a planning concept that focuses on safety for drivers, bicyclists, transit vehicles and pedestrians. According to Smart Growth America (2012), it is defined as “a

movement aimed to develop integrated, connected networks of streets that are safe and accessible for all people, regardless of age, ability, income, ethnicity, or chose mode of travel. It is commonly considered a sub-concept of smart growth. It mostly deals with multi-modal transportation safety and integration; part of its intent is to change the everyday practice of transportation and planning agencies to consider every mode of transportation in road design projects (LaPlante and McCann, 2008). As stated previously, a key component of complete streets is allowing greater choices in how we get around, therefore allowing individuals to tailor their transportation to what works best for them. This means walking and cycling for local trips, public transit for travel on congested corridors and for non-drivers; and automobile travel to access dispersed destinations and for carrying loads (Burden and Litman, 2011). The most typical elements that make up a “complete street” project are sidewalks, bicycle lanes, shared-use paths, transit stops, and safe pedestrian crossings (Smith et al., 2010). Shared-use paths are placed where sidewalks usually are, and are designed for use by both pedestrians and bicyclists. They are typically much wider than most sidewalks.

Complete streets address multiple problems about current transportation. Unlike traditional pedestrian and bicycle plans, they are not limited to roads that are part of designated bike or pedestrian networks; they are designed to cover most roads in the system (McCann, 2005). One aspect of complete streets policies is to curb traffic accidents through traffic calming measures. Traffic accidents cost about \$164 billion annually in property damage and injuries in the US; adopting complete street policies will help lower this number (American Automobile Association, 2008). Complete streets policies help address air pollution by curtailing automobile use; the Urban Land Institute estimates that carbon emissions from transportation will be 41 percent above today’s levels in 2030 if driving rates are not lowered (Ewing et al., 2008).

Additionally, a study by the Texas Transportation Institute found that congestion was responsible for an annual \$78 billion loss in fuel during traffic jams in 2007, an increase from \$57.6 billion in 2000 (Burden and Litman, 2011). Over 72 percent of the shortest trips for individuals are made by automobile (Burden and Litman, 2011); complete streets techniques can convert many of these trips to multimodal travel, cutting down on air pollution and traffic congestion.

Complete streets offers a wide variety of benefits. Complete streets projects and policies support other efforts, including transportation demand management, parking management, transit-oriented development, and smart growth land use policies (Burden and Litman, 2011). An integrated complete streets program can reduce per capita vehicle travel by 10 to 30 percent or more compared with more auto-dependent communities (Ewing et al., 2008). Complete streets benefits are similar to smart growth benefits, and offer some of the same ones, such as improved opportunity for walking, livability, cycling and public transit. There can also be economic benefits: North Carolina DOT (2003) has linked added tourism to the inclusion of bike trails in popular mountain, beach, and city destinations. Complete street policies are also extremely flexible. While the idea of complete streets is based on consistency, every project is unique and must meet the needs of the community it serves (McCann, 2005).

The City of Charlotte, NC, adopted and implemented a complete streets policy in 2007 titled “Urban Street Design Guidelines” (Smith et al., 2010). This made huge strides in the walkability, connectivity, and economic viability of many areas in the city, which was recognized when the US Environmental Protection Agency awarded Charlotte with the 2009 National Award for Smart Growth Achievement in Policies and Regulations (Smith et al., 2010). It is important to remember that complete streets are not simply about street design, but rather,

about combining land development patterns and street designs that work in sync (Burden and Litman, 2011).

Transit-Oriented Development

Transit-oriented development (or TOD for short) centers around designing land use and land development with public transit accessibility in mind. TOD can be defined as “compact development within easy walking distance of transit stations (usually within one-half of a mile) that contains mixes of land uses such as housing, jobs, shops, restaurants, and entertainment (Center for Transit-Oriented Development, 2007). The California Department of Transportation defines TOD as “moderate to higher-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment, and shopping opportunities designed for pedestrians without excluding the automobile” (California Department of Transportation, 2012). TOD projects are generally built at greater densities than traditional smart growth projects because they are very close to transit (Environmental Protection Agency, 2013). TOD is development designed to be built around transit stations that encourages smart growth principles.

TOD is based on five main goals: location efficiency, value capture, livability, financial return, and choice (Belzer and Autler, 2002). Location efficiency refers to placing developments such as residential, commercial, parks, civic uses, and entertainment close to transit stations to promote alternative means of transportation (Ratner and Goetz, 2013). Location efficiency converts driving from a necessity into an option (Belzer and Autler, 2002). A rule of thumb with TOD is that people will generally only walk a maximum of one-half mile to get to a transit

station, so density must be increased to allow more people the opportunity to take transit if they choose. Research shows that people living near transit are three to four times more likely to commute via transit than other residents (Bernick and Cervero, 1997). Given the opportunity, people will take advantage of transit options that allow them more personal flexibility in how they get around.

Value capture means making the TOD project financially viable and beneficial for its residents. Research shows that residents of transit-rich metropolitan areas pay less for transportation than their counterparts in automobile-heavy metropolitan areas, even when the cost of public investment in transit is included in calculations (Belzer and Autler, 2002). A popular tool for value capture has been location efficient mortgages (LEM). LEMs have been sponsored by Fannie Mae and have been offered to residents in location efficient locations like Chicago and Seattle that reduce their spending on transportation by owning no or fewer cars than normal (Belzer and Autler, 2002). It allows individuals to take a larger loan than usual under standard mortgage rules. However, as of 2011 they are not currently being offered by Fannie Mae. A successful example of value capture is the Rosslyn-Ballston corridor in Arlington, VA. Almost 30 years ago this area was declining and low density when the local government decided to focus on TOD around five closely spaced rail stations (Center for Transit-Oriented Development, 2007). The area is now thriving and single family neighborhoods coexist and compliment new development, showcasing an example of choice in living. Assessed land value around the stations increased 81 percent in 10 years, and now 50 percent of the residents in the area take transit to work (Center for Transit-Oriented Development, 2007).

Livability goals for TOD are very similar to livability goals for both smart growth overall and complete streets. The negative effects commonly associated with urban sprawl (e.g. air

pollution, traffic congestion, access to open spaces) are mitigated through TOD (Belzer and Autler, 2002). These are things that are in the interest of the public; TOD provides a return on public investment because it shapes land uses to generate more transit use, which mitigates against traffic and pollution (Renne and Newman, 2002). Enhanced pedestrian accessibility and street design improve quality of life in TOD neighborhoods, and provide greater accessibility to commercial areas (Environmental Protection Agency, 2013).

Financial return is a concern of any project. TOD projects have different return expectations for private versus public investors, and TOD projects are expected to be long-term investments. As seen in the Rosslyn-Ballston corridor project, land values skyrocketed, and with 8 percent of the county land generating 33% of the county revenue, Arlington has the lowest property tax rate in northern Virginia (Center for Transit-Oriented Development, 2007). Communities that invested in streetcars saw their return on investment reach up to 7500 percent, with most averaging at least a 1500 percent return on investment (Center for Transit-Oriented Development, 2007). This doesn't include the increase in customer base that commercial developments witnessed in and around TOD projects. TOD projects may require more complex financing strategies, but the potential for large return on investments are great, especially if location efficiency is taken advantage of (Belzer and Autler, 2002).

A final goal of TOD is choice. Many different types of people have emphasized the desire to have more transportation options in many livability studies (Belzer and Autler, 2002). According to research, by 2030 almost 25 percent of all US households looking to rent or buy are likely to want higher-density housing near transit (Center for Transportation Oriented Development, 2007). There has also been an increase in single-person households, young

professionals, and empty-nesters, who might be looking to move somewhere with higher-density amenities or transit options (Ratner and Goetz, 2013).

TOD is not designed to force people into high-density areas and take transit. The best TOD (and smart growth) projects incorporate a wide variety of housing, offering the most choices for people to live in while still incorporating transit (Belzer and Autler, 2002). Suburban development is still the primary development form, and it leaves few choices in terms of housing or transportation modes. TOD is designed to supplement, not replace current choices (Belzer and Autler, 2002). There will still be places where TOD is not viable. It should be used in places where it makes sense and can be fully utilized. TOD has been standard procedure in many European and Asian cities, given the higher population density and stronger historical emphasis on transit (Cervero, 1998). TOD projects are starting to gain traction in the US and are quickly becoming an integrated part of planning and policy.

CHAPTER 3: METHODOLOGY

As stated previously, this research analyzes the current state of transportation aspects of smart growth in the Research Triangle Region and compares them to accepted standards for smart growth via a predetermined audit instrument. Local governments are aware of the problems with intergovernmental work, but the infrastructure to facilitate this work is lacking, and funding plays a large part of that. This research identifies the biggest problems and provides possible solutions.

Interviews

Key planners and policy-makers in the Research Triangle Region have been interviewed for their insights and thoughts on transportation aspects of smart growth in the triangle area. Six individuals were interviewed with specializations including planning, transportation engineering and transportation policy. A set of questions was prepared in advance for the interviewees. Interview appointments were scheduled between April 14, 2014 and April 30, 2014 with the interviewees. A structured survey and cover letter were sent ahead of time so they were able to give prepared answers. Interviewees also provided qualitative context to various policies and programs, including current practices and implementation of smart growth strategies. In order to maintain quality standards set forth by East Carolina University, approval of the interview process was obtained from East Carolina University's Institutional Review Board, and the identities of the interviewees were kept confidential in order to protect their anonymity in responses. Interviewees provided information on Cary, Chapel Hill, Durham, Raleigh, and specialized information on transportation infrastructure on a regional level.

Audit Instrument

The data were processed through a self-designed audit instrument, which is how the information from the content analysis was technically processed. Part of this research includes ascertaining the current state of transportation aspects of smart growth pertaining to the study area, and that is done by designing an audit instrument that will determine how localities in the region are doing and see where improvements can be made. An audit (in this sense) refers to a formal examination of the plans, policies, programs, regulations, and budgets that relate to the subject at hand (Weitz and Waldner, 2002). This audit uses generally accepted principles of transportation aspects of smart growth, including complete streets and transit-oriented development, for evaluation. The results and discussions and recommendations sections have findings and recommendations on how existing practices equate with, or depart from, the accepted principles (Weitz and Waldner, 2002). The generally accepted principles are derived from two primary sources: “Smart Growth Audits” by Jerry Weitz and Leora Susan Waldner, and the Institute of Transportation Engineers “Smart Growth Transportation Guidelines”; however, other secondary sources have been consulted and included as appropriate in the audit instrument. The interviews are used to fill in gaps that the auditing process could not answer. The audit is used to assess the current state of smart growth practices and policies that encompass transportation in the study area.

For simplicity, each audit has been separated into three main sections: projects, policies, and financial. The projects section deals with planned and completed projects in the study area, both transportation-specific projects and those that have an effect on transportation. The policies section deals with policies and laws enacted that directly and indirectly deal with smart growth practices and policies. The financial section deals with funding and cost of smart growth

practices and policies; this section may include financing for projects. An audit template is provided in the appendix, along with the completed audits for the individual study areas. The subjects of the audit were Cary, Chapel Hill, Durham, Morrisville, Raleigh, and the Research Triangle Region as a whole.

Data Sources

The data sources for this project consisted of various plans and policy reports, including comprehensive plans, land use plans, transportation plans, special transportation studies, development and transportation regulations, zoning ordinances, and metropolitan planning organization plans. Additional data sources included personal interviews in the study area. The plans and policy papers for Cary, Chapel Hill, Durham, Morrisville, Raleigh, and some on the regional and state level were obtained by requesting them through the corresponding offices or downloading them from their online sites. Table 1 provides a list of relevant plans and policy papers that were used in the audit. This table is available in the Appendix for reference purposes.

Analysis of Plans and Regulations

The primary data collection method used is content analysis. Content analysis is a research tool used to determine the presence of certain words or concepts within texts or sets of texts (Busch et al., 2012). This technique is used to quantify and analyze the presence and meaning of words and concepts within a text and then make inferences about themes within the text. Content analysis can be used to search and count specific words and phrases in the data, looking for themes and trends. Traditionally a number of key words or phrases are chosen to

analyze a text for, and then their location, quantity, and relation are tallied and organized into categories (Busch et al., 2012).

There are two basic types of content analysis: conceptual analysis and relational analysis. Conceptual analysis involves choosing a concept for examination in a text and quantifying its presence, while relational analysis goes a step further and explores the relationships between the concepts identified in the text (Busch et al., 2012). Content analysis provides many advantages including the ability for both quantitative and qualitative operations, the ability to interpret texts for purposes such as the development of expert systems, and provides insight into complex models of human thought and language use. However, content analysis has disadvantages, such as being highly time-consuming. It is often devoid of a theoretical base, and tends too often to simply consist of word counts instead of consulting the context that produced the text (Busch et al., 2012). This research used conceptual analysis, but used the qualitative aspects of conceptual analysis; this research did not focus on word counts and focused more on the context within which certain words are found. For example, when searching for terms or phrases, the research determined if context and policy around the term or phrase supports or detracts from particular aspects of smart growth. The key words and phrases for the content analysis were chosen from primary sources for the audit instrument. Illustrative keywords include smart growth, transit, transportation, pedestrian, automobile, bicycle, and multi-modal. This research used the search function for adobe software (or other document software) to search documents where applicable, but manual searches were performed for documents that were not compatible with software or were only available in hard copy.

Presentation and Synthesis of Results

After the audit was completed, the information from the audit was used to analyze planning and implementation concerns, as well as for making recommendations for future transportation projects in the study area that are centered around smart growth. An audit result has been compiled for each local government to compare and contrast on a local and regional scale. These responses are assessed in a regional context when compiling recommendations. It is important to make the distinction between planning and implementation because of the parties responsible for each. Planners generally are in charge of creating plans, but implementation is controlled by a few other parties: notably the legislative bodies of local governments. It is possible to create a high quality plan but have no implementation. Many breakdowns between planning and implementation can occur due to factors such as changing composition of governing bodies, funding, and changes in government focus. Determining the obstacles to implementation of smart growth in the region and what can be done to overcome these obstacles were included in the audit instrument. Additional challenges to implementation are raised and discussed in the Discussion and Recommendations portion of this study. Recommendations not only addressed new and existing smart growth projects, but also addressed ways to meet the challenges presented by implementation of smart growth practices in a regional context specifically to the Research Triangle Region.

CHAPTER 4: RESULTS

Cary

Projects

The audit of Cary provided a look at one of the fastest growing municipalities in North Carolina over the past 15 years. Before 2000, Cary did not have a transit system; now, its bus system is one of the biggest in North Carolina. The Town of Cary has incorporated smart growth practices and policies from the beginning of its expansive growth and continues to do so.

Cary has enabled a number of smart growth projects within its jurisdiction. Cary has supported a number of projects that act as their own inclusive neighborhood, most notably the Arboretum neighborhood and the Bradford development (still under construction). The Arboretum is a mixed-use development and includes a number of luxury apartments as well as other types of apartments. The Arboretum is constructed similar to a high-density downtown area and provides multiple walking amenities that connect to a few nearby communities. The Bradford development is mixed-use and is slated for completion in fall 2014. It will integrate both apartments and commercial features together with open space and similar amenities. The Bradford development will integrate multiple modes of transportation and will use a similar design to small-town downtowns. However, both the Arboretum and the Bradford development lack varied types of housing (especially affordable housing) and lack certain integration with surrounding neighborhoods.

On the public side, Cary has built fire station 8 for the municipality in a sustainable way, and is LEED certified. Cary's bus system has been established and expanded in the past 15 years to now include 6 routes which work in conjunction with Raleigh's bus system and Triangle

Transit buses to provide comprehensive service for Cary residents. The Cary bus system (C-Tran) also features door-to-door service for elderly citizens. Figure 4 represents a system map of C-Tran.



Figure 2. C-Tran System Map (Source: Town of Cary).

Cary has also done projects in conjunction with other municipalities. Cary has implemented a road width reduction project on Lake Pine Drive, which connects the edge of Cary to Apex. Cary has installed complete streets improvements on many of its roads and worked with Apex to build sidewalks and bike lanes that line up with each other. Cary has also done a similar project with Raleigh concerning Buck Jones Road. Cary has been a part of the regional rail conversation for many years - it is not part of the current rail project that Orange County and Durham County have recently approved. Cary has worked with Raleigh on a regional rail study, and it is possible Cary will participate in the regional rail system if or when Wake County becomes part of the existing regional rail program. Full details of the project aspect of the audit for Cary are provided in the Appendix.

Policies

Cary's growth may be due to the economic explosion in the area, but Cary has molded that growth with progressive policies that emphasize smart growth development. The Cary Comprehensive Plan answered most of the audit questions, and is not structured like most comprehensive plans- the comprehensive plan is made up of smaller individual plans around certain subjects. These subjects range from small area plans to growth management and affordable housing plans. As such, the comprehensive plan for Cary is still technically under development, with more additions slated to be completed in the following years. The audit also looked at the Cary Transportation Plan, the Cary Land Development Ordinance, the Wake County Land Use Plan, the Wake County Transit Plan, and the 2040 Metropolitan Transportation Plan. An interview with a Town of Cary official was conducted in order to answer parts of the audit questions that could not be answered from available plans and policy papers.

The plans and policies examined in this audit provide an indicator of how well Cary has followed and implemented transportation aspects of smart growth. The town has addressed long-range needs for transit, especially with the town's impressive expansion of bus services in the past 15 years. Cary has also incorporated ordinances that provide for the reduction of local street standards to avoid excessive right-of-way and pavement widths, and has done this through a combination of revising street standards for local streets and through implementation of skinny streets and road diets in the area. Cary emphasizes maintenance of current roads and existing transportation systems before spending money on new ones. As far as local street intervals go, the town of Cary follows the spacing guidelines set out by the complete streets policy from the NCDOT, which recommends new local streets at designated intervals.

Cary also addresses aspects of multi-modal transportation. As stated before, Cary has incorporated complete streets into its transportation policy and requires new streets to have sidewalks on both sides of the street. Many aspects of complete streets are part of Cary's policies; new developments are required to install sidewalks along existing public streets bordering the development where sidewalks do not already exist. Regulations also require the connection of subdivision streets to existing streets, and new streets must allow connection to future subdivision developments; these same regulations require the provision of inter-property connections between individual developments. Cary also encourages transit-oriented development in its transportation plan.

One way Cary has been addressing smart growth and transit-oriented development is through the development of activity centers. Activity centers are designed to physically and aesthetically unite areas and communities into their own neighborhoods through mixed-use development and orientation towards walkability, compactness, and transit-friendliness. In short,

activity centers are designed to create interconnected neighborhoods using smart growth and transit-oriented development. Each activity center has certain allowances for the amount of commercial, types of residential, and road types that can be included in the activity center. Cary also employs levels of activity centers, so there are ones on a neighborhood level (the smallest area), community level (the mid-size area) and regional level (largest area). Cary currently has approximately 30 different activity centers that ensure balanced neighborhoods that are designed for residents to have easily accessible amenities within their respective activity center. Each activity center is unique, but Cary specifies that the activity centers will all share similar characteristics concerning mixed-use, residential density, space allotted for parking, public outdoor space, site design, transit access, vehicular access, and pedestrian and bicycle access.

Other transportation measures are addressed adequately in Cary's plans and policies. Cary has developed congestion management measures in the form of ride sharing and building in more modes of transportation by incorporating more TOD-specific projects. Cary has implemented a majority of the recommendations put forth by the comprehensive plan and the transportation plan, but there are still a number of things that need funding that are projected to be done within the next decade. Additionally, Cary's next update to its transportation plan is predicted to be completed in the next five to seven years and will place an emphasis on smart growth.

Cary has also not addressed some things that are called for in accepted principles of smart growth. Cary follows the traditional road network of local streets to collectors to arterials rather than an interconnected local street network due to its size. Cary is lacking a bicycle master plan currently, but there is a bicycle component to Cary's current transportation plan. Cary also lacks HOV lanes for its roadways, and does not have any sort of transportation demand management

measures such as vanpools or carpools in place. There is a lack of any TOD-promoting incentives as well, such as down payment assistance in TOD communities or location efficient mortgages. Full details of the policy aspect of the audit for Cary are provided in the Appendix.

Financial

Cary has reached out to a number of different sources to maximize funding for its projects. Cary obtains a large amount of grant funding for its projects through CAMPO related funds, but has also received funding from a number of other sources. Cary approved a \$1 million sidewalk investment program in 2012 to develop sidewalks in areas that are lacking in pedestrian accessibility. Cary also has some tax incentives in place, but they are mostly focused towards increasing development density. There is also a transportation development fee program that requires developers to offer multiple modes of transportation. Much of the funding for Cary's projects comes from bond funding at the state, federal, and the capital fund program that serves the Research Triangle area. Cary does not participate in any regional tax programs currently, but it is possible that will change if Cary decides to be a part of the light rail program in the Research Triangle. Full details of the financial aspect of the audit for Cary are provided in the Appendix.

Chapel Hill

Projects

The audit of Chapel Hill provided informative insight on the workings of one of the smaller municipalities in the Research Triangle Region. Chapel Hill has been progressive in initiating smart growth projects and policies and is one of the leaders in public transit systems in the region.

The town of Chapel Hill has encouraged smart growth projects and has been active in the planning process for a number of projects. However, the Chapel Hill area has also had demand from investors to construct smart growth projects and all projects have not necessarily been pushed by the local government. One of the most recognizable projects in the Chapel Hill area is Greenbridge, which is a LEED (Leadership in Energy and Environmental Design)-certified apartment/ condo complex in downtown Chapel Hill, on the border between Chapel Hill and Carrboro. This project encountered opposition from locals due to concerns about increased property values (and thus land taxes) in an area that was predominantly lower income, but eventually was approved and completed. The project also included affordable housing units, a commonly ignored smart growth principle. After completion, the project provided much needed increases in housing for the downtown Chapel Hill area, but rental and purchasing costs of apartments and condos in the building were too high for students to afford and the company owning the building encountered financial problems. The building has changed hands a few times due to financial problems of actually selling or leasing units in the building, despite its ideal location and energy efficient measures.

Meadowmont is another highly visible project in the Chapel Hill area that has embraced many practices of Smart Growth. This inclusive neighborhood is in the eastern part of the town, and has many smart growth amenities. The neighborhood has many different forms of housing, ranging from single family houses to townhouses to multi-family structures. There is a major grocery store and other stores located in the center of the neighborhood, and streets are designed so that they encourage alternative forms of transportation. There is also an elementary school located in the neighborhood to encourage walking to school for children in the neighborhood. This neighborhood has been widely commended for its smart growth and new urbanist ideas, but

lacks the compactness of other projects. Driveways are mainstays of suburbs, and are featured in most of the housing in the neighborhood. However, Meadowmont is more architecturally consistent than any of the other projects because the whole area was developed at the same time.

The best example of smart growth practices in Chapel Hill is the Southern Village neighborhood. This neighborhood is in the southern part of Chapel Hill and exemplifies many smart growth practices and policies. The neighborhood has its own main street with shops and stores, and features a wide range of housing choices while being compact in nature. Much of the neighborhood is served by alleyways to keep density high. Single family and multi-family homes are available with affordable housing options as well as multiple housing types, such as detached homes, townhomes, condos, and apartments. Multi-modal transportation is encouraged and the compact nature of the neighborhood means that residents often walk or bike to main street amenities.

Two other developments with smart growth aspects tied to them are the 140 development and Shortbread lofts in downtown Chapel Hill. The 140 development is similar to the Greenbridge development except that it is not LEED certified and is closer to the center of downtown. It has achieved success in filling out its units and has many shops on the first floor, so it serves as mixed-use development along downtown Chapel Hill. Shortbread lofts are currently under construction in downtown Chapel Hill (slated to open in summer 2014) and markets itself as high end student living. It encourages higher density in downtown Chapel Hill as well as walkability. However, Shortbread lofts will not be multi-use, as there will be no commercial development on the first floor.

Chapel Hill has a bus transit system within the town. The bus system in Chapel Hill serves major corridors in not only Chapel Hill but the town of Carrboro as well, and is completely free to riders (the majority of the cost to run the system is collected from student fees at UNC, as well as taxes on Chapel Hill and Carrboro residents). Chapel Hill Transit is also the second largest transit system in North Carolina, and is run entirely by the Town of Chapel Hill. The bus transit system has a large amount of park and ride lots, which are designed for riders to park their cars outside the town and ride a bus into Chapel Hill to alleviate congestion and parking issues within the town. The town also employs a number of hybrid and bio-diesel buses and a large number of well-maintained bus stops, as well as an online mapping program that provides real-time information for bus arrival and departure times. Figure 2 shows the system map for Chapel Hill Transit.

System Map

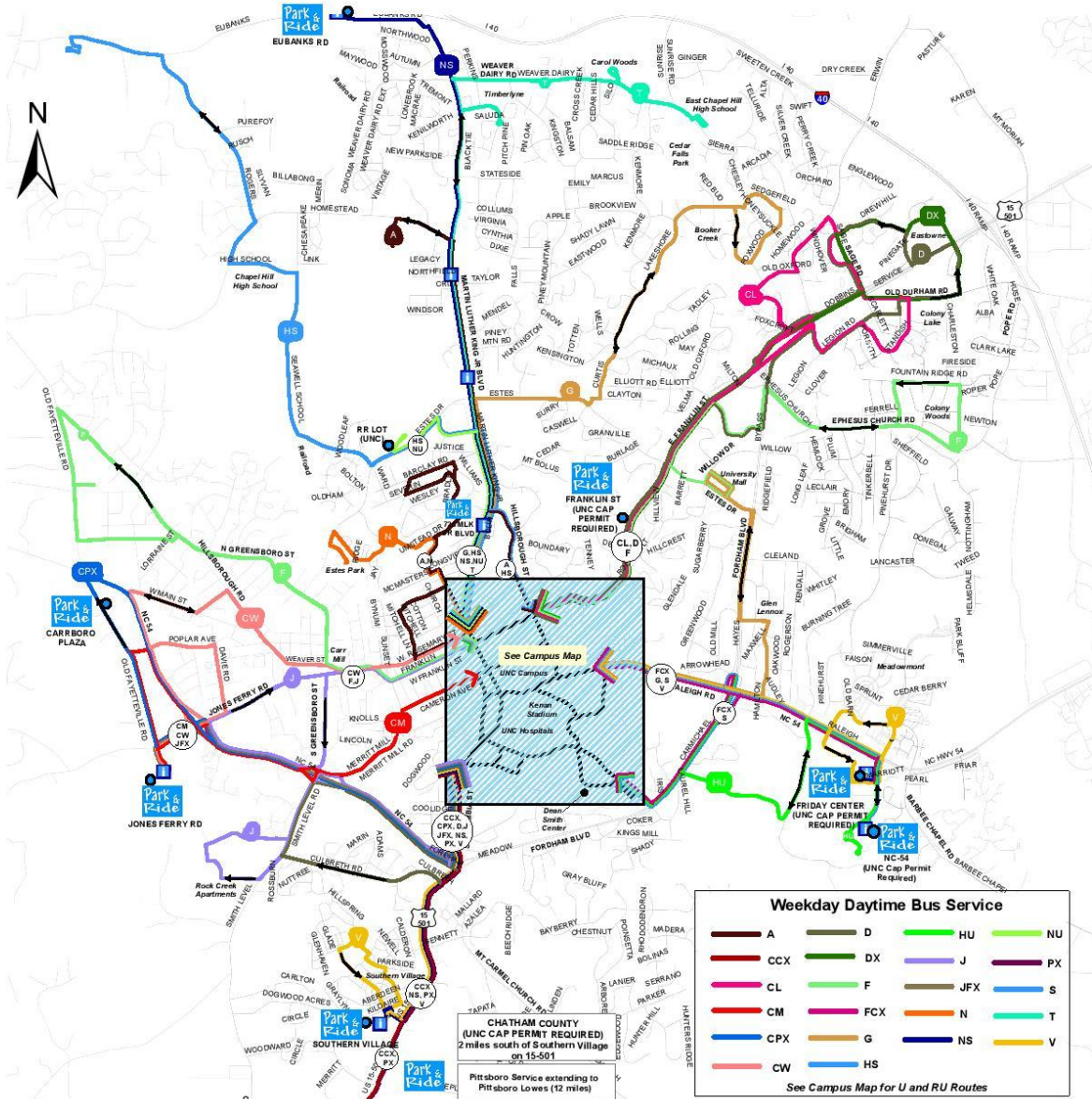


Figure 3. System Map of Chapel Hill Transit (Source: Town of Chapel Hill).

Many of the projects that the Town of Chapel Hill wants to undertake incorporate not only different modes of transportation, but are worked on cooperatively with other municipalities. The best example of regional cooperation is the regional light rail line that has been approved for Orange and Durham Counties. This light rail project has been a priority for the Research Triangle for the past decade and has finally gained traction in a portion of the region when a half-cent sales tax was approved in Orange and Durham Counties for the funding of a light rail system in early 2014. Triangle Transit, a regional transit entity that also handles some coordination responsibilities between the different municipalities, has been put in charge of planning, constructing and running the light rail system. While Chapel Hill does not have say in the routing assignments of the transit line, it does have the ability to steer growth around the transit line in certain ways. The Town of Chapel Hill has discussed starting to plan for areas where light rail stations will be, but has not started any formal planning. The town envisions encouraging smart growth and transit-oriented development around the light rail stations that will bring high density growth to portions of Chapel Hill that may be undeveloped. The best example of this is the Woodmont area, which is slated to include a light rail station in Chapel Hill but currently has no development. Full details of the projects aspect of the audit for Chapel Hill are provided in the Appendix.

Policies

The current comprehensive plan for Chapel Hill is non-traditional, focused more as a “vision.” It looks at goals the town has and ways to attain those goals, as well as future small area plans. The other supplementary plans and policies that were examined in context of Chapel Hill were the Chapel Hill design guidelines, the Chapel Hill Land Use Management Ordinance, the Chapel Hill long range transit plan, the Chapel Hill bike and pedestrian action plan, the

Orange County bus and rail plan, the Orange County comprehensive plan, and the 2040 Metropolitan Transportation Plan. An interview with a Chapel Hill official with knowledge of smart growth practices and policies was used to complete portions of the audit.

The plans and policies examined for the audit instrument provided strong indicators of how well Chapel Hill has followed and implemented transportation aspects of smart growth. At the time of this audit, the Town of Chapel Hill was sending a new Bike Transportation Plan through public forums for revision so it was not available for use; however the most recent complete bike plan was used instead. Chapel Hill's plans address reviewing and reducing local street standards to reduce excessive right-of-ways and pavement widths, and there are policies in place to do this when deemed necessary. In that same vein, local policies provide for the maintenance of existing roads and transportation system before building new ones and specifically the town has a policy of improving existing roads first before building new roads.

Development regulations require consideration of new local streets at designated intervals; the Fordham renewal project is an example of this. The Fordham renewal project is using private investment as its primary motivator instead of public assistance and has encouraged denser development. In doing this, a denser, more interconnected street network has developed in the project area. The town has developed a number of small area plans for one or two neighborhoods or complexes that provide solutions to make the areas more sustainable and use more smart growth practices. The town has started to use form-based codes for buildings in order to encourage mixed-use development and integrate many different types of buildings in one area so that developers have more flexibility in how they design and construct buildings. While developers have to adhere to standards for use and building appearance, their use is much more free form.

The Town of Chapel Hill follows complete streets policies, but is working on updated design guidelines to reflect this change. As such, the town has different requirements for if roads need sidewalks on one side or both sides of the street; the town requires sidewalks on one side of the street on local streets, but sidewalks on both sides of the street on both collector and arterials. New development is also required to install sidewalks along existing public streets bordering development if sidewalks do not exist already, and the land use regulations require inter-property connection between individual development access where applicable, which is done through access easements. The long-range transportation plan encourages the development of transit-oriented development as well, encouraging multi-modal transportation and many aspects of smart growth related to transportation. The town also encourages transportation demand management measures, and the town itself works with the TDM program that operates across the Research Triangle region, which promotes carpooling in certain areas.

The town has implemented a significant amount of regulations related to transportation, but there have been four main obstacles to implementation across the board; these are scale of intensity, traffic concerns, impact to schools, and financial concerns. Intensity has been a concern due to citizen opinion that encouraging smart growth practices may change their present community and provides a strict set of guidelines for design and building of new structures. Traffic is a concern due to the increased density in certain areas and efforts that may result in smaller roads, which has the potential to increase congestion. Also, increased density may cause school overcrowding or the need to build more schools, which may reduce education quality or be difficult due to land values in Chapel Hill. The last concern is financial; although this is common in most planning departments and is the largest impediment to implementing more policies. More cost-intensive policies and longer payback may not be optimal for a municipality.

There are also a number of instances where Chapel Hill does not follow smart growth policies. Chapel Hill follows the traditional street network system of local streets to collectors to arterials, but does have limited implementation of more expansive local street networks. Chapel Hill does not have high-occupancy vehicle (HOV) lanes, although this may be due to the size of Chapel Hill itself. Chapel Hill also does not have any TOD-promoting incentives that can be utilized by citizens or businesses. Full details of the policy aspect of the audit for Chapel Hill are provided in the Appendix.

Financial

Despite being a smaller municipality, Chapel Hill has encouraged the use of smart growth techniques through financial support in a variety of ways. There are funding sources for transportation improvements used to meet project needs. However, Chapel Hill does not have any tax credits or tax incentives in place for smart growth projects- the form-based code is qualified as a form of incentive (albeit non-financial). There are regional taxes, one of which is the half-cent sales tax that is in effect for Orange County and Durham County to fund the light rail transit currently planned for the area. While these local governments are not really sharing tax revenue, rather raising a tax together for a joint project, part of Chapel Hill falls in Durham County so it is receiving funds from both of these counties. Orange County however does actual tax sharing with the local governments within its jurisdiction to fund a variety of projects, including transportation-related projects. There is always a need for more financial support to complete implementation of projects and policies, and as such many of these projects and policies are ranked in terms of importance, with the most effective or the ones with the quickest payback given priority over others. Full details of the financial aspect of the audit for Chapel Hill are provided in the Appendix.

Durham

Projects

The City of Durham has changed its image greatly in the past 15 years. The downtown area of Durham has gone through a sort of mini-revitalization, with the downtown turning into a place not only for business, but also for amenities and living. Durham has actively been shaping itself in a way that encourages smart growth practices and policies.

Many parts of Durham have undergone change in the form of embracing smart growth policies, but the best example of this is the downtown area of Durham. The residential presence in downtown has changed significantly, with new apartment complexes and mixed-use developments having recently been constructed, including a new music venue which has brought new nightlife to downtown Durham. Additionally, the Durham Bulls (AAA baseball team) has had its stadium renovated in the last decade, which has brought in new business. The Foster Street neighborhood has gone through a mini-renaissance, with many new businesses and amenities establishing themselves in the last decade, including a number of new restaurants and a farmer's market.

The Brightleaf and Warehouse districts of Durham have brought new life to downtown Durham. Both of these areas of downtown consisted mostly of old tobacco factories and older buildings rented out for office space, and they have been retrofitted to serve as condos, apartments and shopping areas. The warehouse district consisted mostly of old tobacco factories and warehouses. Now, most of these buildings have been converted to residential or commercial use, which is consistent with smart growth practices which include repurposing older buildings for new uses. Downtown Durham also has a form-based code instead of use-based, which similar

to the development procedures in Chapel Hill has encouraged developers to invest in areas they otherwise would not. The form-based code currently only applies for downtown areas, but Durham is currently looking at expanding it to other parts of the city, including areas along the planned light rail line. In a similar vein to Chapel Hill's form-based zoning, this makes the development approval process easier for developers and provides more freedom of location.

The Hill Building, also known as CCB tower, is an example of repurposing in downtown. This building is being changed to a high-end hotel in downtown Durham with ground floor businesses and amenities; it is a great example of mixed-use development. All of these projects in Durham are encouraging higher densities and multiple modes of transportation within the downtown area. There are also two additional hotels under construction in downtown Durham.

One example of a smart growth project outside of downtown Durham is the 751 South development, which is on the border between Durham and Chapel Hill near Southpoint Mall. This project has gone through many different versions, and the City of Durham debated as to whether or not it wanted to extend water and sewer to the development, as the city would actually lose money if it developed infrastructure for it. City authority has been superseded in regards to this project, and the state government has fast-tracked the development, despite concerns from the Durham city/county government about its viability. The project does have some smart growth practices incorporated into it, as it intends to operate as its own inclusive neighborhood. Because of its location, the development is not in line with smart growth ideas of accessibility; the project has also had concerns about environmental impact due to it being adjacent to a reservoir. Durham environmental regulations are more stringent than state regulations and were bypassed when state authorities fast-tracked the development.

Durham employs a bus system called DATA, or Durham Area Transit Authority. The bus system has changed management lately and has gone through a shifting of its routes and service standards. The Authority works closely with other transit systems in the area, including Duke Transit, which services the two campuses of Duke University. Figure 3 shows a system map of the DATA bus system.

The biggest potential smart growth projects may be yet to come, with the implementation of light rail in Durham. Since Durham approved the one-half cent sales tax to start preparations for a light rail line that runs through a good portion of the city, the planning department has had discussions about how to develop areas around possible transit stops. The city has started discussions about encouraging denser developments not only along the transit line, but at the stops themselves to foster ridership on the light rail line. At the time of this audit however, Durham had not started planning for smart growth or transit-oriented developments along the proposed transit line. Full details of the projects aspect of the audit for Durham are provided in the Appendix.

Policies

Durham has shown a history of emphasizing and implementing smart growth policies, and has a strong base in place for future policies. Because the Durham planning department does planning for both the city and the county, some of the plans they can put out are more expansive. The comprehensive plan for Durham is a source for answering many audit questions, and portions of the audit that were not answerable by the comprehensive plan were completed using the Durham Comprehensive Bicycle Transportation Plan, the Durham Design Manual, the Durham Unified Development Ordinance, the Durham Commute Trip Reduction Ordinance, the Durham Greenhouse Gas Inventory, the Durham Pedestrian Plan, the Durham Trail and Greenways Plan, and the 2040 Metropolitan Transportation Plan. An interview with a Durham county official with knowledge about smart growth practices and policies was also used to complete the audit.

The plans and policies examined for the audit provide a strong indicator of how well Durham has followed and implemented transportation aspects of smart growth. The comprehensive plan addresses long-range needs for air travel, which is seldom discussed in plans. The comprehensive plan addresses the possibility of reviewing and reducing local street standards to reduce excessive right-of-way and pavement widths, and the city of Durham has implemented a number of measures similar to street diets and skinny streets. Durham requires that maintenance on current roads and existing transportation systems be done before spending money on new ones.

Durham has a number of policies in place to address density and amenities. There are regulations in place that require new local streets at designated intervals; there is a connectivity requirement in place that requires a certain ratio of links to nodes, and there is a maximum block size allowed downtown that requires connectivity at certain intervals. Durham has adopted complete street guidelines, and sidewalks are required on either one side or both sides, depending on what type of area the sidewalk is going in. Also, the complete streets policy in place in Durham is based on density rather than use.

One program that Durham has implemented is the station area strategic infrastructure (SASI) study (2014). This study was designed to identify infrastructure need around potential rail stations for regional transit. This study is intended to improve infrastructure so that transit-oriented development and smart growth projects will be able to be more easily implemented. SASI will also identify ways to use multi-modal transportation around rail stations.

One aspect of smart growth and transit-oriented developments that is commonly not focused on much is affordable housing. Durham has an ordinance in place that allows developers

a density bonus if they provide affordable housing in their development, which may spur increased transportation options due to increased density.

Durham also addresses congestion management measures. There is a Commute Trip Reduction Ordinance in place, and there is a trail system with increased accessibility for pedestrians as well as bikers. Parks and open space in Durham are connected to other areas by sidewalks, which has been encouraged by Durham's Trail and Greenways Plan. A significant number of policies and recommendations from Durham's plans have been implemented, and the plans have a lot of support from elected officials.

Additionally, Durham has something called a suburban growth area, which is similar to an Urban Growth Boundary. An Urban Growth Boundary is a regional boundary that attempts to control urban sprawl by establishing a boundary between where high density and lower density development can take place. This specifies how far away from the city center that developments can be built in order to concentrate density in certain areas and preserve undeveloped and open space. Durham has specific policies in place that emphasize social and environmental justice, most notably the city's ordinances on watershed protection growth and stream buffers for new developments everywhere in the city. Durham also consistently has community meetings all across the city for input on planning documents and decisions; smart growth regulations are designed so they do not disproportionately affect low-income or minority communities. Durham also has a national inventory of habitats that developers are not allowed to build on, which includes restrictions on where developers can build.

There have been a number of things that Durham does not do in regard to transportation aspects of smart growth. Durham employs the traditional transportation network of local streets

to collectors to arterials, but does employ local street networks in areas in and around downtown. New developments are not required to install sidewalks along existing public streets bordering the development where sidewalks do not already exist. There are no specific incentives in place that promote transit-oriented development, but the city of Durham is planning to do pre-zoning for compact neighborhoods near light rail, which will provide a benefit to developers because appropriate zoning will already be established, alleviating the problem of zoning taking a potentially extended amount of time due to the public process. Durham also lacks any sort of HOV lanes on its roadways. The comprehensive plan offers many recommendations (and a large number of these have been implemented), but many of the policies and recommendations present in the comprehensive plan are merely conceptual and do not go into detail on how to get them done and implemented. Also, many issues that are brought up in the plan are not specifically addressed. Obstacles to parts of smart growth being implemented in Durham have come down to a few key points- the two most important being how smart growth is new thinking and not understood too well, and financial concerns. Many citizens (and elected officials) do not have a complete understanding of smart growth, partially due to the fact that limited amounts of smart growth projects and policies have been fully completed and evaluated in the region. However, the primary reason seems to be education and misinformation issues. Full details of the policy aspect of the audit for Durham are provided in the Appendix.

Financial

Durham has had a number of smart growth policies aimed at transportation already in place, but suffers from some of the same problems regarding funding that other municipalities have. Durham has funding sources in place for projects and the implementation of policies, but it has no monetary or tax incentives for developers to work on smart growth projects. Most of the

incentives come in the form of pre-zoning and form-based zoning. Durham does have a regional tax that benefits the area, as funds from the one-half cent sales tax for regional light rail will also be used in an infrastructure capacity along the rail line. Full details of the financial aspect of the audit for Durham are provided in the Appendix.

Morrisville

Projects

Morrisville sits at the center of the Research Triangle, at the crossroads of the larger cities in the region. Morrisville experiences large amounts of traffic from drivers who do not live in the city, and has experienced large amounts of growth as well.

Morrisville has been redeveloping portions of the town to accommodate multi-modal transportation. Most of the transportation-related projects for Morrisville have not been completed yet, but a major improvement the town wants to do is install a roundabout at Church Street and Jeremiah Street in order to improve traffic circulation. There are also plans to narrow the cross-sections and provide traffic calming measures for NC 54, Morrisville-Carpenter Road and Church Street as they enter town center to provide a safer environment for bicyclists and pedestrians. There are also significant plans to expand existing greenways and bicycle paths in the town to make connections between developments and neighborhoods. Morrisville has plans to still expand roads and expressways in the town in order to accommodate increased traffic, but has accepted that other forms of transportation must be integrated in order to mitigate congestion.

A significant smart growth development in Morrisville is Park West Village, which is a mixed-use development located near the center of Morrisville. This development currently

features only commercial and office spaces, but residential development above commercial development is in the planning phases and should begin construction soon. This development features larger amounts of parking than most smart growth developments would have, but it is providing multi-modal connections to nearby developments to encourage alternative transportation.

There is no transit service in Morrisville, but it is served by Wake County's rural transportation program, which provides on-demand services for transportation to and from rural portions of Wake County. Town officials have discussed bringing Cary's public transit service (C-Tran) to part of the town in order to generate additional mobility for both municipalities. The latest transportation plan for Morrisville (2009) recommends fixed-route bus transit for Morrisville's busiest transportation corridors, but costs and ridership are prohibitive to Morrisville running its own transit line. Morrisville continues to support the region's potential for light rail and may be considered for a transit stop if Wake County approves development of the project. Full details of the project aspect of the audit for Morrisville are provided in the Appendix.

Policies

Morrisville continues to follow a shift to multi-modal and smart growth developments in its policies and practices. The Morrisville Transportation Plan was the primary plan used in completing the audit, but additional documents used include the Morrisville Comprehensive Plan, Morrisville Town Center Plan, Morrisville Unified Development Ordinance, Wake County Land Use Plan, Wake County Transit Plan, and the 2040 Metropolitan Transportation Plan.

The Morrisville Transportation Plan provided the primary information for describing the state of Morrisville's smart growth policies and practices. The transportation plan addresses all long range needs for different types of travel except for water, which does not apply to Morrisville. In terms of transit, the plan indicates that the town wants to expand transit programs to Morrisville to serve citizens who prefer transit to automobile transportation. The transportation plan does have policies in place to review and reduce local street standards where applicable, as well as reduce excessive requirements for local streets. This is evident in the projects to narrow cross-sections of certain streets as they enter the town center, as well as the Crabtree Crossing Parkway Extension, which aims to reduce traffic speeds and shift automobile traffic towards bicycle and pedestrian traffic. Current roads are always provided for before building new ones, and the town has been proactive in developing new local streets at designated intervals to increase the routes available for citizens traveling through the town in cars, on bicycles, and as pedestrians.

Alternative transportation means have been expanded in Morrisville recently, and current plans call for more expansion of bicycle and pedestrian amenities. Morrisville's Unified Development Ordinance has incorporated aspects of complete streets; Morrisville requires new residential developments to have sidewalks on both sides of the street. New developments are required to install sidewalks along existing public streets, and regulations require the connection of residential development streets to existing streets to boost connectivity. Inter-property connection between individual developments is also required according to Morrisville regulations. Morrisville's Transportation Plan calls for town employees and business partners to provide discounts for their employees who use alternative means of transportation or carpool; Triangle Transit is considered a potential partner with which to coordinate.

Transit-oriented development is encouraged in the transportation plan despite there being no transit systems in Morrisville. As part of the town encouraging denser development, transit-oriented development is mentioned as a goal of the transportation plan; the town offers a density bonus to developments that build greenway amenities or connectors. Morrisville also has activity centers similar to Cary to utilize local neighborhoods that encourage citizens to not use automobiles as much. The comprehensive plan encourages multi-jurisdictional cooperation, and the transportation plan specifically mentions that town officials want to have mutual agreements with surrounding communities to share fire, police, and transit resources, especially with smaller municipalities where pooled resources can provide benefits to both municipalities.

Morrisville also lacks some policies that would provide benefit to the area. Morrisville follows the traditional hierarchical system of local streets to collectors and then arterials, but has been making moves to encourage installation of additional local streets in the downtown area. The town does not have a bike transportation plan in place, but there are bike facilities in Morrisville. There are no TOD-promoting incentives in place, but the town does offer density bonuses for development that provide greenway infrastructure. There are also no HOV lanes, but this is due to lack of traffic in most of the town; however, the major thoroughfares in Morrisville that many residents of the Research Triangle Region drive on to and from work would benefit from an HOV lane to encourage carpooling. Full details of the policy aspect of the audit for Morrisville are provided in the Appendix.

Financial

Morrisville has a shortage of funds for its transportation projects and has not been very successful in obtaining grants. Smaller projects tend to be completed before larger ones because

of costs, and the larger ones tend to take much longer to complete. There are no smart growth-related tax credits or incentives in place by Morrisville; however, if Wake County approves the one-half cent sales tax for light rail transit, some of the revenue could be used to help fund transit (light rail or bus) in Morrisville. There are not many flexible funding sources available to Morrisville, and the town is not part of any regional tax programs; however, the town has the ability to apply for grants through CAMPO and NCDOT to receive funding for transportation projects. Full details of the financial aspect of the audit for Morrisville are provided in the Appendix.

Raleigh

Projects

Raleigh is the second largest city in North Carolina and is experiencing high growth rates. Raleigh has worked towards a number of smart growth projects both in the public sector and the private sector. Being the capital of North Carolina, Raleigh is under scrutiny from a number of sources, but it also receives support from a number of stakeholders.

Raleigh has done a number of projects on its road system to alleviate congestion and encourage multi-modal transportation. The Hillsborough Street project that extends from downtown to nearby NC State University's campus has been changed in recent years to incorporate roundabouts on particularly congested intersections, as well as improving pedestrian and bicycling amenities. This project also changed zoning along Hillsborough Street to incorporate more mixed-use development.

The Raleigh city government has tried to make it easier for private sector projects to be successful. North Hills is an example of a smart growth development that reused existing

developments, as the North Hills site was originally a brownfield site (brownfield refers to land that was previously used for industrial or commercial purposes). North Hills also utilizes electric vehicles by patrons who shop in North Hills, with its provision of electric charging stations for electric cars. There are also solar panels utilized on roofs of buildings in North Hills, and multi-modal transportation is utilized through interconnectivity with the Raleigh greenway and bike system and access to Raleigh's public transit system.

5401 North is another example of a smart growth project in Raleigh. This project incorporates mixed-use development and is a greenfield site (greenfield refers to previously undeveloped land that has not been used before); it acts as an all-inclusive community similar to Meadowmont in Chapel Hill. It has a variety of housing types at different values meant to diversify the community. It also is centered around multi-modal transportation- there are a number of open spaces and pedestrian/ bike paths for residents to use to travel within the community. These pathways also connect to Raleigh's already expansive bike and pedestrian network. The development places emphasis on providing "an integrated street network" and "alternative, less fuel-intensive transportation"; as such, the development also provides a number of green features such as advanced stormwater systems and green roofs. The development also incorporates public schools into its design, besides being adjacent to Wake Tech Community College, the community college of Wake County.

One development that has encountered obstacles is Cameron Village. Cameron Village has been undergoing a revitalization that has resulted in high-rise apartment buildings that have encountered opposition from nearby residents due to the height of the structures and the potential of rising property values that current residents might not want. The Cameron Village area is

incorporating mixed-use development and intends to make alternative forms of transportation easier to and from the downtown area and Cameron Village.

Raleigh's bus transit system, Capital Area Transit (CAT) operates 39 routes across the city and works in conjunction with both the NCSU Wolfline (NC State's bus system) and Triangle Transit to provide comprehensive service to Raleigh residents. Capital Area Transit coordinates with other regional transit programs to provide complete service lines where citizens can get off at the end of one line for another transit system and get on the beginning of another line for a different transit system. Raleigh also employs a free bus service in downtown for quick movement around the downtown area. Figure 5 is a system map of Capital Area Transit.

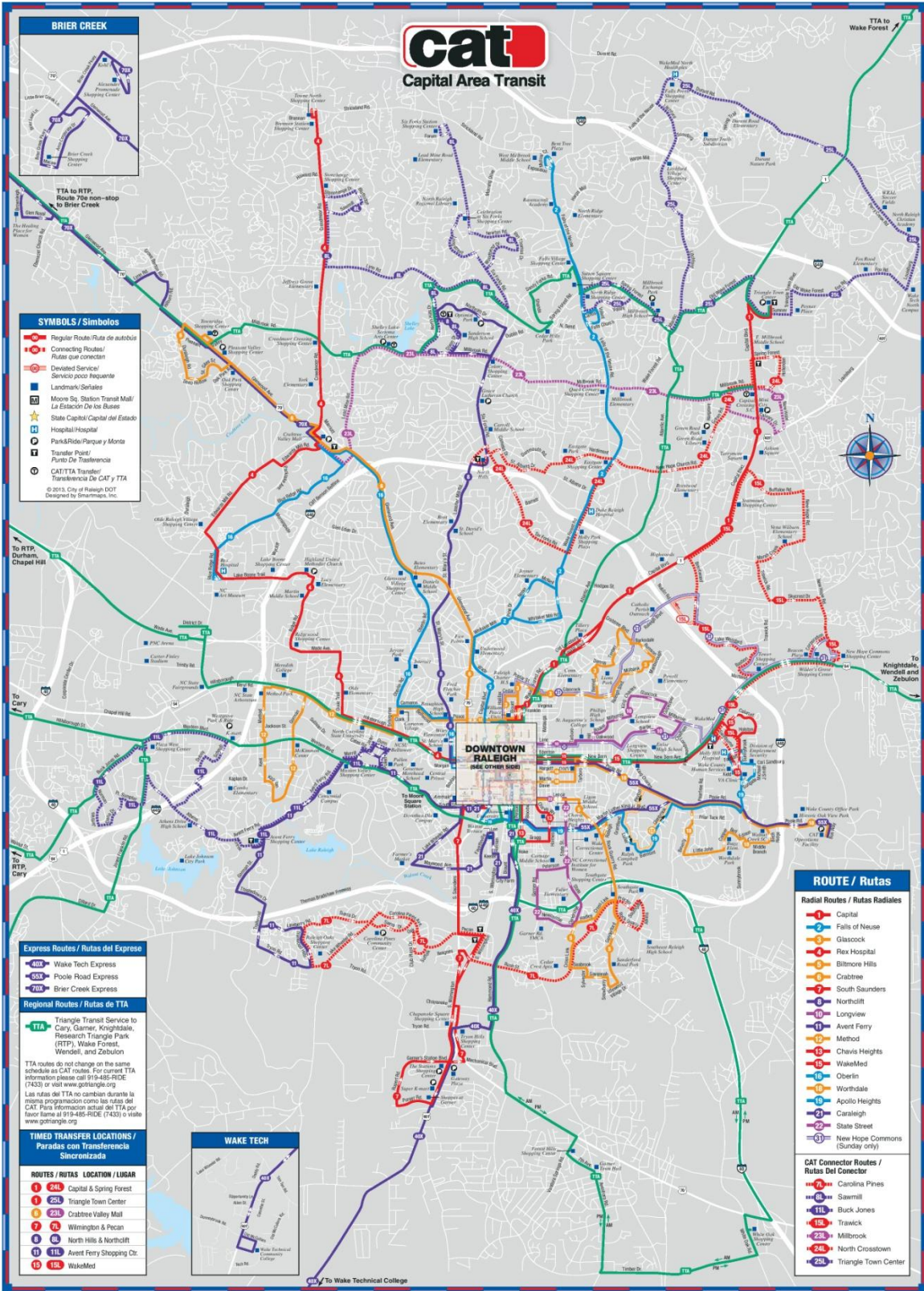


Figure 5. Capital Area Transit System Map (Source: City of Raleigh).

Raleigh is currently not part of the regional light rail transit plan that is being supported by Durham and Chapel Hill, but inclusion in this plan is dependent more on the county commissioners rather than city officials, which is where the opposition is coming from. City officials expect Wake County and Raleigh to become part of the light rail transit program within the next five years. Full details of the project aspect of the audit for Raleigh are provided in the Appendix.

Policies

Raleigh has implemented a number of smart growth policies and continues to advocate them in its comprehensive and transportation plans. The Raleigh Comprehensive Plan answered most of the questions regarding the audit and is constructed as a traditional comprehensive plan, having been completed in 2009 with amendments every year to keep the plan up to date. The audit also looked at the Raleigh Bicycle Transportation Plan, the Raleigh Consolidated Plan, the Raleigh Street Design Manual, the Raleigh Unified Development Ordinance, the Raleigh Pedestrian Plan, the Wake County Land Use Plan, the Wake County Transit Plan, and the 2040 Metropolitan Transportation Plan. Raleigh does not have a designated transportation plan, but rather has the comprehensive plan provide transportation details. The city will carry out transportation corridor studies in order to provide in-depth analysis and recommendations for high-need areas of Raleigh. An interview with a City of Raleigh official was conducted in order to answer questions of the audit that could not be answered from available plans and policy papers.

Raleigh's plans and policies provide information for indicating areas where it has been successful in integrating smart growth practices and policies. Raleigh encourages local street

networks, but there is a stipulation; the area must have certain density, meaning that they are only implemented in areas that have a high enough density to have significant pedestrian and alternative transportation traffic. Otherwise, Raleigh follows the traditional “hierarchical” street system of local to collector to arterials. Raleigh has regulations in place to review or reduce excessive right-of-way and pavement widths through a resurfacing program. Considering and providing new local streets at designated intervals are also included in regulations, specifically in Raleigh’s Unified Development Ordinance.

Raleigh has a number of things applying to multi-modal transportation as well. Raleigh has adopted a modified version of complete streets in its policies and requires sidewalks on both sides of new residential developments. Raleigh has its own bicycle transportation plan, which is rare for the region. Regulations also require new developments to install sidewalks along existing public streets bordering the development, and developing inter-property connections to future subdivision developments, but this applies only to major roads. Raleigh’s Comprehensive Plan encourages transit-oriented development around transit corridors and high density areas.

A number of other transportation measures are also conducted by the city of Raleigh. Raleigh has its own set of congestion management measures and has been working to mitigate congestion; Raleigh is currently in the middle of upgrading its traffic signal system to increase efficiency, but also to increase infrastructure quality by installing fiber optic connections. Raleigh is also implementing a transportation demand management program with its own dedicated TDM coordinator. The city is encouraging carpooling and alternative modes of transportation in place of single-occupant vehicle transportation. A significant amount of Raleigh’s recommendations from its comprehensive plan have been implemented, but Raleigh’s Comprehensive Plan uses action items, which refer to specific goals that the city wants to

complete. Raleigh keeps track of its success in implementation through completion of these action items.

There are some areas where Raleigh has not incorporated the typical standards of practice for transportation aspects of smart growth. Raleigh does not have any sort of TOD-promoting incentives in place, and Raleigh currently does not have HOV lanes, but some of the transportation corridor studies have recommended the installation of HOV lanes. Raleigh policy follows a majority of best practices of smart growth regarding transportation. Full details of the policy aspect of the audit for Raleigh are provided in the Appendix.

Financial

Raleigh has put effort into maximizing its available funding sources, but clashes with Wake County have affected some funding. Raleigh consistently has funding sources for transportation improvements in the form of the general fund, which is property tax fueled, as well as impact fees and the capital improvements program. Raleigh has considered the idea of implementing a VMT (vehicle miles traveled) tax, which instead of placing a tax on gas, imposes a tax depending on how many miles a registered vehicle travels in a year. However, a VMT tax requires legislation at the state level for implementation. Raleigh advocates a half-cent sales tax to fund a regional light rail line, but has encountered opposition from leadership in Wake County to implement this funding source. Revenue from this source would fund bus programs as well as the regional light rail line. Full details of the financial aspect of the audit for Raleigh are provided in the Appendix.

Research Triangle Region

This portion of the results section analyzes the Research Triangle Region as a composite of Triangle Transit, the MPOs in the region, and the local governments already being examined.

Projects

The Research Triangle Region as a whole has a number of projects, but there are a few projects that truly are regional in nature rather than localized. Besides the projects mentioned in reviews of local municipalities, the main regional smart growth project is the light rail transit line. CAMPO, DCHCMPO and Triangle Transit execute most of the regional projects, with the NCDOT also overseeing some of the explicitly transportation-oriented projects. In the Research Triangle Region, there are over 550 in-progress or planned transportation related projects that will have some beneficial effect on mitigating congestion and improving multi-modal transit or accessibility. A number of projects are detailed in the Metropolitan Transportation Plan and small area studies completed by CAMPO and DCHCMPO.

An explicitly regional project is Triangle Transit's bus system. This system serves most of the municipalities in the Research Triangle Region, with regional bus routes in addition to vanpool services, shuttle services, and commuter resources. However, Triangle Transit is its own entity and does not answer to any local or regional governing body. It connects many parts of the triangle, and a large portion of Triangle Transit stops also serve local transit systems to encourage ease of movement and integration with other systems. Triangle Transit currently has plans to extend services to the outer communities of the region, such as Hillsborough and Mebane. The transit systems that Triangle Transit coordinates with include Capital Area Transit (CAT), Cary Transit (C-Tran), Chapel Hill Transit, Durham Area Transit Authority (DATA),

Duke Transit, NCSU Wolfline, and the Wake County regional transportation system for non-urbanized areas (TRACS). Triangle Transit will also serve as the head agency to build and operate the proposed light rail system. Figure 6 is a system map of Triangle Transit.

The largest potential project that has a regional impact is the proposed light rail system. Durham and Orange County have both approved a one-half cent sales tax for construction and integration of a light rail transit line, but Wake County has not. Wake County has done a rail study both for light rail and commuter rail and the planning department has advocated for both, but neither is currently being pursued by Wake County. Municipalities in Durham and Orange County have started planning for new development along the proposed rail lines, specifically higher density mixed-use development in the vein of transportation-oriented development.

The North Carolina DOT handles some of the work on highways in the region, but the MPOs for the region handle some of this work as well. A chief concern has been balancing the transportation needs of the region as a whole with how they will integrate with the other large metro regions of North Carolina, which are the Charlotte region and the Triad region. Full details of the project aspect of the audit for the Research Triangle Region are provided in the Appendix.

Policies

The region as a whole is shifting towards one that organizes its growth around managing transportation and increasing density. The Joint 2040 Metropolitan Transportation Plan was the main plan used for providing an overall picture of the Research Triangle Region, but all of the local plans, plus the 2035 Long Range Transportation Plan, the North Carolina statewide Pedestrian and Bicycle Plan, and the NCDOT Complete Streets Planning and Design Guidelines were used to complete the audit.

For the policies portion of the audit instrument, local and regional policies were both weighed in answering questions depending on their impact and presence in either local or regional policy. For example, the Metropolitan Transportation Plan encourages local street

networks where applicable, but many local policies follow the hierarchical system of local street to collector to arterial. Some instances like these mean that the regional policy may be to defer to local policy. Both the idea of reviewing and reducing local street standards to reduce excessive right-of-way and revising street standards to lower excessive requirements for streets are both encouraged in state/regional policy (through complete streets standards) and some local policies. However, decisions on implementation of complete streets policies are left up to local municipalities. This tends to be the case for most policies that concern complete streets standards or pedestrian and bicycle amenities. An example of this is that both regional policy and local policies encourage increasing connectivity for local areas by providing new local streets at designated intervals. On the other hand, many different local municipalities follow separate pieces of complete streets policy, as some require sidewalks on either one side or both sides of residential streets, whereas the *North Carolina Complete Streets Planning and Design Guidelines* (2012) calls for sidewalks on both sides of residential streets. Interviews were conducted with officials with CAMPO and Triangle Transit in order to answer parts of the audit that could not be answered from available plans and policy papers.

Regional policy is very supportive of transit-friendly and TOD projects. Regional policy is also very supportive of intergovernmental coordination and agreements; the MPOs in the region are used to coordinate transportation projects and policy. Despite there being two separate MPOs in the Research Triangle Region, they regularly work together on projects (as evidenced by the 2040 Metropolitan Transportation Plan). The 2040 Metropolitan Transportation Plan specifically addresses ideas of social and environmental justice. There are also policies to address congestion management measures, as there is a Transportation Demand Management Plan in existence for the Research Triangle which includes a number of recommendations. The

2040 Metropolitan Transportation Plan calls for HOV lanes along I-40, and Triangle Transit has vanpooling and carpooling measures. In 2008 a project called the SmartCommute Challenge was undertaken as a transportation demand management practice, which offers a number of bonuses to participants, including subsidized transit passes.

On a regional level, few best practices were not included as part of policy. There is not a regional bike plan; however the North Carolina Statewide Pedestrian and Bicycle Plan is rather comprehensive and combined with the bicycle portion of the 2040 Metropolitan Transportation Plan, presents a clear picture of bicycle transportation planning. There are a number of local plans that are not consistent with their neighbors or on a regional level, but many of these are due to different goals and objectives among communities. Other reasons for discrepancies between policies of local municipalities in the region include (1) the fact that regional bodies have left certain policy choices up to local governments and (2) differences in philosophy due to political factors; however, since a large amount of grant funding for transportation projects comes through the MPOs, local governments tend to do projects that promote the MPO's overall vision of the region. Full details of the policy aspect of the audit for the Research Triangle Region are provided in the Appendix.

Financial

Lack of funding appears to be a major obstacle to transportation project implementation in the region. Road-pricing techniques are not used in the Research Triangle and are rarely used elsewhere. There are some areas of the US that have implemented road-pricing techniques including New York, San Francisco, and Seattle, but there are currently no projects in the southeastern United States. There are currently no tax incentives in place in the region, but there

are a number of other incentives in place such as density bonuses for smart growth developments and form-based zoning rather than traditional zoning. There is a regional tax in place, but it currently only applies to Durham and Orange County and refers to the one-half cent sales tax for light rail transit. If Wake County joins the light rail project, it is possible that taxes generated will be used to improve all transit programs in the region, not just the light rail project. Full details of the financial aspect of the audit for the Research Triangle Region are provided in the Appendix.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

This section provides details and context on the state of transportation aspects of smart growth in the region, as well as providing recommendations for future improvements in policy and execution. It is important to consider reasonable and achievable recommendations that can be implemented rather than best case recommendations that may be unattainable due to a myriad of reasons (e.g., political pressures, existing infrastructure, costs, etc.). Each municipality is discussed individually then the region as a whole is considered. A summary table of highlighted recommendations is available in Appendix B.

Cary

Cary has been one of the fastest growing municipalities in North Carolina in the past 10 years, and as a result some of the growth happened faster than policy could keep up with. Cary is largely suburban and has large amounts of sprawl, but recently has taken a leading role in smart growth practices and multi-modal transportation in the region. However, most of the transportation infrastructure in Cary is focused on automobile travel despite recent significant improvements in pedestrian and bicycle infrastructure. Cary currently does not have a bicycle plan, but the comprehensive transportation plan has a well-written bicycle element. Based on the audit conducted, the plan is very well written and there are almost no gaps in best practices or policy in the document. Cary also has a fast-growing bus transit system, but it lacks consistent ridership- the comprehensive transportation plan shows that a very low percentage of the population uses public transit. Cary's infrastructure can support a robust transit system, but it requires citizen participation. There is also little integration of Cary's bus system with other local bus systems, but this is partially due to the size of the Cary system. Cary has a relatively large tax base, and as a result the planning department is well-funded. However, Cary needs to begin

major investments in alternative transportation in order to keep up with its growth and limit the effects of congestion. Cary does have a number of outstanding joint and collaborative projects with other municipalities that have resulted in effective transition areas at the borders of these municipalities.

Recommendations

Cary's largest problems come down to two things: integration of alternative modes of transportation and funding. Cary already has an expansive system of pedestrian and bicycle amenities, but suffers from issues with connectivity. Many of the greenways, trails and bicycle facilities do not connect with each other or with the state system of greenways and bike facilities. One of Cary's main priorities should be providing connections to existing infrastructure. In this same vein, Cary must find ways to improve the ridership and coverage of its bus system. A citizen education program could be useful in improving the public image of transit and increasing awareness of transit benefits, which could increase ridership. Increasing coverage or levels of service for the bus system could also increase convenience, which would improve ridership. Cary should work closer with Triangle Transit to coordinate connections between routes and find ways to provide better coverage in Cary. An education program could also improve public perception of multi-modal transportation and smart growth, which could give higher priority to smart growth projects in the town's yearly budget. Cary should continue to implement the contents of its comprehensive transportation plan because it emphasizes smart growth and complete streets practices.

Funding is the other key part of Cary's successful integration of smart growth policies. Cary currently has a transportation development fee for new developments, but the city could

also consider integrating new grant sources and tax credits for developments that incorporate smart growth practices. For a tax credit to be implemented, strict qualifications would have to be designed in such a way to properly reflect best smart growth practices. Cary also tends to place more emphasis on short-term, low cost projects; long-term, higher cost projects tend to be opposed by political groups, but these projects have the potential for more meaningful impact. Cary should provide a better balance of short-term and long-term projects. In this same vein, Cary should consider applying for funding through joint projects with other municipalities- these projects may receive higher consideration than other projects due to their wide-range impact.

Cary should continue its advocacy for light rail infrastructure. Cary is not part of the current light rail plan in Durham and Orange County, but if Wake County joins the plan, some of the revenue from the half-cent sales tax would go towards other transportation systems; it is possible the bus system in Cary would receive additional funding. If the light rail plan is adopted in Wake County and a light rail station is planned in Cary, the town should begin planning for the area around the station to be transit-oriented development. The integration of light rail in Cary could also result in the reallocation of bus resources, as the new light rail line may run adjacent to an existing bus line.

Chapel Hill

Chapel Hill benefits from being one of the most progressive areas in the state and a relatively rich and intelligent community, helped in part by UNC-Chapel Hill. There are few smart growth policies the town has not incorporated, but despite the town having a relatively small population compared to the rest of the major municipalities in the region it has many of the same congestion problems. The expansive public transit system in Chapel Hill has addressed a portion of the potential traffic problems the town has experienced. Chapel Hill has not had to do

a lot of the road expansions that other municipalities have done, but this is mostly due to street infrastructure being inflexible due to existing property and limited room to expand existing roads. Limited road work has resulted in more financial support for other projects though, which has had benefits.

Chapel Hill also benefits from a generous budget for its planning department and is able to consistently address issues. This has resulted in a high number of quality plans as well as high quality updates to plans.

Recommendations

One of the few problems Chapel Hill has with policies that concern transportation aspects of smart growth has been public perception. Smart growth policies tend to be a stark contrast to traditional practices and have encountered resistance to implementation from citizens. Many citizens are concerned about how smart growth implementation will affect how they get around and what freedoms they have with their property. A chief concern is how intense many of these changes could be, compared to the standards previously used. Increased funding for educational tools could be useful in increasing awareness for what smart growth can accomplish, but the funding has to be used appropriately. Funding to create educational tools and information is not useful if citizens are not aware such tools are available. An educational outreach program could be considered that holds community meetings to educate citizens about the transportation options and the future of transportation in their community.

As mentioned before, traffic and congestion is a problem in Chapel Hill. Due to Chapel Hill's size, there are only a few major traffic corridors for automobiles to travel in and out of the town. A potential congestion mitigation measure may be to provide incentives for those who use

public transit in Chapel Hill- the accessibility of park and ride lots along the edge of Chapel Hill make it easier for commuters to use the bus system, and Chapel Hill Transit reaches almost every part of town. Increased bike lanes and bike facilities could encourage less automobile use, especially since complete streets policies are implemented in the town. Part of the traffic issue in Chapel Hill is due to UNC events as well. Chapel Hill would benefit from increased coordination with the university in order to work together on joint issues of transportation; this is especially important because the university is the leading employer in the town. Working with the university on transportation issues could present more opportunities for funding on projects that also affect the university. The town would be able to prioritize projects based on immediate need from the university if the university is able to provide additional funding on projects.

An important consideration is the impact on public schools as well. Higher density in some areas may affect the size of public schools, and affect how children get to school. While Chapel Hill has access to Safe Routes to School (a program for child safety) funding, additional funding measures may be needed to ensure children that live close to the schools and walk or bike can do so safely. If existing schools get too big, there may be a need to build new schools in already developed areas, which would mean a reassessment of transportation around new school sites for child safety. More investments in pedestrian and bicycle facilities could work to the benefit of goals already in the comprehensive plan and the bicycle plan that is currently being drafted by the Chapel Hill planning department.

Chapel Hill should also consider an incentive program for developers to do more smart growth or transportation amenities; a density bonus for developers that develop additional bicycle or pedestrian facilities could be considered, or a tax-related incentive for TOD neighborhoods. While not specifically a finding of the audit (because the light rail project has not

broken ground yet), the Town of Chapel Hill should begin planning for transit-oriented development around where the projected light rail line will go. Chapel Hill should also begin planning for new pedestrian and bicycle facilities along the light rail line to help accommodate new pedestrian traffic patterns.

Durham

Durham has benefitted from being proactive the past 10 years in its incorporation of smart growth policies, specifically policies that balance land use with transportation in a beneficial manner. Durham is one of the few municipalities in the southeast that has an urban growth boundary (called an urban growth area or UGA by Durham) around the city borders and has encouraged dense, mixed-use development within the UGA. Addressing many potential sprawl and transportation issues early on has prevented many problems in Durham. However, the public transit system in Durham is not very good as explained further below- ownership has changed hands a few times, and the Durham Area Transit Authority still has the same negative perception that most public transit has had. Durham also has no high occupancy vehicle (HOV) lanes in the high traffic corridors yet and experiences high levels of congestion. However, the downtown revitalization that has been happening the last 10 years has brought more residents to downtown and has encouraged multi-modal transportation. Durham benefits from having the city of Durham and the Durham County planning departments as one singular department, so planning for the area is simplified and consolidated. However, in the last few years Durham has had problems with state officials getting involved with local politics, as was the case with the 751 South development mentioned previously in the Results section. Durham has been progressive in watershed protection and water safety measures, but the political climate at the

state level may advocate less stringent environmental regulations to encourage growth in the private sector.

Recommendations

The largest problem Durham has in regards to smart growth and transportation is the use of alternative means of transportation. DATA is not considered a viable means of transportation by many residents due to its ineffective coverage of the Durham area and inconvenience. DATA should analyze its current route coverage and determine ways to better incorporate usage by residents and commuters; more park and ride lots would be beneficial for commuters and encourage use by residents on the outskirts of Durham. An educational campaign about the benefits of transit could encourage use by residents, and increased use could fund increased service or routes. Public transit in Durham could be further streamlined by incorporating Duke Transit into DATA service, which might allow transit to provide better coverage for Duke University students.

As is the case with many other municipalities, citizens typically do not have a comprehensive understanding of smart growth ideas. Educational tools and advocacy should be used to inform Durham citizens about transportation-oriented smart growth ideas and multi-modal transportation. A more complete understanding by Durham citizens of things like smart growth and complete streets may result in higher advocacy from elected representatives, which may result in higher funding for these sorts of projects.

Cost is a major factor, but there are few ways to increase funding. Durham could implement a transportation fee similar to the one Cary has in place, but this would require special legislation on the state level to do. Durham should continue to pursue new investment sources,

such as grants, private investment, and MPO investments. Durham should continue to collaborate with other governments in the region, especially those that are adjacent to Durham. Durham should work with adjacent municipalities to ensure that Durham's transportation infrastructure is flush with their infrastructure at Durham's borders; this may mean collaborating on bike and pedestrian facilities, as well as transit facilities. Shared transit stops for bus systems at adjacent municipalities may increase ridership for both systems. Durham should also work to collaborate more closely with Duke University on transportation infrastructure- the university and hospital system are large employers in Durham and increased transportation connectivity may result in lower automobile use.

Morrisville

Morrisville is in a unique situation- it is one of the smaller municipalities in the region, yet sits at the crossroads of the region, directly adjacent to Research Triangle Park. Because Morrisville is an area of high commuter traffic, the current transportation infrastructure has less capacity than demanded by regional vehicle traffic. Even with its good infrastructure, Morrisville has significant congestion problems. Morrisville has limited multi-modal infrastructure but it has pushed recently to increase it. Morrisville has no transit system, but it is serviced by Triangle Transit. The lack of a significant transit system is a major issue given how much traffic Morrisville has. The bicycle and pedestrian infrastructure needs development; there are very few bicycle facilities in the area, and those that do exist are not connected to each other. Morrisville has its own transportation plan. Despite being a smaller municipality, Morrisville has a significant inventory of plans that affect transportation and smart growth, but it does not have a pedestrian or bicycle specific plan. Morrisville takes into account parts of CAMPO's Metropolitan Transit Plan, as well as Wake County's overall transit plan. Morrisville has not

been able to keep up with the growth of the region and its congestion problems have worsened in the past 10 years. Morrisville has tremendous potential for multi-modal transportation infrastructure, especially since it is commonly traversed by many citizens of the Research Triangle Region.

Recommendations

Morrisville should strive to begin large-scale transportation projects to keep up with the growth of the area. Morrisville has projects underway for road widening and expansion, but these are more reactionary to congestion rather than proactive. In order to keep up with congestion and growth, Morrisville must begin other projects now that will not only help alleviate congestion from automobiles, but encourage alternative forms of transportation. The current transportation plan for Morrisville has recommendations for new infrastructure and should be followed, albeit on a faster timeline than indicated in the plan. Since Morrisville is at the crossroads of the region, it will need to develop more robust infrastructure than is needed to support its own population.

Morrisville's bike and pedestrian infrastructure needs to be expanded significantly. Despite implementing complete streets policy, many roads do not have adequate sidewalk coverage and few major roads have bicycle infrastructure. Morrisville should focus on connecting the existing infrastructure first, and then building out from existing infrastructure to promote accessibility and connectivity. The current transportation plan recommends that small-scale, low-cost projects be done first. Potential projects should be selected on a basis of cost and connectivity objectives.

The argument has been made that it is difficult to determine if Morrisville needs any sort of dedicated bus transit system given that a large portion of its traffic is commuters passing

through the area; however, a dedicated transit system could benefit citizens and commuters in the area. Morrisville should continue to investigate the inclusion of a fixed-line transit system.

Alternatively, Morrisville could petition for Triangle Transit routes that go further into the town or for CAT to extend service to parts of Morrisville. The light rail transit project presents a unique opportunity to benefit Morrisville. It has the potential to not only alleviate congestion with a station in Morrisville and the Research Triangle Park, but the one-half cent sales tax could be used to help fund a bus transit system in Morrisville. Morrisville should continue to support the light rail project's approval in Wake County, and if the project is approved, it should work to develop TOD at station sites (if there is an eventual station site in Morrisville).

Being a smaller municipality, Morrisville is at a disadvantage when it comes to funding opportunities. One of the disadvantages of grants is that oftentimes participating communities must match a portion of the grant to receive it, which is not feasible for smaller communities. Morrisville could combat this by applying for grants jointly with other municipalities on cooperative projects. Morrisville should continue to aggressively apply for CAMPO funds for bicycle and pedestrian projects. Morrisville provides a density bonus for greenway construction in developments, but it could benefit from changing zoning to a form-based approach, especially for higher density areas. Form-based zoning might encourage or require developers to provide more multi-modal transportation development. Morrisville should also consider a local tax credit for developers that incorporate smart growth practices due to its position near Research Triangle Park; Morrisville is a high demand area for businesses that want to be near the RTP.

Raleigh

Raleigh has been proactive in setting up the future to be smart growth and multi-modal transportation oriented, but has encountered the majority of opposition on the county level. The

city of Raleigh can only approve so many things to improve the city. There are a number of things that must be approved on the county level, specifically those referring to regional projects or some funding sources. However, Raleigh constructs its long-range plans in an effective way. The recommendations in the plans are based not on what the city wants to happen, but what is predicted to be feasible based on predicted funding levels. While this presents a realistic view of transportation and smart growth projects, the plans lose some aspect of ambition that is important if a more sustainable design is to be implemented. However, recommendations in these plans reflect the ideals of smart growth and represent a growing shift in practical planning application. Raleigh lacks its own transportation plan, but follows the Wake County Transit Plan and has a transportation portion in the comprehensive plan. Other plans such as a pedestrian plan, a bicycle plan, and small area studies provide guidance on transportation measures. Raleigh also follows CAMPO's long range transportation plans for policy matters; the city has implemented complete street policies as part of its comprehensive plan. Raleigh's bus system, Capital Area Transit (CAT) has comprehensive coverage across the area, but suffers from low ridership. Raleigh engages in a number of multi-jurisdictional plans with other municipalities; being the largest city in the region, Raleigh has been a leader in joint projects and regional collaboration.

Recommendations

Raleigh receives sufficient funding for multi-modal transportation from both its tax base and a Capital Improvement Program, but still has issues. As mentioned before, Raleigh has significant political barriers to adoption of significant smart growth and multi-modal projects and policies. For example, Raleigh officials are currently on-board with the proposed one-half cent sales tax to fund light rail transit in the region, but Wake County Commissioners do not want to fund transit and have refused to compromise on the issue. The past referendum in Wake County

did not pass, but supporters are still working towards another referendum. Raleigh should work on providing educational materials on light rail to its citizens and developing ways to distribute it to citizens. If citizens are more educated about issues, they may vote to support transit and elect officials more supportive of transit. In terms of transit, the CAT system operates independently of NC State's Wolfline, which if operations were combined may present a more efficient and streamlined coverage both for students and riders. Raleigh could benefit from the inclusion of more park and ride lots for both CAT and Triangle Transit riders.

Other forms of transportation in Raleigh could also be improved. Bicycle infrastructure in Raleigh has been improving, and while there is now a number of greenways, bike lanes and sharrows (sharrows are lanes that are shared by both automobiles and bicycles), the biggest issue has been connectivity. Raleigh should focus on connecting its existing infrastructure first before developing new bicycle infrastructure. Raleigh should also implement ambitious goals into its plans in order to represent best-case scenarios for funding and support from the city government. While it is unlikely many best-case scenarios will be implemented, having them in the plan will provide guidance and ideas for future projects. However, Raleigh should continue implementing goals and projects described in its comprehensive plan, as they represent ideal smart growth policies and practices found in leading smart growth literature. Raleigh should consider shifting to a form-based zoning approach due to the increasing population of Raleigh and shrinking space as form-based zoning can speed up new construction projects. Form-based zoning could provide incentive for developers to build mixed-use developments and require incorporation of multi-modal transportation into new developments. Raleigh should continue to seek and support multi-jurisdictional projects and work with other municipalities to accomplish them.

Raleigh should continue to use its various funding sources to implement multi-modal transportation. Raleigh has a Capital Improvement Program, as well as CAMPO and other funding sources. Encouraging Wake County to approve the one-half cent sales tax for light rail would also bring benefit to the bus system. Raleigh is currently considering a vehicle miles traveled (VMT) tax, which would be used in place of a fuel tax to charge motorists based on how many miles they travel per year. This may generate more funds due to fuel taxes bringing in fewer funds due to increasing efficiency of vehicles. Raleigh should also consider a tax credit for developers that build according to smart growth practices, or provide density bonuses for developers that incorporate alternative means of transportation into its design.

Research Triangle Region

The region as a whole has set up its policies to encourage smart growth, but the region has an uphill battle. Congestion and growth levels are very high and only increasing; heavy investments in infrastructure are needed to combat traffic and sprawl. While the political climate in the region is more progressive than most of the southeastern US, the region has long followed a policy of only expanding road and highway systems and building outward rather than pursuing infill development strategies. The potential exists for the region to become a national leader in regionally integrated multi-modal transportation, but it requires a shift in how things have been done historically. The region's existing public transit systems do not experience very high ridership levels outside of Chapel Hill Transit. The extent to which the different transit systems are integrated is not as good as it should be given the region's congestion problems. Each of the municipalities has pedestrian and bicycle facilities to some degree, but some are more developed than others. Overall, the region's plans and policies encourage smart growth and multi-modal transportation, but the shift towards these policies has been a slow one. The region and its local

governments need to “jump in the pool rather than dip a toe in” if they hope to address the growing congestion and density problems.

Integration and cooperation seem to be the region’s greatest challenges. Being a distinct region with several different population clusters, there are many different entities that have their own priorities and citizen bases. Results showed that CAMPO and DCHCMPO have a high level of cooperation when it comes to plans and policies, and they often pool resources in the development of regional projects. While CAMPO and DCHCMPO are able to provide a degree of top-down coordination with multi-modal transportation, it is not enough. The local municipalities generally only cooperate when it comes to mutually beneficial projects, and they do not cooperate at all on policy and financial matters. CAMPO and DCHCMPO each have a well-designed metropolitan transportation plan for their area, but municipalities only follow portions of it, or just enough that they can get funding for projects. The municipalities work with each other on some projects, but there is not enough cooperation. Given the recent population trends in the area as stated in the introduction, carefully planned development around municipality borders will become increasingly important, meaning that the various counties, towns, and cities will need to cooperate even more.

Recommendations

The recommendations for the region are more broad and overarching in nature rather than specific; the more specific recommendations have been made in the individual municipality sections. As stated before, cooperation and integration is the biggest challenge in the region. The individual municipalities need to work closer together on transportation issues; close cooperation can help municipalities prioritize projects based on regional need which will have far-reaching

benefits. Specific coordination at the borders of municipalities to ensure seamless integration of multi-modal transportation would mutually benefit all parties. CAMPO should continue to press for acceptance of its metropolitan transportation plan and should consider stricter requirements for application of funds. CAMPO and DCHCMPO's Metropolitan Transportation Plans should continue to be followed and implemented as it advocates a wide range of smart growth practices and policies. All municipalities in the region should adopt some type of form-based zoning for downtowns and high-density areas. Form-based zoning provides more predictable and consistent development patterns that encourage connectivity between pedestrian, bicycle and automobile facilities (if these facilities are part of the zoning regulation). All municipalities should also consider implementing minimum node density requirements to promote accessibility, connectivity and transit use. Node density refers to points in the road network that connect with other roads to provide traffic interchanges.

The light rail transit project is at the forefront of transportation issues in the Research Triangle Region at this time. Light rail is one necessary component for combatting rising congestion and traffic concerns and should be implemented as soon as possible for the entire region. Wake County still needs to ratify the one-half cent sales tax, but that is only one part of the challenge. Public sentiment against public transit is well known, and the organizations in the region that deal with transportation should begin a large-scale education program about the benefits of public transit and multi-modal transportation. The existence of infrastructure is only useful if citizens in the area utilize it, and education could be a key factor in lowering congestion. If citizens in the Research Triangle Region care more about smart growth and multi-modal transportation, lawmakers and politicians in local municipalities will make it more of a priority

for implementation and funding. Municipalities in the region should continue to support light rail transit and push for its funding and development.

Bus transit in the triangle still presents problems. With the existence of eight different bus transit systems in the region, there are obvious coordination issues. Local municipalities and universities should consider having Triangle Transit manage and consolidate their respective bus transit systems in order to maximize coordination and efficiency between existing systems. An important factor in this is to make sure that local municipalities still hold a significant amount of say in decisions affecting transit in their area. Regardless of management integration with Triangle Transit, each of the transit systems should consider holding community meetings to provide a broad range assessment of current system efficiency.

Funding for smart growth projects remains an issue. CAMPO and DCHCMPO provide a large portion of funds for projects in the region, but infrastructure improvements are still slow going. CAMPO and DCHCMPO should take a leading role in assisting local municipalities in applying for state and federal grants to increase their available funds. Smaller municipalities such as Morrisville often struggle to receive grant funding because they have to match a certain portion of the grant (which is easier for larger municipalities with larger funding sources). The MPOs should help municipalities apply for grants jointly in order to increase the chances of receiving grant funding. Local municipalities should explore the possibility of abolishing a fuel tax and implementing a VMT tax, as this may raise more funds and provide incentives to those who use alternative modes of transportation or carpool. However, a VMT tax may present legal ramifications and needs further study into how local municipalities may implement it. Local municipalities should also implement a transportation development fee similar the Cary's, despite the general public opposition to increases in government taxes and fees. A transportation

development fee may require state approval and needs further investigation into what benefits could be derived for local municipalities. A tax break/credit or density bonus for developments that incorporate smart growth techniques is difficult to implement in the current political climate, but it may encourage smart growth infrastructure faster in the private sector. Developers could receive the tax credit by having requirements of density and certain transportation infrastructure in place. Municipalities should consider implanting a program similar to the SmartCommute Challenge (a transportation demand management program discussed in the Results section), which would provide incentive for individuals to utilize multi-modal transportation.

CHAPTER 6: CONCLUSION

The results of this audit show that smart growth practices are being incorporated across the region, but local governments are still struggling with adequate support and implementation. The Research Triangle Region has followed sprawl and automobile-centered development for so long that a major ideological shift is required but which is going to be a long process. Some of the local municipalities have been working on changing this over the past 10 years, but since smart growth and multi-modal transportation improvement is a long process, the results of these investments are just now starting to be evident. There will always be a need for automobile transportation, but the integration of smart growth and multi-modal transportation will provide individuals with more options and help manage problems of congestion, social inequality, and a lack of a sense of community.

The Research Triangle Region is heading in the right direction, but needs to garner more support from its citizens. Transportation aspects are also only one part of the picture; transportation features affect a wide array of other planning attributes, most notably land use, environmental planning, and parks and recreation. Land use and transportation are very closely tied in smart growth and multi-modal transportation, and land use policies and practices should be analyzed periodically as well.

In conclusion, local governments in the Research Triangle Region, and the region itself, have incorporated transportation aspects of smart growth into policy and practices. Yet, smart growth principles still lack acceptance among general citizens and elected officials, and are low priority for funding in local municipalities. The smart growth audit presented here provides a snapshot of where transportation aspects of smart growth currently stand in the Research Triangle Region (as well as what is planned by planning organizations) in comparison with best

practices. This work is one step in a process that may help spur a shift in ideology in favor of smart growth so that the Research Triangle can address its long-term transportation issues. It is important to remember that during implementation, smart growth practices and policies are not tailored to force individuals into high-density, anti-suburban developments and designs; these practices and policies provide individuals with more options should they wish to take advantage of the pedestrian-friendly and transit-oriented aspects of smart growth.

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APPENDIX A: IRB APPROVAL LETTER



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914  · Fax 252-744-2284  · www.ecu.edu/irb

Notification of Exempt Certification

From: Social/Behavioral IRB
To: [Brian VanderJeuqdt](#)
CC: [Jerry Weitz](#)
Date: 3/31/2014
Re: [UMCIRB 14-000408](#)
Transportation Aspects of Smart Growth in the Research Triangle Region

I am pleased to inform you that your research submission has been certified as exempt on 3/29/2014 . This study is eligible for Exempt Certification under category #2 .

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification request at least 30 days before the end of the five year period.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: COMPILED AUDIT INFORMATION

Table 1. Inventory of Plans, Ordinances and Programs.

Document	Year Published
Cary	
Town of Cary Comprehensive Plan	2004
Comprehensive Transportation Plan	2008
Cary Land Development Ordinance	2003
Chapel Hill	
Chapel Hill 2020 Comprehensive Plan	2012
Chapel Hill Bicycle and Pedestrian Action Plan	2004
Chapel Hill Land Use Management Ordinance	2003
Chapel Hill Design Guidelines	1998
Chapel Hill and Carrboro Long Range Transit Plan	2009
Durham	
Durham Comprehensive Plan	2012
Durham Design Manual	2010
Durham Trails and Greenways Master Plan	2011
Durham Greenhouse Gas Inventory	2007
Durham Commute Trip Reduction Ordinance	2013
Durham Comprehensive Bicycle Transportation Plan	2006
Durham Unified Development Ordinance	2006
Durham Walks! Pedestrian Plan	2006
Morrisville	
Morrisville Land Use Plan	2009
Morrisville Unified Development Ordinance	2013
Morrisville Town Center Plan	2007
Morrisville Transportation Plan	2009
Raleigh	
Raleigh Comprehensive Plan	2009
Raleigh Bicycle Transportation Plan	2009
Raleigh Consolidated Plan	2010
Raleigh Street Design Manual	2014
Raleigh Unified Development Ordinance	2013
County, Regional, and State Documents	
North Carolina Bike and Pedestrian Plan	2013
NCDOT Complete Streets Planning and Design Guidelines	2012
CAMPO and DCHCMPO 2035 Long Range Transportation Plan	2009
Triangle Region Travel Demand Management Plan	2007
CAMPO and DCHCMPO 2040 Metropolitan Transportation Plan	2013
Orange County Bus and Rail Investment Plan	2012
Orange County 2030 Comprehensive Plan	2008
Wake County Land Use Plan	2012
Wake County Transit Plan	2012

Table 2. Audit Results.

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
Projects												
1. Has the area completed smart growth projects?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Comprehensive plan	Y	Interview- Raleigh	Y	Interview- CAMPO
2. Do projects complete "missing links" in transportation networks to provide connectivity?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	Y	Interview- CAMPO
3. Do projects incorporate many different modes of transportation?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	Y	Metropolitan transportation plan
4. Are smart growth projects planned for the area?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	Y	Interview- CAMPO
5. Do projects incorporate space for future transportation improvements?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	Y	Interview- CAMPO
6. Does the local governing body assist with smart growth projects?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Comprehensive plan	Y	Interview- Raleigh	Y	Interview- CAMPO
7. Do smart growth projects in the area incorporate transportation aspects?	Y	Transportation plan	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	Y	Interview- CAMPO
8. Have goals for smart growth projects been set?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Transportation plan	Y	Interview- Raleigh	Y	Interview- CAMPO
9. Are projects collaborated with others on a regional level?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Transportation plan	Y	Interview- Raleigh	Y	Interview- CAMPO
Policies												

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
1. Do plans include a transportation element that addresses long-range needs for roads?	Y	Transportation plan	Y	Comprehensive plan	Y	Comprehensive plan	Y	Transportation plan	Y	Comprehensive plan pg. 64	Y	Metropolitan transportation plan
2. Do plans include a transportation element that addresses long-range needs for sidewalks?	Y	Transportation plan	Y	Bicycle and pedestrian action plan	Y	Pedestrian plan	Y	Transportation plan	Y	Comprehensive plan	Y	Metropolitan transportation plan
3. Do plans include a transportation element that addresses long-range needs for bicycle paths?	Y	Transportation plan	Y	Bicycle and pedestrian action plan	Y	Comprehensive bicycle transportation plan	Y	Transportation plan	Y	Comprehensive plan	Y	Metropolitan transportation plan
4. Do plans include a transportation element that addresses long-range needs for transit?	Y	Transportation plan	Y	Long range transit plan	Y	Comprehensive plan	Y	Transportation plan pg. 17	Y	Comprehensive plan	Y	Metropolitan transportation plan
5. Do plans include a transportation element that addresses long-range needs for freight movement?	Y	Transportation plan	N	Interview-Chapel Hill	N	Interview-Durham	Y	Transportation plan	Y	Comprehensive plan	Y	Metropolitan transportation plan
6. Do plans include a transportation element that addresses long-range needs for water travel?	N/A		N/A		N/A		N/A		N/A		N/A	

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
7. Do plans include a transportation element that addresses long-range needs for air travel?	Y	Transportation plan	N	Interview-Chapel Hill	Y	Comprehensive plan	Y	Transportation plan	Y	Comprehensive plan	Y	Metropolitan transportation plan
8. Do transportation policies encourage local street networks (as opposed to the conventional system of arterials, collectors, and local streets)?	N	Transportation plan- pg. 7-5	N	Design guidelines	N	Interview-Durham	N	Transportation plan	N	Interview-Raleigh	Y	Metropolitan transportation plan
9. If the above question is answered yes, are there any discrete examples of a local street development in accordance with the plan?	N/A		N/A		N/A		N/A		N/A		N	Interview-CAMPO
10. Does the Comprehensive Plan address the appropriateness of reviewing and possibly reducing local street standards so as to reduce excessive right-of-way and pavement widths?	Y	Transportation plan	Y	Comprehensive plan	Y	Comprehensive plan pg. 8-10	Y	Transportation plan	Y	Comprehensive plan pg. 72	Y	Metropolitan transportation plan

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
11. Have street standards been revised to lower any excessive requirements for local subdivision streets (i.e. skinny streets)?	Y	Interview- Cary	N	Comprehensive plan	Y	Comprehensive plan pg. 8-13	Y	Transportation plan	Y	Comprehensive plan pg. 68	Y	Complete streets planning and design guidelines
12. Do local transportation policies provide for the maintenance of current roads and existing transportation systems before spending money on new ones?	Y	Transportation plan	Y	Interview- Chapel Hill	Y	Comprehensive plan	Y	Transportation plan	Y	Comprehensive plan	Y	Local transportation plans
13. Do development regulations have a requirement to consider and possibly provide for new local streets at designated intervals?	Y	Interview- Cary	Y	Land use management ordinance	Y	Unified development ordinance	Y	Unified development ordinance	Y	Interview- Raleigh	Y	Metropolitan transportation plan
14. Are sidewalks required for new residential subdivisions on one side of the street?	N	Interview- Cary	Y	Design guidelines	Y	Pedestrian plan- pg. 3-3	N	Transportation plan	N	Street design manual	N/A	Regional policy defers to local standards
15. Are sidewalks required for new residential subdivisions on both sides of the street?	Y	Pedestrian plan- 4-2	Y	Bicycle and pedestrian action plan	Y	Pedestrian plan- pg. 3-3	Y	Transportation plan	Y	Comprehensive plan pg. 89	N/A	Regional policy defers to local standards

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
16. Has a bikeway master plan been adopted?	N	Interview- Cary	Y	Bicycle and pedestrian action plan	Y	Comprehensive bicycle transportation plan	N	Transportation plan	Y	Bicycle transportation plan	N	Metropolitan transportation plan
17. If so, do regulations require installation of bike facilities per that plan?	N	Interview- Cary	Y	Bicycle and pedestrian action plan	Y	Comprehensive bicycle transportation plan	N	Transportation plan	Y	Bicycle transportation plan	N	Metropolitan transportation plan
18. Is new development required to install sidewalks along existing public streets bordering the development, where such sidewalks do not already exist?	Y	Transportation plan	Y	Interview- Chapel Hill	N	Interview- Durham	Y	Unified development ordinance	Y	Comprehensive plan pg. 90	N/A	Regional policy defers to local standards
19. Do regulations require the connection of subdivision streets to existing streets and designing streets to allow connection to future subdivision developments?	Y	Transportation plan, pg. 7-21	Y	Interview- Chapel Hill	Y	Comprehensive plan pg. 8-2	Y	Unified development ordinance	Y	Unified development ordinance	N/A	Regional policy defers to local standards
20. Do land-use regulations require the provision of inter-property connection between individual development access where applicable?	Y	Transportation plan	Y	Land use management ordinance	Y	Unified development ordinance	Y	Transportation plan	Y	Interview- Raleigh	N/A	Regional policy defers to local standards

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
21. Are land-use regulations "transit-friendly" or "transit supportive?"	Y	Transportation plan, pg. 6-23	Y	Interview- Chapel Hill	Y	Comprehensive plan- pg. 2-18	Y	Interview- Cary	Y	Comprehensive plan	Y	Interview- CAMPO
22. Does the comprehensive plan recommend intergovernmental agreements where needed to attain mutual goals of community building?	Y	Comprehensive plan	Y	Comprehensive plan	Y	Interview- Durham	Y	Land use plan	Y	Comprehensive plan pg. 293	Y	Interview- CAMPO
23. Do comprehensive plan policies reflect notions of social equity and environmental justice?	Y	Comprehensive plan	Y	Comprehensive plan	Y	Interview- Durham	Y	Land use plan	Y	Comprehensive plan pg. 75	Y	Interview- CAMPO
24. Are multiple modes of transportation available?	Y	Comprehensive plan	Y	Comprehensive plan	Y	Comprehensive plan	Y	Land use plan	Y	Comprehensive plan	Y	Interview- CAMPO
25. Does policy encourage transit-oriented (TOD) and transit friendly developments?	Y	Transportation plan, pg. 6-23	Y	Long range transit plan, 7-2	Y	Comprehensive plan pg. 2-18	Y	Transportation plan	Y	Comprehensive plan	Y	Metropolitan transportation plan
26. Does local policy promote sprawl?	N	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Interview- Cary	N	Interview- Raleigh	N/A	
27. Does regional policy promote sprawl?	N	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Interview- Cary	N	Interview- Raleigh	N	Interview- CAMPO

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
28. Does land use policy encourage multi-modal transportation at the local level?	Y	Comprehensive plan	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Comprehensive plan	Y	Comprehensive plan	N/A	
29. Does land use policy encourage multi-modal transportation at the regional level?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- CAMPO	Y	Interview- Raleigh	Y	Interview- CAMPO
30. Does policy encourage locating new development, especially public facilities, in areas that have multiple modes of transportation available?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- CAMPO	Y	Interview- Raleigh	Y	Interview- CAMPO
31. Do policies specifically address congestion management measures?	Y	Transportation plan	Y	Long range transit plan	Y	Commuter trip reduction ordinance	Y	Transportation plan	Y	Comprehensive plan pg. 72	Y	Metropolitan transportation plan
32. Do roadway design standards protect pedestrians and support transit and non-automotive modes?	Y	Cary land development ordinance	Y	Design guidelines	Y	Interview- Durham	Y	Transportation plan	Y	Comprehensive plan	Y	Long range transportation plan

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
33. Are TOD-promoting incentives such as down payment assistance, reduced transit passes, and location efficient mortgages offered?	N	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Interview- CAMPO	N	Interview- Raleigh	Y	Travel demand management plan
34. Are high-occupancy vehicle (HOV) lanes called for in the plan or utilized in the community?	N	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Transportation plan	N	Interview- Raleigh	Y	Interview- CAMPO
35. Does the plan address transportation demand management measures, such as vapoools or carpools?	N	Interview- Cary	Y	Interview- Chapel Hill	Y	Commuter trip reduction ordinance	Y	Transportation plan	Y	Interview- Raleigh	Y	Travel demand management plan
36. Has a trail system or other non-motorized public access to amenities been established?	Y	Transportation plan	Y	Bicycle and pedestrian plan	Y	Trail and greenways master plan	Y	Transportation plan	Y	Bicycle transportation plan	Y	Interview- CAMPO
37. Do parks and open space have connectivity to other areas through sidewalks?	Y	Comprehensive plan	Y	Bicycle and pedestrian plan	Y	Trail and greenways master plan	Y	Transportation plan	Y	Comprehensive plan pg. 90	Y	Interview- CAMPO

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
38. Is there an established process for public participation in drafting and adopting plans and ordinances?	Y	Interview- Cary	Y	Interview- Cary	Y	Interview- Cary	Y	Land use plan	Y	Interview- Raleigh	Y	Interview- CAMPO
39. Do plans have framework to require state, metro, and regional institutions to facilitate multi-jurisdictional decision-making and problem-solving?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Transportation plan	Y	Interview- Raleigh	Y	Interview- CAMPO
40. Are local plans, regulations and practices consistent with one another?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- Cary	Y	Interview- Raleigh	N	Interview- CAMPO
41. Does current policy provide a strong foundation for future smart growth practices and policies?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- CAMPO	Y	Comprehensive plan	Y	Interview- CAMPO
42. Have a significant amount of transportation policies and recommendations from plans been implemented in the municipality?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	N	Interview- CAMPO	Y	Comprehensive plan	Y	Interview- CAMPO

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
43. Have a significant amount of regulations related to transportation been implemented since the comprehensive plan's publishing?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	Y	Interview- CAMPO	Y	Comprehensive plan	Y	Interview- CAMPO
Financial												
1. Do smart growth efforts in the area receive enough financial support?	N	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Transportation plan	N	Interview- Raleigh	N	Interview- CAMPO
2. Are road-pricing techniques used to encourage infill development rather than sprawl?	N	Transportation plan	N	Interview- Chapel Hill	N	Interview- Durham	N	Interview- CAMPO	N	Interview- Raleigh	N	Interview- CAMPO
3. Are funding sources for transportation improvements used to meet project needs on a continuing basis created?	Y	Interview- Cary	Y	Bike and pedestrian plan	Y	Interview- Durham	N	Interview- CAMPO	Y	Interview- Raleigh	Y	Interview- CAMPO
4. Are tax credits or incentives in place for smart growth projects?	Y	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	N	Interview- CAMPO	N	Interview- Raleigh	N	Interview- CAMPO

Question	Cary		Chapel Hill		Durham		Morrisville		Raleigh		Research Triangle Region	
	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source	Yes/No	Source
5. Is the use of flexible and innovative funding encouraged to maximize resources that can be used to provide smart growth features?	Y	Interview- Cary	N	Interview- Chapel Hill	N	Interview- Durham	N	Interview- CAMPO	Y	Comprehensive plan pg. 85, 294	Y	Interview- CAMPO
6. Are regional funding alternatives, such as regional tax sharing, encouraged to produce regional projects that have widespread effects?	N	Interview- Cary	Y	Interview- Chapel Hill	Y	Interview- Durham	N	Interview- CAMPO	N	Comprehensive plan pg. 294	Y	Interview- CAMPO

Table 3. Recommendation Summary.

<i>Recommendation</i>	<i>Study Section</i>					
	Cary	Chapel Hill	Durham	Morrisville	Raleigh	Research Triangle Region
Education	x	x	x	x	x	x
Congestion Mitigation		x	x	x	x	x
Increased Bike Facilities		x		x		
University Coordination		x	x		x	x
Pedestrian and Bicycle Safety		x				x
Smart Growth Incentive Program	x	x	x	x	x	x
TOD Incentives	x	x	x		x	x
Improve Public Transit	x		x	x	x	x
Transportation Fee Program			x			x
Pursue New Investment Sources	x			x	x	x
Intergovernmental Coordination	x	x	x	x	x	x
Transportation Connectivity	x			x	x	x
Balance Short-Term and Long-Term Projects	x			x		x

	Cary	Chapel Hill	Durham	Morrisville	Raleigh	Research Triangle Region
Support light rail infrastructure	x	x	x	x	x	x
Consolidate Research Triangle Public Transit						x
Form-based Zoning Approach for High Density	x	x	x	x	x	x
Execute Large-scale Projects				x		

