

CONNECT 2050

The Research Triangle Region's
Metropolitan Transportation Plan



Table of Contents

1. Executive Summary.....	1
2. What is the Plan?	6
2.1 Why Do We Need A Plan?	6
2.2 What Is In The Plan?	7
2.3 How Will The Plan Be Used?.....	10
3. About Our Home	11
3.1 Our Region	11
3.2 Our People.....	12
3.3 Our Economy	13
3.4 Our Environment	14
3.5 Our Future	16
3.6 Our Challenge	16
4. Our Vision – What It is Based on And How We Will Achieve It	19
4.1 The Values Underlying Our Vision: Equitable Investment and Multi-Pronged Engagement	19
4.2 Vision.	19
4.3 Goals and Objectives.	19
4.4 Performance Targets and Measures of Effectiveness.	21
5. How We Developed Our Plan.....	24
5.1 Who is Responsible for the Plan?	24
5.2 Stakeholder & Public Engagement	25
5.3 Supportive Tools: CommunityViz and the Triangle Region Transportation Model.....	31
5.4 Related Plans and Studies.....	32
6. Analyzing Our Choices.....	37
6.1 Land Use Plans and Policies.....	37
6.2 Socio-economic Forecasts	38
6.3 Trends, Uncertainties, Deficiencies, and Needs	41
6.4 Alternatives Analysis.....	43
6.5 Performance Evaluation Measures	47
7. Our Metropolitan Transportation Plan: What We Intend to Do	48
7.1 Land Use & Development Strategies	48
7.2 Shared Regional Investments	49
7.3 Complete Corridors	50
7.4 Roadways.....	51
7.5 Transit Facilities & Services	54
7.6 Active Transportation & Micromobility Investments.....	58
7.7 Strategies to Manage Transportation Demand	62
7.8 Transportation Technologies	64
7.9 Investments for Safe, Effective Transportation System Management (TSM).....	65
7.10 Specialized Investments: Railroads and Airports.....	66
7.11 Freight Movement.....	69
7.12 Policy Priorities, Special Plans, Projects, Studies and Performance Tracking	70
8. Our Financial Plan	74
8.1 Revenues	74
8.2 Costs	80
8.3 Balancing Costs and Revenues	81
9. Critical Factors and Emphasis Areas in the Planning Process	82
9.1 Sustainability & Resiliency: Critical Environmental Resources	85
9.2 Transportation, Air Quality and Climate Change.....	87
9.3 Environmental Justice.....	88
9.4 Safety and Security	96
9.5 The FAST Act and the 2050 MTP	99
10. Post-2050 Comprehensive Transportation Plan Projects	102

Appendices [appendices will be provided with the final version of the report, and may be referenced web links]

- Appendix 1: Community Engagement
- Appendix 2: Complete Corridor & Road Projects List
- Appendix 3: Transit Project List
- Appendix 4: Active Transportation Projects
- Appendix 5: Resources on Technologies: Connected & Autonomous Vehicles, Electrification, Telepresence
- Appendix 6: Joint MPO Transportation Policy Priorities
- Appendix 7: Air Quality (MOVES output)
- Appendix 8: Public Comments and Plan Revisions
- Appendix 9: Acronyms
- Appendix 10: Detailed Transportation and Growth Maps and Performance Metrics Tables
- Appendix 11: Year-of-Expenditure Financial Plan and Cost & Revenue Details
- Appendix 12: Environmental Justice Maps and Critical Environmental Resource Maps
- Appendix 13: FAST Act Target Values

Online Interactive Project Maps:

CAMPO: [\[to be added in final version\]](#)

DCHC MPO: [\[to be added in final version\]](#)

2050 Metropolitan Transportation Plan adoption dates:

Capital Area MPO: February 16, 2022

Durham-Chapel Hill-Carrboro MPO: February 9, 2022

Date of this document version: January 14, 2022

A Note to Readers:

The heart of any transportation plan is the investments that will be made to serve the mobility needs of our rapidly growing region's citizens, businesses and visitors. These investments take the form of road, transit, railroad, airport, cycling and walking facilities and services, together with related technologies and strategies. Maps are created to help visualize the nature of both the facilities in which we plan to invest and the existing and future population and jobs that the facilities are designed to serve. But the maps in this document are for illustrative purposes only and are subject to change and interpretation. The details of the investments are in the project lists that are included with this report.

Comments may be submitted to either of the MPOs through their websites:

NC Capital Area MPO: www.campo-nc.us/

attention: Chris Lukasina

Durham-Chapel Hill-Carrboro MPO: www.dchcmpo.org/

attention: Andy Henry

Because this document addresses the official plans of both MPOs, the document is color-coded. Text and tables with a white background apply to both MPOs.

Text and tables highlighted in this green color apply only to the Durham-Chapel Hill-Carrboro MPO.

Text and tables highlighted in this yellow color apply only to the Capital Area MPO

1. Executive Summary

Transportation investments link people to the places where they work, learn, shop and play, and provide critical connections between businesses and their labor markets, suppliers and customers.

This document contains the 2050 Metropolitan Transportation Plans (MTPs) for the two organizations charged with transportation decision-making in the Research Triangle Region: the Capital Area Metropolitan Planning Organization (CAMPO) and the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO). These organizations, and the areas for which they are responsible, are commonly called “MPOs.”

The Metropolitan Transportation Plans are the guiding documents for future investments in roads, transit services, bicycle and pedestrian facilities and related transportation activities and services to match the growth expected in the Research Triangle Region.

The areas covered by this plan are part of a larger economic region. Transportation investments should consider the mobility needs of this larger region and links to the other large metro regions of North Carolina and throughout the Southeast. The Triangle Region is expected to accommodate substantial future growth; we need to plan for the region we will become, not just the region we are today.

2020 and Forecast 2050 Population and Jobs	2020		2050		2020 to 2050 Growth	
	Population	Jobs	Population	Jobs	Population	Jobs
Capital Area MPO	1,360,000	660,000	2,200,000	1,270,000	840,000	610,000
Durham-Chapel Hill-Carrboro MPO	480,000	310,000	680,000	520,000	190,000	210,000
Areas outside Triangle MPO boundaries	180,000	70,000	310,000	100,000	130,000	30,000
Total for area covered by the region’s transportation model	2,020,000	1,040,000	3,180,000	1,880,000	1,170,000	840,000

The Triangle has historically been one of the nation’s most sprawling regions and current forecasts project both continued outward growth and infill development in selected locations, most notably in the central parts of Raleigh and Durham and the area between them, including a mixed use center currently being developed within the Research Triangle Park. A key challenge for our transportation plans is to match our vision for how our communities should grow with the transportation investments to support this growth.

No region has been able to “build its way” out of congestion; an important challenge for our transportation plans is to provide travel choices that allow people to avoid congestion where it cannot be prevented.

Our population is changing. The population is aging, more households will be composed of single-person and two-person households without children, the number of households without cars is increasing, and more people are interested in living in more compact neighborhoods with a mix of activities. Our plans are designed to provide mobility choices for our changing needs.

Our MPOs are tied together by very strong travel patterns between them; our largest commute pattern and heaviest travel volumes occur at the intersection of the MPO boundaries. Our MPO plans need to recognize the mobility needs of residents and businesses that transcend our MPO and county borders.

The region has a common vision of what it wants its transportation system to be:

a seamless integration of transportation services that offer a range of travel choices to support economic development and are compatible with the character and development of our communities, sensitive to the environment, improve quality of life and are safe and accessible for all.



The MPOs have jointly adopted goals and objectives to accomplish this vision and selected performance measures to track progress over time. Each MPO has targets that reflect the unique characteristics and aspirations of the communities within the MPO. *Connect2050* commits our region to transportation services and development patterns that contribute to a more equitable and sustainable place where people can successfully pursue their daily activities.



To analyze our transportation investment choices, the MPOs followed a systematic process involving significant public engagement, with a greatly increased focus on traditionally under-represented voices. It began with understanding our communities' core values and priorities.



Special emphasis was placed on identifying key activity centers in the region and investments and strategies that would connect these centers to neighborhoods with the most significant number of lower-income, BIPOC and zero-car households, providing these neighborhoods with a range of travel choices, especially transit.



Next, we used carefully documented analysis tools to forecast the types, locations and amounts of future homes and jobs based on market conditions and trends, factors that influence growth, and local plans.

Based on the forecasts, we looked at mobility trends and needs, and where our transportation system may become deficient in meeting these needs.

Working with a variety of partners and based on public input, we created land use and transportation system scenarios and analyzed their impacts, comparing the performance of system alternatives against one another and to performance targets derived from our goals and objectives.

The result of this analysis and extensive public engagement was a set of planned investments, together with a pattern of land development aligned with these investments. Additional studies were identified to ensure that the investments are carefully designed and effectively implemented. The core of the plan is the set of transportation investments described in Section 7:

- New and expanded roads where needed, and re-designed roads for safer, better multimodal travel;
- Local and regional transit facilities and services, including rapid bus and rail lines;
- Aviation and long-distance passenger and freight rail services;
- Bicycle and pedestrian facilities, both independent projects and in concert with road projects;
- Transportation Demand Management: marketing and outreach efforts that increase the use of alternatives to peak period solo driving;
- Technology-Based Transportation Services: the use of advanced technology to make transit and road investments more effective—including the advent of autonomous and connected vehicles; and



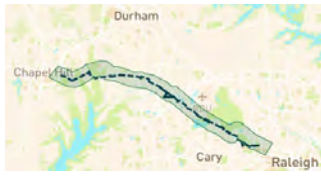





In addition to these investments, the plan includes a focus on three issues where the ties between development and transportation investments are most critical:

- (i) transit corridor development – with an emphasis on equitable transit-oriented development and affordable housing strategies,
- (ii) the development of “complete corridors” centered on major roadways but where multi-modal elements are especially beneficial, and
- (iii) “safe & healthy streets” with designs that are sensitive to the neighborhoods of which they are a part and support the needs of a full range of users, including drivers, transit users, cyclists and pedestrians – these are often referred to as “context-sensitive complete streets” by transportation professionals.

The plan anticipates that the region will match its historic focus on roads with a sustained commitment to high-quality transit service as well, emphasizing five critical components:

- Connecting the region's main centers with fast, frequent, reliable rail or bus services;
- Offering transit service to all communities that have implemented local transit revenue sources;
- Providing frequent transit service in urban travel markets;
- Launching on-demand “microtransit” services where they can provide superior service, and
- Supplying better transit access, from "first mile/last mile" circulator services within key centers to safe and convenient cycling and walk access to transit routes.

Three transit capital investments are part of a set of shared regional investments by both MPOs:

<p>North Carolina Railroad Corridor Passenger Rail (1st phase from Durham to Garner or Clayton)</p>		<p>Regional Transit Center Relocation (serving regional buses, future BRT and future passenger rail)</p>	
<p>Triangle Bikeway along I-40 (NC 54 in Chapel Hill to I-440 in Raleigh)</p>		<p>Wake-Durham Bus Rapid Transit (extension of Wake Western Corridor BRT from Cary to RTP HUB)</p>	
<p>US 70 Durham: modernization Wake: freeway conversion</p>		<p>I-40 Durham: modernization Wake: managed freeway</p>	
<p>Aviation Parkway Durham: modernization Wake: new alignment</p>		<p>Triangle Transportation Demand Management Program</p>	

Although the plan includes a new emphasis on transit investment, it envisions significant additional roadway investment as well, focusing on “complete corridors” that incorporate provisions for transit and active transportation travel as part of roadway improvements.

One clear message from both elected official discussion and public engagement during the development of *Connect2050* is that roadways need to be designed and engineered with much greater care than has been typical in the past, using more flexible and context-sensitive standards that have now been successfully implemented in many places. Especially in urban and urbanizing locations, designs should prioritize steady, safe, reliable, moderate-speed travel, rather than emphasize high-speed travel.



Parkway Design



Boulevard Design



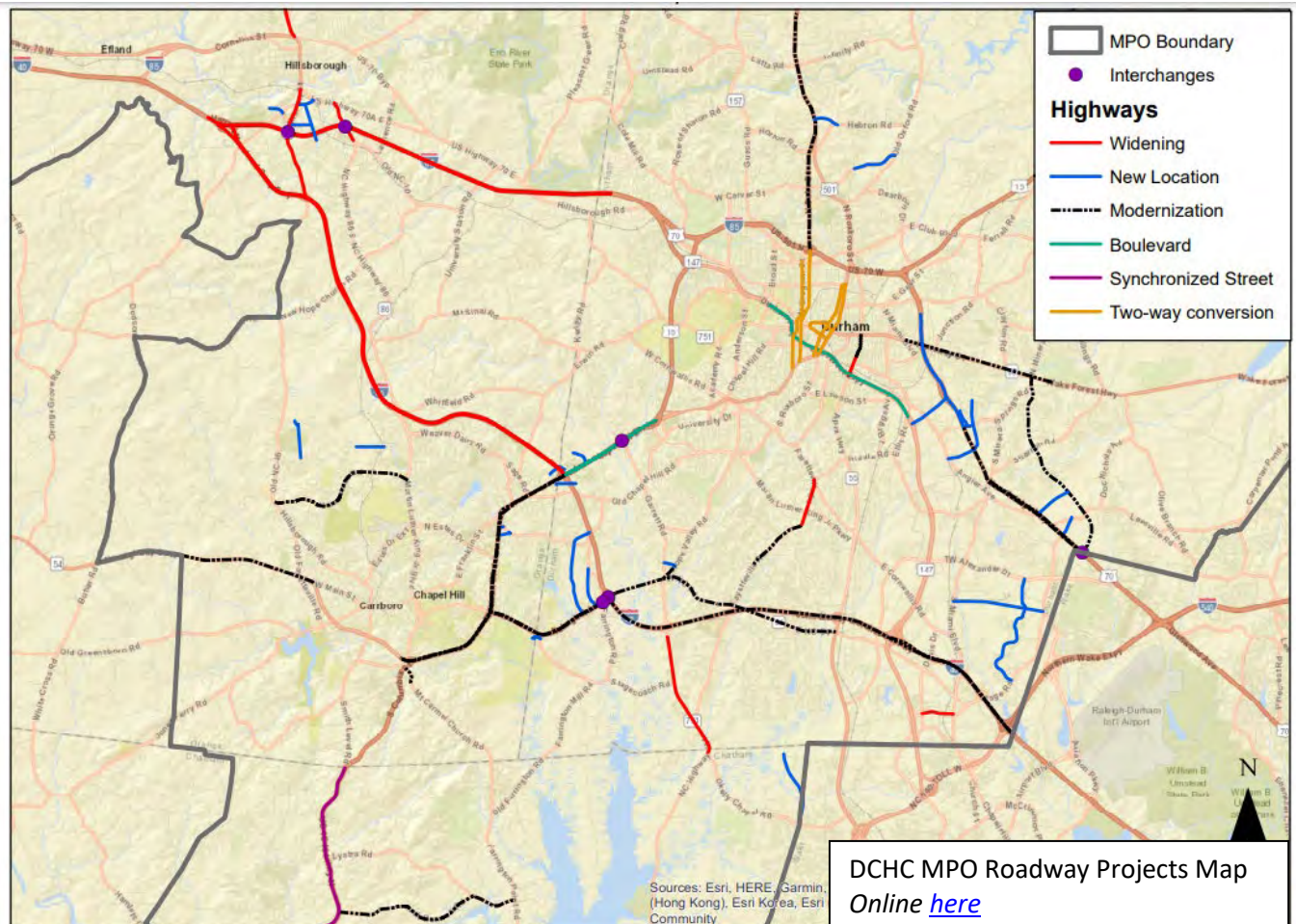
Superstreet Design

Major roadway projects in each MPO are highlighted on the following pages; all projects are listed in Appendix 2 and available on interactive maps on-line. Section 7 of the Plan provides greater detail on planned roadway and transit investments.

DCHC MPO Major Roadway Projects List (estimated cost > \$100 million) and All Projects Map

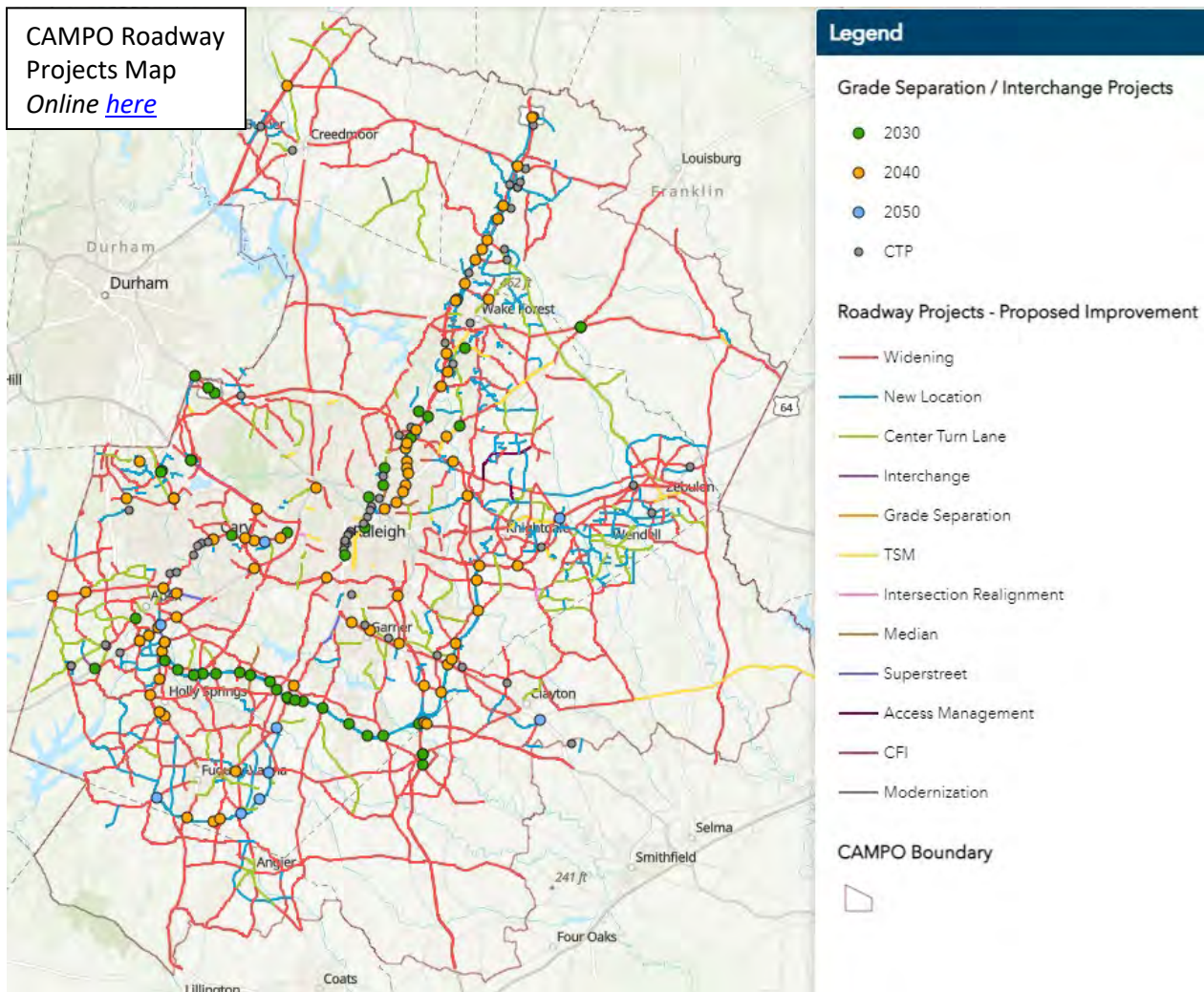
Durham Chapel Hill-Carrboro MPO		
2021-30	2031-40	2041-50
East End Connector linking US 70 to NC 147 (Durham Freeway) to form I-885*	US 15-501 modernization (South Columbia in Chapel Hill to Cameron Blvd. in Durham)	
I-40 widening in Orange County (US 15-501 to I-85)	I-40/NC 54 Interchange and NC 54 modernization (TIP# U-5774)	
	US 70 modernization in Durham County (Lynn Road to Wake County)	
	I-85 widening in Orange County (Orange Grove Rd. to Sparger Road.)	
	US 15-501 Synchronized Street (Smith Level Road to US 64 in Chatham Co.)	
	I-40 managed roadway modernization (NC 54 to Wake County; links to CAMPO I-40 project)	
	NC147 modernization (I-40 to Swift Ave.)	

* funded in prior years but open to traffic in indicated time period



CAMPO Major Roadway Projects List and All Projects Map

Capital Area MPO		
2021-30	2031-40	2041-50
I-40 widened from Wade Ave. to Lake Wheeler Road	I-40 widened from I-440 to NC 42 in Johnston County	I-87 widened from US 64 Bus to US 264
I-440 widened from Wade Avenue to Crossroads	I-87 widened from I-440 to US 264	NC 210 widened from Angier to Lassiter Pond Rd.
I-40 widened from I-440 to NC 42 in Johnston County	US 1 widened south from US 64 to NC 540	NC 50 widened from NC 98 to Creedmoor
US 64 W corridor improvements from US 1 to Laura Duncan Rd.	Managed lanes added to I-540 (Northern Wake Expressway) from I-40 to US 1	US 401 widened from Fuquay-Varina to MPO boundary in Harnett County
NC 540 toll road extended from Holly Springs to I-40 south of Garner	NC 540 completed as a toll road from Holly Springs to I-87/US 64 bypass	NC 96 widened from US 1 to NC 98
US 70 widened and access management from I-540 to Durham/Wake Co. Line	I-40 Managed lanes added to I-40 from Durham County line to MPO boundary in Johnston County	NC 56 widened from I-85 to MPO boundary in Franklin County



2. What is the Plan?

This document contains the 2050 Metropolitan Transportation Plans for CAMPO and the DCHC MPO. These plans are the guiding documents for future investments in roads, transit services, bicycle and pedestrian facilities and related transportation activities and services to match the growth expected in the Research Triangle Region.

2.1 Why Do We Need A Plan?

A transportation plan is essential for building an effective and efficient transportation system. The implementation of any transportation project, such as building a new road, adding lanes to a highway, purchasing transit buses, constructing a rail system, or building bicycle lanes with a road widening project, often requires several years to complete from concept to construction.

Once a community determines that a project is needed, there are many detailed steps to be completed: funding must be identified; analysis must be completed to minimize environmental and social impacts; engineering designs must be developed, evaluated, and selected; the public must be involved in project decisions; right-of-way may have to be purchased; and finally, the construction must be contracted and completed.

No matter which step one might consider the most important in this long process, a project always begins with the regional transportation plan. In fact, this basic planning concept is so important, that federal regulations require that a project must be identified in a metropolitan transportation plan in order for it to receive federal funding and obtain federal approvals.

Federal regulations not only require a metropolitan transportation plan, the regulations stipulate the contents of the plan and the process used in its development. The plan must have:

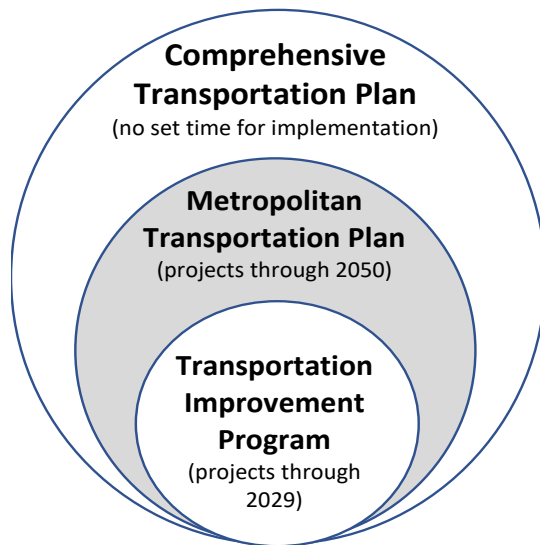
- A vision that meets community goals.
- A multi-modal approach that includes not only highway projects, but provides for other modes such as public transportation, walking, and bicycling.
- A minimum 20-year planning horizon.
- A financial plan that balances revenues and costs to demonstrate that the plan is financially responsible and constrained.
- An air quality analysis to show that the plan will meet federal standards, when a region is subject to air quality conformity requirements.
- A public involvement process that meets federal guidelines, and is sensitive especially to those groups traditionally under-represented in the planning process.

Regions like the Research Triangle must develop these plans at least every five years, and must act to amend these plans if regionally significant transportation investments are added, deleted or modified in the plans.

2.2 What Is In The Plan

Metropolitan areas in North Carolina prepare two distinct, but related **types of transportation plans**:

Figure 2.2.1



1. Comprehensive Transportation Plans (CTPs) are “needs-based.” They show all the existing, new, upgraded and expanded major roads, transit services, bicycle and pedestrian facilities and related transportation activities that are needed to meet the growth and mobility aspirations of our citizens over the long term. The CTP has no defined future date by which the facilities and services would be provided, nor is it constrained by our ability to pay for facilities and services or the impacts of these facilities and services on our region’s air quality.
2. Metropolitan Transportation Plans (MTPs) are “revenue-based.” They show the new, upgraded and expanded roads, transit services, bicycle and pedestrian facilities and related transportation activities that we believe we can fund and build by the year 2050, and that will meet federal air quality standards.

This document focuses on the second of these two types of plans: the Metropolitan Transportation Plan that shows what we can achieve by 2050 with anticipated funding and that will preserve air quality. The road project lists in Appendix 1 include a separate list of projects that are beyond the funding ability of the MTP, but are included in the Comprehensive Transportation Plan.

The facilities and services in a MTP are a subset of the facilities and services in a CTP. Figure 2.2.1 shows this relationship between the MTP and CTP, and also the plans’ relationship to the Metropolitan Transportation Improvement Program (MTIP), the ten-year program of projects that is also developed for metropolitan areas and that serves as the main implementing document of the MTPs for those projects and services that use state and federal funding. The current MPO-adopted MTIPs cover fiscal years 2020-2029.

This document compiles the MTPs for the two areas under the jurisdiction of the organizations with the main responsibility for transportation planning in the Research Triangle Region:

1. The Capital Area Metropolitan Planning Organization (Capital Area MPO, or CAMPO) which covers all of Wake County and portions of Franklin, Granville, Harnett and Johnston Counties; and
2. The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (Durham-Chapel Hill-Carrboro MPO, or DCHC MPO) which covers all of Durham County and parts of Orange and Chatham Counties.

Therefore, this is one document, so that those interested in transportation planning in the Research Triangle Region have a single, consistent reference to consult, but two plans, since there are state and federal requirements that each MPO be responsible for the plans, projects & services, funding, and air quality requirements within its jurisdiction.

This point merits emphasis: The selection of projects and allocation of funding to them is an *independent* decision by each MPO. This single document is a way to help these organizations make more consistent and complementary decisions within their spheres of authority, and to communicate these decisions to the citizens of the region.

To distinguish these lines of authority, this document is color-coded. Text and tables with a white background apply to both MPOs.

Text and tables highlighted in this green color apply only to the Durham-Chapel Hill-Carrboro MPO.

Text and tables highlighted in this yellow color apply only to the Capital Area MPO

Figure 2.2.2 summarizes key features of the two types of plans and different areas of authority, and indicates what is included in this version of the single regional document.

Figure 2.2.2

Authority	Capital Area MPO		Durham-Chapel Hill-Carrboro MPO	
Name of the Plan	CAMPO 2050 Metropolitan Transportation Plan	CAMPO Comprehensive Transportation Plan	DCHC MPO 2050 Metropolitan Transportation Plan	DCHC MPO Comprehensive Transportation Plan
Area Covered	Wake County and parts of Franklin, Granville, Harnett and Johnston Counties	Same as CAMPO Metropolitan Transportation Plan	All of Durham and parts of Orange and Chatham Counties	Same as DCHC MPO Metropolitan Transportation Plan
Who requires this plan?	Federal Government	State Government	Federal Government	State Government
Plan's Horizon Year	2050	No Set Year	2050	No set year
Is this plan fiscally constrained?	Yes	No	Yes	No
Must this plan meet air quality standards?	Yes	No	Yes	No
What officially constitutes the plan?	All MTP maps, lists of projects, and the text of this document that applies either generally or specifically applies to the CAMPO area	Just the set of CTP maps that apply to the CAMPO area (no text, list of projects or written report)	All MTP maps, lists of projects, and the text of this document that applies either generally or specifically applies to the DCHC MPO area	Just the set of CTP maps that apply to the DCHC MPO area (no text, list of projects or written report)
What projects are included in the plan?	New and expanded facilities and services	Existing, new and expanded facilities and services	New and expanded facilities and services	Existing, new and expanded facilities and services
Is the plan included in this version of the document	Yes	No, but additional CTP roads are listed in Appendix 1	Yes	No

Figure 2.2.3 shows a map of the two MPO areas, outlined in purple, as well as two other important geographic areas to consider as one consults this plan:

1. The Triangle Air Quality Region, shown in white, which consists of all of Wake, Durham, Orange, Franklin, Granville, Harnett and Johnston Counties, plus four townships in Chatham County; and
2. The Triangle Regional Model (TRM) “modeled area,” outlined in red, which is the area covered by the travel forecasting model: the tool that estimates future travel on existing and planned roads and transit lines. Most of the data in this document is for travel in the modeled area, which fully covers both MPOs.

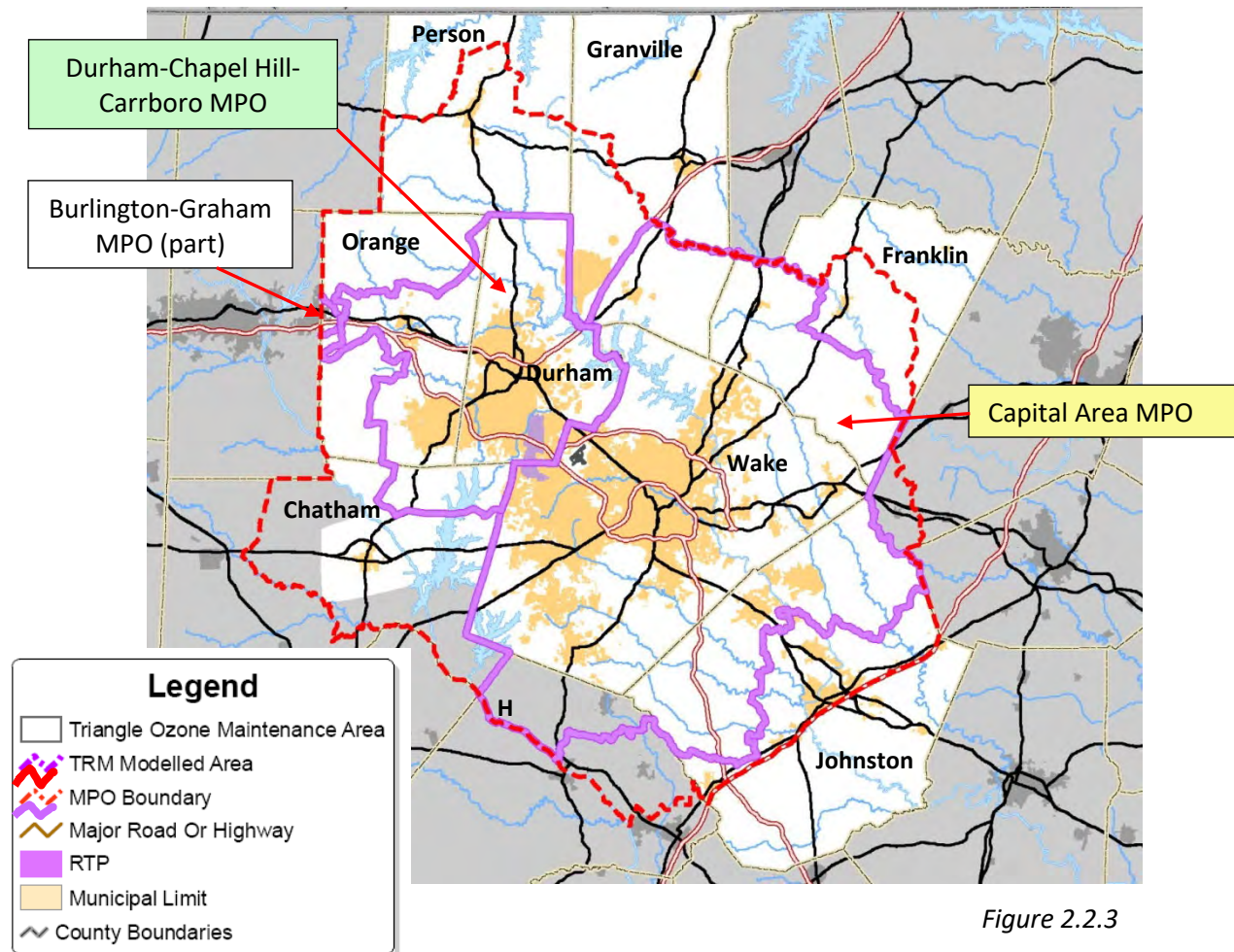


Figure 2.2.3

The core of the plan is the set of transportation investments described in Section 7, including:

- New, upgraded (or “modernized”) and expanded roads;
- Transit facilities and services, including bus and rail;
- Bicycle and pedestrian facilities, both independent projects and in concert with road projects;
- Aviation facilities;
- Rail facilities for inter-city passenger and freight;
- Transportation Demand Management: marketing and outreach efforts that increase the use of alternatives to driving alone;
- Technology-Based Transportation Services: the use of advanced technology to make transit and road investments more effective, including planning for autonomous and connected vehicles; and
- Transportation Systems Management: road projects that improve safety and traffic flow without adding new capacity.

2.3 How Will The Plan Be Used?

Metropolitan Transportation Plans are used for several important decisions, including:

Programming projects. Only projects that appear in a Metropolitan Transportation Plan may be included in the Transportation Improvement Program (TIP) for funding.

Preserving future rights-of-way for roads and transit facilities. The state and local governments use Metropolitan Transportation Plans to identify land that may need to be acquired and to ensure that new development does not preclude the eventual construction of planned roads and transit routes.

Designing local road networks. Metropolitan Transportation Plans chiefly address larger transportation facilities with regional impact. Communities can then use these “backbone” projects to plan the finer grain of local streets and local transit services that connect to these larger facilities.

Making land use decisions. Communities use regional transportation plans to ensure that land use decisions will match the investments designed to support future growth and development.

Making pricing decisions. Next to land use, pricing policies have the greatest influence on travel decisions. Decision-makers can use the plan as they consider transit fares, toll rates and parking prices.

Making private investments decisions. Businesses, homeowners and developers use these plans to understand how their interests may be affected by future transportation investments.

Identifying key plans and studies. State, regional and local agencies use this plan to outline more detailed plans and studies that will be undertaken leading to future projects and investments.

KEY POINTS FROM THIS SECTION:

- The Comprehensive Transportation Plan (CTP) shows everything we would eventually like to do. This document, the Metropolitan Transportation Plan (MTP), shows everything we think we can afford to do by the Year 2050. The Transportation Improvement Program (TIP) shows everything in the MTP that we plan to do until 2030 that involves state or federal funding.
- This single document includes the 2050 Metropolitan Transportation Plans for two planning areas: the Capital Area MPO and the Durham-Chapel Hill-Carrboro MPO. Each of these organizations retains independent authority within its area of jurisdiction.
- These plans will be used by local, state and federal agencies to allocate resources for specific road, transit, bicycle and pedestrian investments, to ensure that land is preserved for these investments and to match land use and development decisions with planned infrastructure investments.
- This document also includes lists of projects beyond the time frame of the 2050 MTP which are included in the two MPO CTPs, and links to more information about these projects.

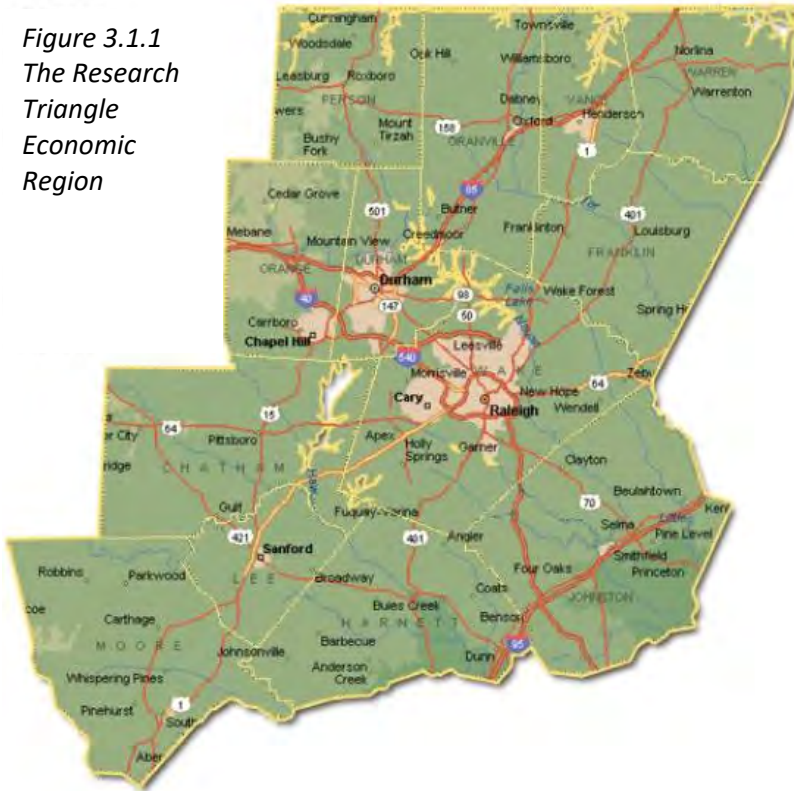
3. About Our Home

Transportation investments link people to the places where they work, learn, shop and play, and provide critical connections between businesses and their labor markets, suppliers and customers. So an important starting point for planning future investments is to understand the current state of our communities, how they relate to each other and to nearby regions, and how they might change over the next generation.

3.1 Our Region

The Research Triangle is a burgeoning sunbelt metropolitan region. Nine counties are defined by the Census Bureau as “metropolitan;” eight that are members of one or the other MPO plus Person County. More broadly, the economic region covers about 13 counties, stretching from the Virginia border on the North to Harnett, Lee and Moore counties in the south. In 2020, the eight counties in the Durham-Chapel Hill and Raleigh-Cary MSAs were home to 2.1 million people and the 13-county economic region was home to 2.4 million people.

Figure 3.1.1
The Research
Triangle
Economic
Region



The Triangle Economic Region	
<i>Metropolitan Counties</i>	
Chatham*	DCHC
Durham*	DCHC
Franklin**	CAMPO
Johnston**	CAMPO
Orange*	DCHC
Person*	
Wake**	CAMPO
Granville*	CAMPO
Harnett***	CAMPO
<i>Nonmetropolitan Counties</i>	
Lee	
Moore	
Vance	
Warren	

* Durham-Chapel Hill MSA
** Raleigh-Cary MSA
*** Fayetteville MSA

As the MPOs plan for transportation, it is important to consider not only mobility within their boundaries, but also the connections to the wider economic region and other regions in North Carolina. The Triangle is one of three large, complex metro regions – called “Combined Statistical Areas” -- along North Carolina’s Piedmont Crescent, together with the Triad and Charlotte. Each of these CSA regions has more than 1.7 million NC residents and, combined, account for 60% of the state’s population, 64% of its jobs and 69% of the value of all goods and services produced in North Carolina.

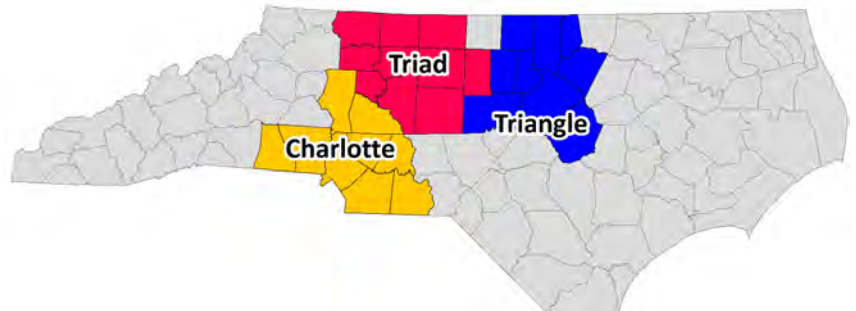
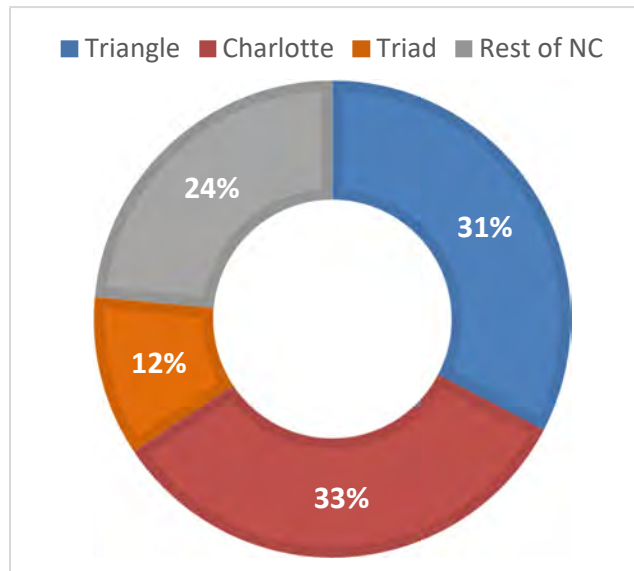


Figure 3.1.2 The “Big 3” Metro Regions
(Census Combined Statistical Areas)

More importantly, as we consider future transportation investments, these three regions are expected to account for more than three-quarters of North Carolina's growth over the next generation, with the Triangle and Charlotte regions each absorbing 1/3 of North Carolina's future growth.

This rapid population growth is part of a larger national trend, where over two-thirds of all population growth is expected to occur in a series of "megaregions," the fastest-growing of which are located in sunbelt areas like the Triangle. The Triangle, along with the Triad and Charlotte, are part of the Piedmont Atlantic Megaregion (PAM), stretching from Raleigh to Birmingham, AL, and which is forecast to grow from 17.6 million people in 2010 to over 31 million people by 2050.

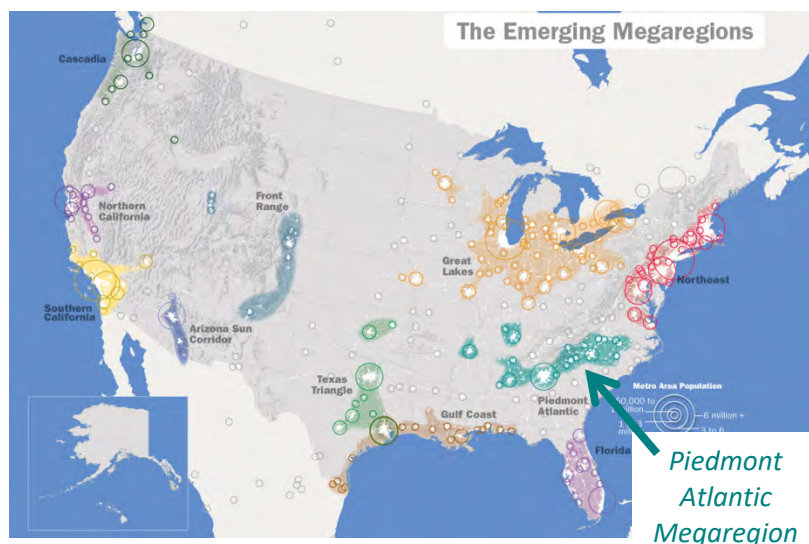
Figure 3.1.3 Where Future Population Will Locate in North Carolina (2020-2050)



3.2 Our People

As our region has grown and as we add 1.1 million new people over the span of this plan in the nine counties that make up the Raleigh-Durham-Cary CSA, the composition of our population is changing in ways that can influence the types of transportation investments we may choose to make:

- By 2030, 18% of Triangle residents will be 65 or older, up from 10% in 2010.
- In 2019, 40,000 households in the Triangle had no vehicle available, up from 37,000 in 2010.
- We are highly mobile: 9% of households lived in a different county, state, or country a year ago and another 8% changed houses within their home county.
- Almost 500,000 households – roughly 62% of the total – are households with only one or two people, and close to 56,000 people live in group quarters such as university dormitories.
- Surveys report that about a quarter to a third of households today would prefer to live in a compact, walkable neighborhood with a mix of activities, the kinds of neighborhoods that can be effectively served by transit. This would suggest that by the Year 2050, as many as one million Triangle residents would select a compact, walkable, mixed-use neighborhood if that option is available for them.



3.3 Our Economy

The cornerstones of the region’s economy are the major universities and their associated medical centers, the technology firms exemplified by companies in the Research Triangle Park and state government. Employment is concentrated in the three core Triangle Counties: Wake, Durham and Orange Counties have over 1 million full time and part time jobs of all types; the 9 counties in our Combined Statistical Area (CSA) have 1.3 million jobs, and the 13-county economic region has nearly 1.5 million jobs. Figure 3.3.1 shows the distribution of economic value by industry for our CSA, while Figure 3.3.2 shows the geographic distribution of jobs in the CSA.

The Triangle’s economy has proven resilient in the past, and the size of the region’s economy is substantial: the Triangle’s CSA accounted for 26% of the value of goods and services produced in North Carolina in 2020 and at more than \$150 billion in today’s dollars, surpassed the economic value produced by 17 states (Figure 3.3.3).

The concentration of jobs in several areas -- most notably the downtowns of Raleigh and Durham, the Research Triangle Park area and the university/medical center areas associated with Duke University, UNC-Chapel Hill, NC State University and North Carolina Central University -- results in significant commuting across the MPO boundary.

Figure 3.3.1 2020 Gross Product by Industry-Triangle CSA

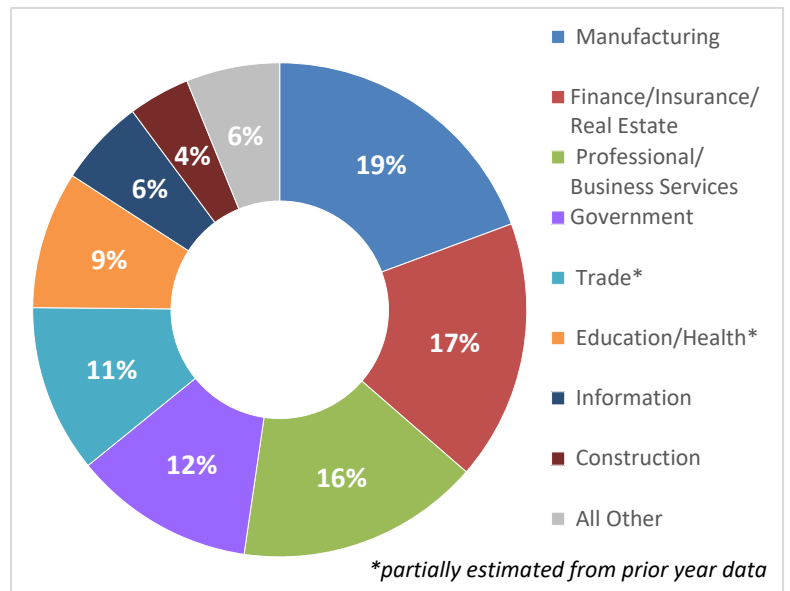


Figure 3.3.2 2020 Employment by County (BEA)

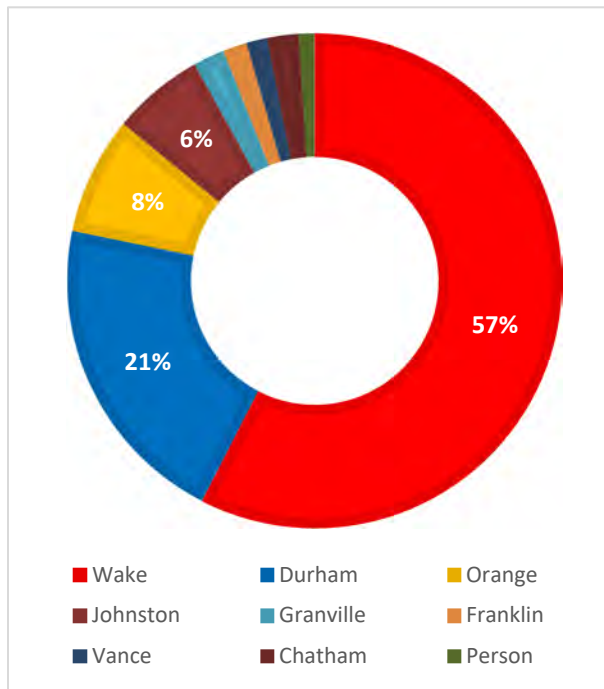


Figure 3.3.3 Gross Product: Value of Goods & Services Produced in the Triangle CSA (in \$2020 billions; BEA)

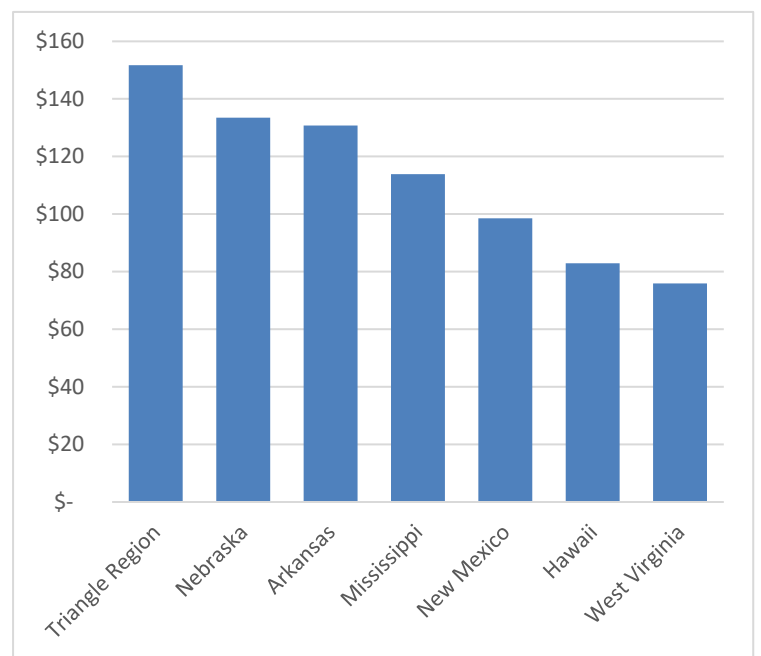


Figure 3.3.4 shows the growth in cross-county commuting for workers living in the Raleigh-Durham-Cary CSA while Figure 3.3.5 shows commuting flows in and out of Wake County, with the largest flow consisting of 116,000 people who commute each day between Wake County on the one hand and Durham and Orange Counties on the other.

Figure 3.3.4 Total Cross-County Commuting

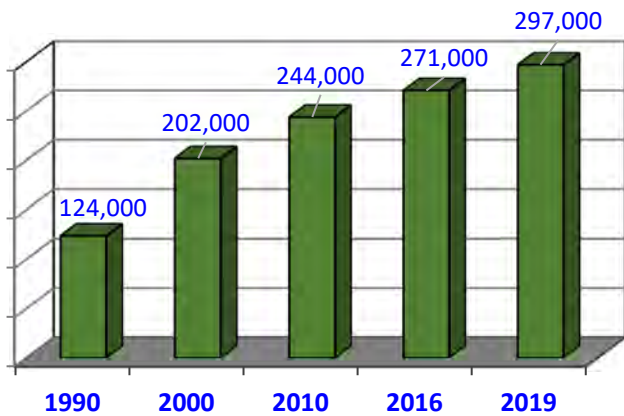
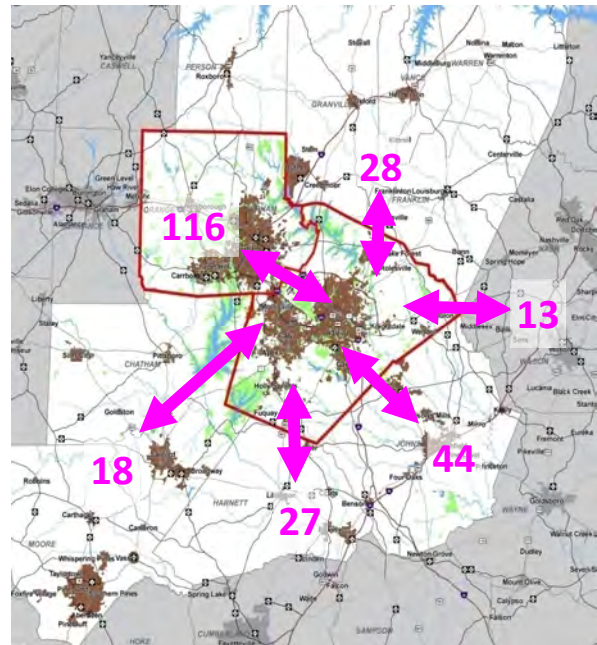


Figure 3.3.5 Daily Commuting Flows (in thousands of commuters)



In fact, our most heavily traveled roadway is the section of I-40 near the Wake County-Durham County line, the border between our two Metropolitan Transportation Planning Organizations. Auto and truck traffic continues to grow at this location, and forecasts are that the trend will continue.

Figure 3.3.6 I-40 Traffic Volume west of I-540

3.4 Our Environment

Among the many environmental concerns in our region, land use, air quality and greenhouse gas emissions are three that have critical connections to transportation investments. Land use is a particularly critical issue in a fast-growing region like the Triangle, since the pattern of future land use can have significant influence on the efficiency and effectiveness of different transportation investments, especially transit services. Much of the Triangle Region is characterized by low-density development with different types of land uses -- such as homes, offices and stores -- separated from one another, a pattern commonly referred to as "sprawl." According to one national study that examined measures of density, land use mix, road connectivity and "centeredness," both the Raleigh-Cary and Durham-Chapel Hill MSAs ranked in the bottom 30% of the most sprawling among the 220 regions studied. Similar studies examined the environmental and social impacts of sprawl, concluding that persons in the most sprawling areas add many more miles of travel each day to their schedule, suffer more traffic deaths, and tend to endure worse air quality.

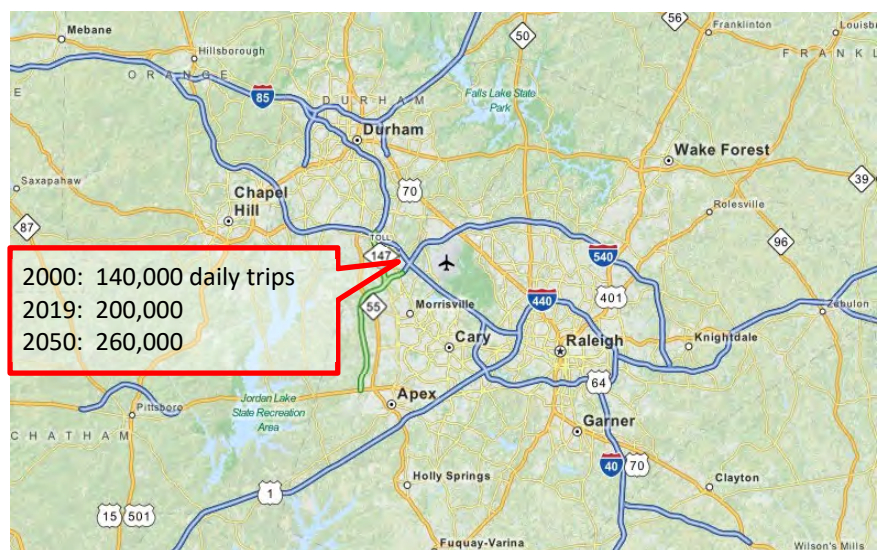
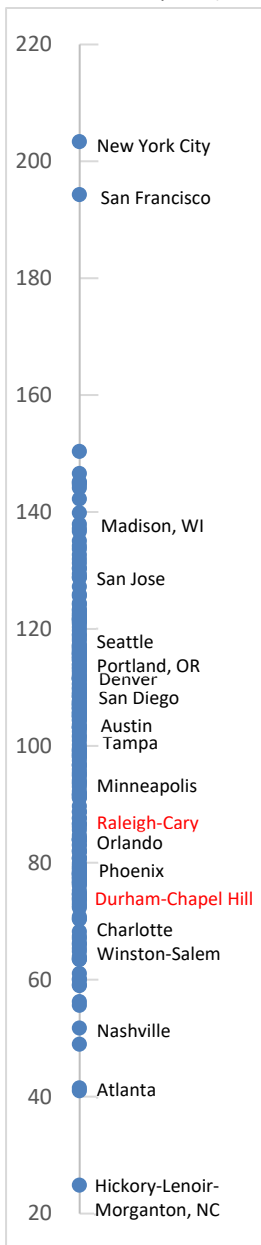


Figure 3.4.1 Sprawl Index (lower scores indicate more sprawl)



Air quality remains an important concern and is directly linked with the transportation system. Ozone is an irritant that has been shown to decrease lung function and trigger asthma attacks among the young, elderly, and adults who work or exercise outdoors.

Emissions from cars and trucks account for over one-half the emissions of nitrogen oxides (NOx) – the controlling pollutant in the formation of ground level ozone – in the Triangle Area. Given the serious health effects of ozone, controlling ozone emissions is an important goal of the MPO’s transportation investments.

The Environmental Protection Agency (EPA) has established standards for common air pollutants. A geographic area that meets or better the standard for a pollutant is called an “attainment area.” An area that does not meet a standard is called a “non-attainment area.” Standards are set for a number of pollutants, including ozone, particulate matter and carbon monoxide. The Triangle area is currently in attainment, has been in non-attainment in previous decades.

Attainment status can affect a community’s economic development efforts, and federal funding for transportation projects can be affected in non-attainment areas. New or expanded industries that emit air pollutants face stricter and more costly technology standards in non-attainment areas. For these reasons, the two MPOs continue to examine air quality impacts closely, and we are required to demonstrate that our transportation plans and programs comply with federal air quality conformity processes.

In addition to conventional air pollutants, greenhouse gas emissions from vehicles and their contribution to climate change are a growing concern. Although climate change is a global issue, its impacts and the activities that cause climate change happen at the local level. These activities are influenced by the decisions of local and state officials: land use development and pricing decisions that affect how and how much we travel, roadway and transit and active transportation investments that set the travel choices we have, and vehicle and refueling infrastructure expenditures that determine how polluting are travel will be.

Although the focus of a Metropolitan Transportation Plan is on the specific transportation facilities and services that are fiscally reasonable and can serve changing travel markets, the *Connect2050* plan links these investments to broader energy use and greenhouse gas issues, principally in three ways: (i) on-going efforts to designate and implement alternative fueling infrastructure along key regional corridors, (ii) support for continued conversion of transit vehicle fleets to the use of alternative fuels, and (iii) closer alignment

of work among MPOs and NCDOT and regional efforts like the Department of Energy (DOE)-supported Triangle Clean Cities Coalition.

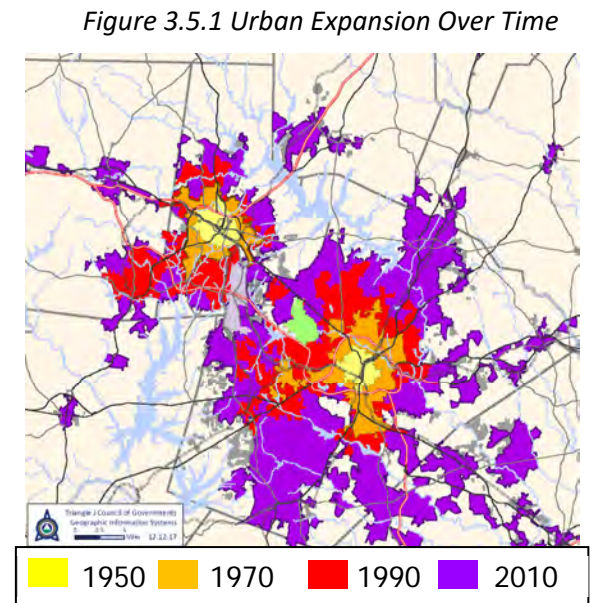
The recent designations of the I-85, I-95 and I-40 corridors in the region by the National Electric Highway Coalition for the installation of fast charging stations by the end of 2023 is one example of transportation investments designed to address greenhouse gas emissions.



3.5 Our Future

The part of the Research Triangle Region covered by our forecast is anticipated to add 1.2 million people over the span of this plan, more than the current *combined* population of the seven largest cities and towns within our MPO boundaries: Raleigh, Durham, Cary, Chapel Hill, Apex, Wake Forest and Holly Springs.

Forecasts suggest that much of this future growth will continue to extend outwards from the urbanized area as it was most recently defined following the 2010 Census. Figure 3.5.1 shows how the urbanized areas around Durham and Raleigh have grown over the years. The Census defines urbanized areas as areas with more than 500 residents per square mile and strong commuting ties to a central city with more than 50,000 people.



Our future involves more than just growth; we also face rapidly evolving and technologies that could significantly shape the nature of travel. The advent of autonomous and connected vehicles could influence the designs of our streets, our need for parking, the relationship between our land uses and transportation network, and car ownership, all in as-yet-unclear ways.

3.6 Our Challenge

These characteristics of our home -- a rapidly growing population and economy, continuing risks to air and water quality, a propensity to disperse growth outwards, and disruptive technologies, create transportation challenges. More commuters are traveling longer distances, and the single-occupant automobile continues to dominate how we travel. And although we tend to focus on commuter travel, travel for such purposes as school, business, shopping, and social engagements constitute increasing shares of travel. These conditions have produced increasing demands on our transportation network, which in terms of “vehicle miles traveled” and other demand measures is experiencing a growth rate that is greater than that of our population. The consequences have been rising traffic congestion, increasing transportation infrastructure costs, and further pressure on our air, water, open space, and other environmental assets. Our region’s quality of life, a key attraction for professional and skilled workers and business investment to our region, may ultimately become threatened by the consequences of our patterns of growth and inadequate transportation infrastructure.

These consequences create many challenges for us, for example:

- How do we find the resources to invest in our transportation infrastructure, and to what extent does this demand for resources compete with other needs such as schools, water and waste treatment facilities, affordable housing, protection of green space and social services?
- As we expand our roadway network to meet growing travel demand, how can we minimize the negative impacts on our travel times, air and water quality, and open spaces?
- How do we design a transportation network that serves 1) the needs of different types of places, from downtowns to small towns to suburban areas to rural communities, 2) a range of socioeconomic groups and 3) our economic and environmental values?

Figure 3.6.1 Major Highway Projects Added 1990-2020

One of the largest challenges facing our region is that despite major investments in road projects, congestion levels are increasing due to extensive population growth, increased travel within the region and large amounts of “pass-through” traffic on our interstate highways.

Figure 3.6.1 shows \$2.8 billion in major road projects that were completed in the past 30 years or are nearing completion. **Red** lines are highways with interchanges, while **purple** lines are streets with intersections.

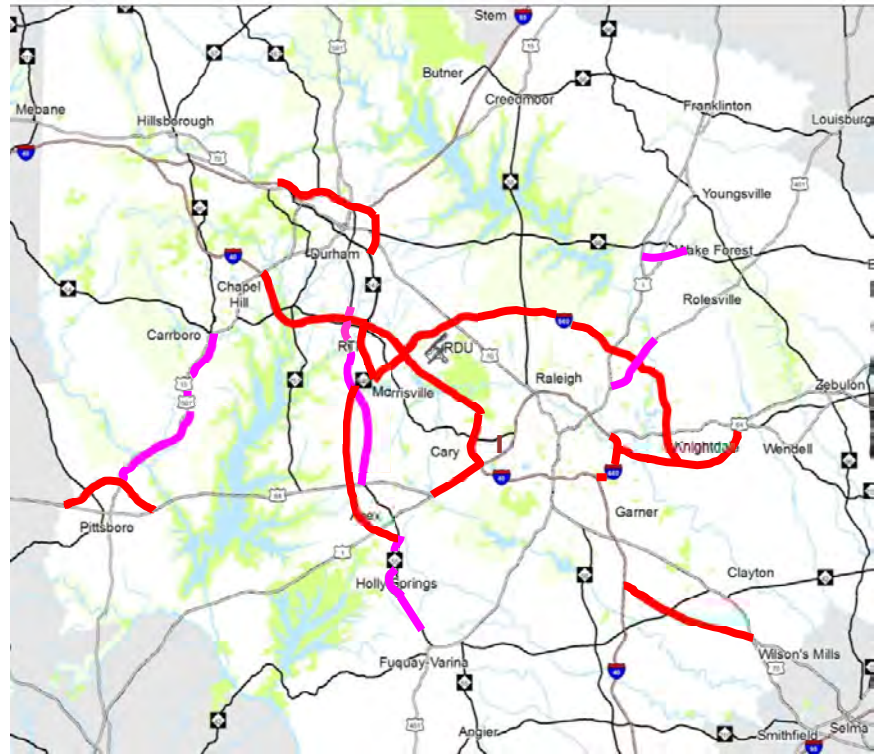
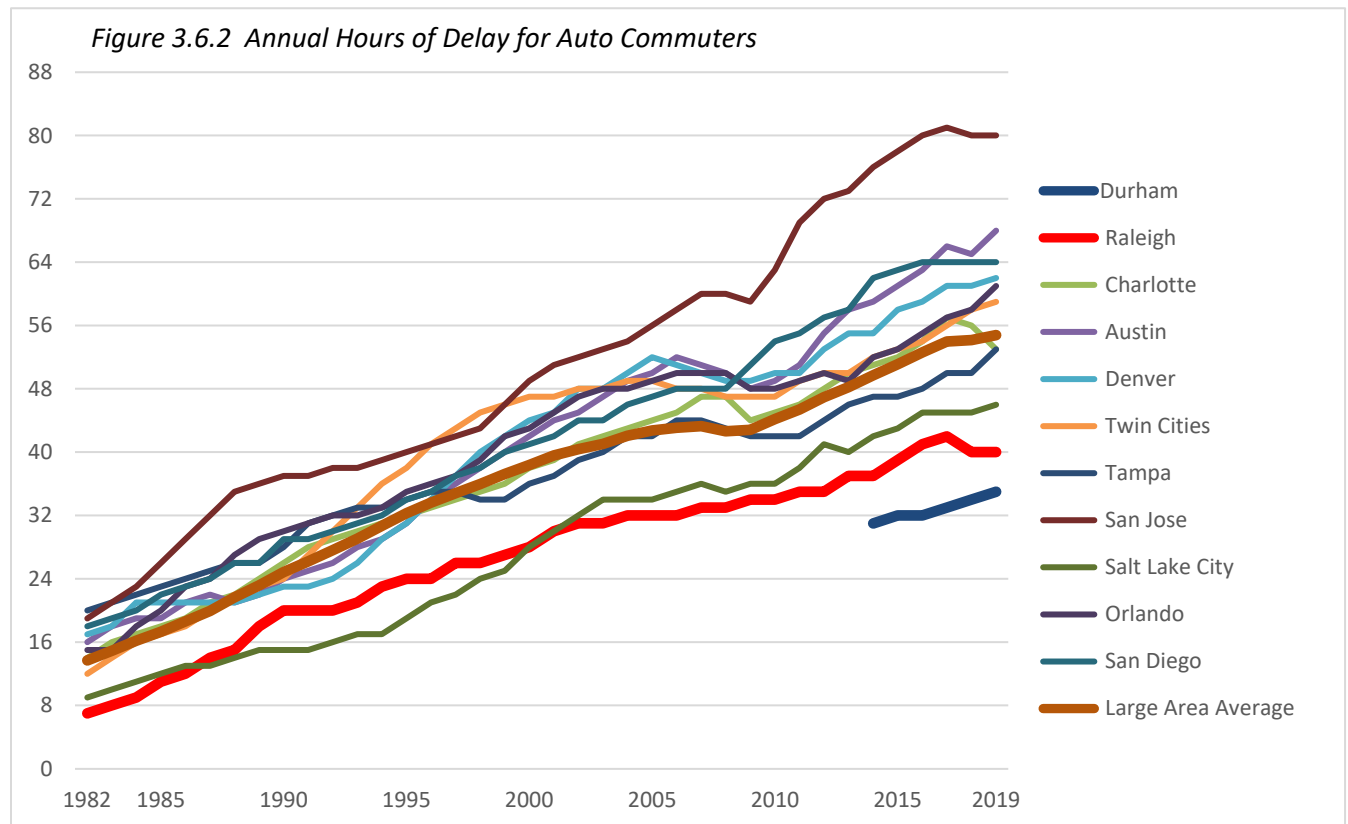


Figure 3.6.2 shows how auto commuters have experienced delays in the Triangle, in many of the regions with which we compete and for all large regions in the US. The graph shows that although the Triangle has comparatively less delay than peer regions, delay consistently rises over time and that economically successful, fast-growing regions have not been able to “build their way out of congestion.” The graph shows that in the early 1980s, a typical Raleigh auto commuter spent one full workday per year (8 hours) delayed by congestion, and that by 2019 that had risen to one full week (40 hours). The typical San Jose auto commuter spent two work weeks delayed by congestion in 2019.



We are undertaking the update of our long-range transportation plan to help ensure that we are able to meet the significant challenges we face. We must plan now for the roadways, transit services, and bicycle and pedestrian facilities that will be needed in 2050, if we expect to meet the travel demands of the place we will become. Our communities have opportunities to create and maintain a strong, growing economy, high quality of life, affordable housing market, culturally diverse populace, and sustainable environment. Our ability to anticipate and meet the challenges in planning, designing, and building an efficient and effective transportation network is a key element for ensuring that we can make the most of these opportunities.

KEY POINTS FROM THIS SECTION

- The MPO areas covered by this plan are part of a larger economic region. Transportation investments should consider the mobility needs of this larger region and links to the other large metro regions of North Carolina and throughout the Southeast.
- The Triangle Region is expected to accommodate a phenomenal amount of future growth, part of a larger national trend of growth in sunbelt “megaregions;” we need to plan for the region we will become, not just the region we are today.
- Like many regions that had the majority of their growth after World War II, the Triangle is a sprawling region and projections are for continued outward growth and infill development in selected locations, most notably in the central parts of Raleigh and Durham and the area between them. A key challenge for our transportation plans is to match our vision for how our communities should grow with the transportation investments to support this growth.
- No region has been able to “build its way” out of congestion; an important challenge for our transportation plans is to provide travel choices that allow people to avoid congestion or minimize the time they spend stuck in it. Emerging, potentially disruptive technologies associated with autonomous and connected vehicles – and the changing nature of work post-COVID – may significantly affect travel, but the nature and scale of these impacts remains highly uncertain, and may affect travel markets only in the long-term stages of this plan.
- Our population is changing. The population is aging, more households will be composed of single-person and two-person households without children, the number of households without cars is increasing, and more people are interested in living in more compact neighborhoods with a mix of activities. Our plans must provide mobility choices for our changing needs.
- Our MPOs are tied together by very strong travel patterns between them; our largest commute pattern and heaviest travel volumes occur at the intersection of the MPO boundaries, and the commute interchange between Durham and Wake Counties is by far the largest of any two counties in North Carolina. Our MPO plans should recognize the mobility needs of residents and businesses that transcend our MPO and county borders.

4. Our Vision And How We Will Achieve It

4.1 The Values Underlying Our Vision: Equitable Engagement and Investment

The *Connect2050* Plan began from a different foundation than previous metropolitan transportation plans. Instead of relying on a conventional perspective that prioritizes faster car travel and less congested roads, this plan used a lens that also focused on the mobility and accessibility concerns of people who are less likely to own cars and have a greater propensity to use transit, walking and bicycling to meet their travel needs.

Traditional road congestion and vehicle speed concerns are still addressed, but they are balanced by concerns for safer streets, user-focused transit services, more connected bicycle and pedestrian networks, and greater access to job hubs from traditionally under-represented neighborhoods – places that have historically borne an outsized burden of the impacts of highway projects. Environmental justice communities -- and the REINVEST Neighborhoods that represent the most significant combinations of individual environmental justice communities -- served as important determinants for the equity of the investments this plan includes.

The planning process was different, too. Although traditional public comment periods and public hearings were still held, new methods designed for more equitable engagement were undertaken: collaborations with trusted community-based partners, attending community events, scheduling “pop-up” engagement activities where people congregate, and extracting engagement results from related planning efforts to minimize “engagement fatigue.” Much of this work was affected by the limitations inherent in planning during a pandemic, but the results are that traditionally under-represented voices were prominent in the development of this plan.

4.2 Our Vision

The region has a common vision of what it wants its transportation system to be:

a seamlessly integrated set of transportation services that provide travel choices to support economic development and that:

- *are compatible with the character and development of our communities,*
- *are sensitive to the environment,*
- *improve quality of life, and*
- *are safe and accessible for all.*

The *Connect2050 Metropolitan Transportation Plan* commits our region to transportation services and patterns of development that contribute to a distinctive place where people can successfully pursue their daily activities.

4.3 Goals and Objectives

The two MPOs worked together to develop a consistent set of goals and objectives designed to achieve the region’s vision. Where the language of the goals and objectives differ, DCHC MPO ones are highlighted in green and CAMPO ones in yellow. Goals are short statements of intent; objectives state the priorities within each goal on which the MPOs intend to focus. This plan is based on eight goals and their supporting objectives:

1. Connect People and Places. Objectives:

- Connect people to jobs, education and other important destinations using all modes.
- Ensure transportation needs are met for all populations, especially the aging and youth, economically disadvantaged, mobility impaired, and minorities.
- Increase mobility options for all communities – particularly communities of concern.
- Achieve zero disparity of access to jobs, education, and other important destinations by race, income or other marginalized groups.

2. Promote and Expand Multimodal and Affordable Travel Choices. Ensure That All People Have Access to Multimodal and Affordable Transportation Choices. Objectives:
 - Enhance transit services, amenities and facilities.
 - Improve bicycle and pedestrian facilities.
 - Increase utilization of affordable non-auto travel modes.
3. Manage Congestion and System Reliability. Objectives:
 - Allow people and goods to move with minimal congestion and time delay, and with greater predictability. Allow people and goods to move with greater reliability.
 - Promote Travel Demand Management (TDM), such as carpooling, vanpooling and park-and-ride.
 - Enhance Intelligent Transportation Systems (ITS), such as ramp metering, dynamic signal phasing and vehicle detection systems.
 - Increase efficiency of the existing transportation system through strategies such as Transportation Demand Management (TDM) and Intelligent Transportation Systems (ITS).
4. Stimulate Inclusive Economic Vitality and Opportunity. Objectives:
 - Improve freight movement.
 - Link land use and transportation.
 - Improve project delivery for all modes.
 - Target funding to the most cost-effective solutions. Invest in cost-effective solutions to improve travel reliability and safety.
 - Ensure equitable distribution of transportation investments especially to communities of concern.
5. Ensure Equity and Participation. Objectives:
 - Ensure that transportation investments do not create a disproportionate burden for any community.
 - Enhance public participation among all communities. Ensure equitable public participation among communities of concern.
6. Improve Infrastructure Condition and Resilience. Objectives:
 - Increase the proportion of highways and highway assets rated in 'Good' condition.
 - Maintain transit vehicles, facilities and amenities in the best operating condition.
 - Improve the condition of bicycle and pedestrian facilities and amenities.
 - Promote resilience planning and practices.
 - Support autonomous, connected and electric vehicles.
7. Protect the Human and Natural Environment and Minimize Climate Change. Objectives:
 - Reduce negative impacts on the natural and cultural environments.
 - Reduce mobile source emissions, greenhouse gas emissions and energy consumption. Reduce transportation sector emissions.
 - Achieve net zero carbon emissions.
 - Connect transportation and land use.
8. Promote Safety, Health and Well-Being. Objectives:
 - Increase the safety of travelers and residents. Achieve zero deaths and serious injuries on our transportation system.
 - Promote public health through transport choices. Provide all residents with active transport choices.

4.4 Performance Measures of Effectiveness and Target Values

As part of the process for creating the Goals & Objectives, the MPOs developed a set of common Performance Measures related to the objectives to enable tracking progress over time. Measures fall into one of three categories: i) those that can be determined quantitatively using analytic methods and data already available, ii) those that can be determined quantitatively, but will require new analysis methods and/or additional data, or iii) those that would need to use more qualitative methods, such as surveys or focus groups, to judge progress.

Performance measures that are currently quantifiable were determined for three comparative conditions:

- 2020 – This is the base condition. It is the 2020 population and employment using the 2020 transportation network (e.g., highways and transit service).
- 2050 E+C – This is the “Existing plus Committed” (E+C) network which includes the existing and under-construction transportation network and the 2050 population and employment.
- 2050 – This is the 2050 MTP transportation network plan as adopted by the two MPOs using the 2050 population and employment.

Although the measures are common to both MPOs, each MPO may choose different target values they wish to achieve for each measure based on conditions and priorities specific to each MPO. The two MPOs will continue to develop or refine specific target values and to use these values in prioritizing the implementation of projects.

The performance measures have been crafted to align with new and developing performance requirements under the Federal FAST Act, the nation's transportation law. Both MPOs have approved FAST Act compliant performance measures and targets for transit asset state-of-good-repair, transit safety, roadway and bicycle and pedestrian safety, infrastructure condition, and travel reliability.

The following measures are used for this plan; some of the measures support more than one objective. Values at the time of adoption of this MTP are included in Appendix 13. As values are updated or new ones are added, they can be found on each MPO's web site, and are incorporated by reference in the 2050 MTP.

<i>Performance Measure</i>	<i>FAST Act Target</i>
% of work and non-work trips by auto that take less than 30 minutes by MPO, low-income, minority and zero-car households	
% of work and non-work trips by transit that take less than 40 minutes by MPO, low-income, minority and zero-car households	
% of planned investment in existing roadways (versus new alignment).	
Percentage of transit and bicycle/pedestrian mode shares in "travel choice neighborhoods:" areas accessible to light rail, bus rapid transit, commuter rail and frequent bus service (½ mile to stations, ¼ mile to frequent bus service)	
Amount and % of legally binding affordable housing units located with ½ mile of transit infrastructure stations or frequent bus service	
% of Environmental Justice population and total population within ½ mile of bus service, 1 mile of rail service, ½ mile of bike facilities or ¼ mile of sidewalk	
Per capita transit service hours	
Total transit boardings per capita	
MPO total programming per capita on bicycle and pedestrian facilities	
% of jurisdictions with ordinance requirements for sidewalk construction or in-lieu fees	
Daily minutes of delay per capita	
Interstate Level of Travel Time Reliability	2-year and 4-year
Non-Interstate NHS Level of Travel Time Reliability	2-year and 4-year

<i>Performance Measure</i>	<i>FAST Act Target</i>
% of peak-hour travelers driving alone	
Total individuals provided TDM program and activity support	
# of employees working for Best Workplace for Commuters employers	
Vehicle miles of travel (VMT) per capita and total	
Amount of ITS investments	
% of lane miles with NCDOT unacceptable pavement condition rating	
Number and % of structurally deficient bridges	
% of reported potholes repaired within two days by NCDOT	
Interstate Pavement Condition (Good)	2-year and 4-year
Interstate Pavement Condition (Poor)	2-year and 4-year
Non-Interstate NHS Pavement Condition (Good)	2-year and 4-year
Non-Interstate NHS Pavement Condition (Poor)	2-year and 4-year
NHS Bridge Condition (Good)	2-year and 4-year
NHS Bridge Condition (Poor)	2-year and 4-year
% of transit equipment meeting or exceeding useful life benchmark	✓
% of transit vehicles by asset class meeting or exceeding useful life benchmark	✓
% of transit facilities with condition rating below 3.0 on Federal Transit Administration Transit Economic Requirements Model scale	✓
% of cycling facilities by type (bike lanes, shared use paths, etc.) rated in good condition	
# of public participants in each process by type (in-person, email, survey, social media)	
Environmental Justice requirements met by 2050 MTP	
# of non-motorized fatalities and serious injuries	✓
# of total fatalities	✓
Total fatalities rate (per 100 million vehicle miles traveled)	✓
# of total serious injuries	✓
Total serious injuries rate (per 100 million vehicle miles traveled)	✓
Fixed-route and non fixed-route fatality total and rate	✓
Fixed-route and non fixed-route injury total and rate	✓
Fixed-route and non fixed-route safety events total and rate	✓
Fixed-route and non fixed-route distance between mechanical failures	✓
% of adults who are physically active	
Minutes of truck delay per trip	
Freight buffer time index	
Interstate Truck Travel Time Reliability	2-year and 4-year
Average payback period of investments by mode	
% of TIP projects completed on-time (let to construction) by mode	
% of MTP projects built in the time period in which they first appeared	
% of TIP projects built in the time period in which they first appeared	
Emissions per capita from on-road mobile sources (ozone, carbon monoxide, particulate matter, greenhouse gases)	
Energy consumption per capita from transportation sources	

Section 6.5 of this plan includes the results of analyzing the performance measures. This report includes a detailed analysis of Environmental Justice issues in section 9.3 – *Environmental Justice (EJ)*, and provides a comparison of the location of 2050 MTP projects and EJ populations in Appendix 12 – *Environmental Justice Maps*.

KEY POINTS FROM THIS SECTION:

- The *Connect2050* Plan was built on a new foundation of equitable engagement and investment.
- Our MPOs have a common vision for what our region’s transportation system should achieve.
- Both MPOs adopted consistent goals and objectives to accomplish this vision, and a common set of performance measures to track progress towards the goals and objectives.
- Each MPO may choose different target values they wish to achieve, based on the conditions and priorities of the different MPOs.
- Performance measures are designed to align with Federal requirements under the FAST Act, the federal transportation law; and targets for safety and transit asset state of good repair are included as part of this version of the 2050 Metropolitan Transportation Plan

5. How We Developed Our Plan

This section describes the organizations and technical tools used to develop the Plan, how the public was involved in the Plan's development and review, and recent and on-going studies and plans that relate to the 2050 MTP.

5.1 Who is Responsible for the Plan?

Metropolitan Planning Organizations (MPOs) are the regional organizations responsible for transportation planning for urban areas, and are charged with developing their individual Plans. The Research Triangle Region has two MPOs: The Durham-Chapel Hill-Carrboro (DCHC) MPO and the Capital Area MPO (CAMPO).

The CAMPO planning area covers all of Wake County and portions of Franklin, Granville, Harnett and Johnston Counties, along with 19 municipalities in these five counties. The DCHC planning area covers all of Durham County, a portion of Orange County including the towns of Chapel Hill, Carrboro and Hillsborough, and northeast Chatham County. *Figure 2.2.3* in Chapter 2 shows a map of the MPO boundaries. The DCHC MPO and CAMPO are also two of the eleven urbanized areas in North Carolina designated as Transportation Management Areas (TMAs) by the principal federal transportation legislation called *Fixing America's Surface Transportation (FAST) Act*. TMAs are urbanized areas with a population over 200,000 and have additional responsibilities such as the development of a congestion management process and direct allocation of certain federal revenues. Much of the MPO organizational structure and processes are designed to address state and federal legislation related to transportation. Each MPO is comprised of two committees:

Policy Board (PB) – The Policy Board, termed the Executive Board in CAMPO, coordinates and makes decisions on transportation planning issues. The Board is comprised of elected and appointed officials from each county, municipality and major transit provider within each MPO, and from the NCDOT.

For the Capital Area MPO, these officials are from the counties of Franklin, Granville, Harnett, Johnson and Wake, the municipalities of Angier, Apex, Archer Lodge, Bunn, Cary, Clayton, Creedmoor, Franklinton, Fuquay-Varina, Garner, Holly Springs, Knightdale, Morrisville, Raleigh, Roseville, Wake Forest, Wendell, Youngsville and Zebulon, GoTriangle and the North Carolina Department of Transportation. The Board also has advisory (non-voting) members from the NC Turnpike Authority and the Federal Highway Administration.

For the DCHC MPO, these officials are from the City of Durham, the Town of Chapel Hill, the Town of Carrboro, the Town of Hillsborough, Durham County, Orange County, Chatham County, GoTriangle and the North Carolina Department of Transportation. The Board also has advisory (non-voting) members from the Federal Highway Administration.

Technical [Coordinating] Committee (TC or TCC) – The TC/TCC is composed of staff members from our local governments, GoTriangle (formerly Triangle Transit), Research Triangle Park, Triangle J Council of Governments, Raleigh-Durham Airport Authority, the N.C. Turnpike Authority and the largest universities in the applicable MPO: North Carolina Central University, University of North Carolina and Duke University in the DCHC MPO, and North Carolina State University in CAMPO. The TC/TCC staff, who provide technical recommendations to the Policy Board, are commonly transportation, land use, community, and facility planners and engineers representing their organizations on the committee. The final key organizational element of the MPO is the Lead Planning Agency (LPA). The LPA is responsible for the administration and oversight of the planning, project implementation, grant funding, and other MPO related activities. In the DCHC MPO, the LPA staff work for the City of Durham's Transportation Department. In CAMPO, the staff are employees of the City of Raleigh, but only work on MPO tasks.

5.2 Stakeholder & Public Involvement Process

Extensive input and coordination activities were used to develop the 2050 MTP. These activities included both regional coordination efforts between the two MPOs and involvement of the public and local elected officials by each MPO.

Regional Coordination

Several regional coordination activities were undertaken to ensure that the two MPO plans would be integrated and mutually supportive. The key coordination activities are described throughout the various sections of this report in detail. The following list provides a summary of key coordinated activities used to develop the Plan:

- County Transit Plans -- The DCHC MPO and their respective counties are updating the Durham County Transit Plan and the Orange County Transit Plan during 2021-22, and transit projects in this MTP reflect the latest discussions for these plans. The Capital Area MPO and Wake County updated the Wake County Transit Plan in 2020. These plans designate the general design for improved bus, rail and bus rapid transit in their respective counties, and the funding sources to finance these improvements.
- Connect 2050 CommunityViz -- The MPOs fund, guide and use the same Socioeconomic Data forecast process and model. This process convened local planners, developers and other professionals who impact the development process to create the Community Visualization land use model (version 3) and produce population and employment projections.
- Alternatives – The MPOs jointly defined and evaluated the various land use and highway, bus transit and rail transit alternatives, and selected the same land use alternative for use in the final Plan.
- Joint Policy Board Meeting –The MPOs conducted joint MPO Policy Board meetings on December 1, 2020 and September 29, 2021 to advance 2050 MTP coordination at the policy board level.
- Financial Plan – The MPOs used the same financial methodologies and cost and revenue basis for highways, bus transit, rail transit, and all aspects of the plan.
- Triangle Regional Model (TRM) – The MPOs used the same principal planning tool for the 2050 MTP, the Triangle Regional Model (TRM) – the region’s travel demand model), version 6.
- Goals, Objectives and Performance Measures – The two MPOs developed and used a consistent set of Goals, Objectives and Performance Measures to guide the selection of a land use scenario and of projects in the 2050 MTP process.

MPO Public Involvement Policy

Meaningful, equitable engagement is front and center for both MPOs. Both MPOs have a formal public involvement policy that governs the public input process for not only the MTP process but for all major activities such as the Transportation Improvement Program (TIP). The policies prescribe: the methods for notifying the public; the type of input activities such as workshops and hearings; the minimum comment period; the use of visual techniques; and direct outreach to key groups such as low-income, minority and limited-English proficiency households, and people with disabilities. The public involvement policy for each MPO is available at:

CAMPO -- www.campo-nc.us

DCHC MPO -- www.dchcmpo.org

Public involvement exceeded the MPOs’ public involvement policies for developing a transportation plan. The 2050 MTP included a comprehensive process to use citizen and stakeholder input for providing a critical evaluation of the outcomes for each stage of developing the plan. Citizens, public officials and board and commission members took advantage of a variety of planning and public input activities to voice their views and concerns.

Building from the Local to the Regional

The MTP development process is unique because, as a starting point to the overall update effort, it is made up of the endorsed recommendations and adopted plans of the MPO’s partner municipalities and agencies. From comprehensive plans, to county transit plans, to special area studies conducted by the MPO, each planning process typically has a public engagement component that helps shape its end result. Public engagement on this micro level is often more appealing – seeming more relevant, having a greater sense of impact and timeliness - for members of the community when compared to a regional, long-range plan like the MTP. Ultimately, that engagement on the subregional level impacts what also gets included on the regional level - in the 2050 MTP. Below is a list of CAMPO studies or planning efforts which involved significant public engagement *and* occurred since the 2045 MTP was adopted. The local and MPO plans are identified in section “5.4 -- Related Plans and Studies” of this report.

MTP Public Engagement Process

Building on the foundation of data and interpretation of goals and objectives by the MPO’s staff and Policy Boards, public engagement adds a critical piece to the MTP development process. Public engagement builds the trust and credibility of the MTP by engaging a variety of stakeholders and residents who provide important information and input. The 2050 MTP development process included a comprehensive public engagement strategy utilizing input from residents, municipal and agency partners, key community stakeholders and interest groups to provide critical evaluation of the products at each stage in the Plan’s development.

The 2050 MTP development process occurred during the height of the COVID-19 pandemic and related prohibitions on community meetings or other in-person activities. Public engagement plans were adjusted significantly to provide a more robust set of engagement activities online through MPO websites, electronic communications, and virtual interactive activities, and to ensure outreach occurred to populations that may not have internet access. Ultimately, over the 18 month development process engagement activities included a variety of methods from written materials to in-person engagement, virtual engagement through websites, videos, online public info sessions, as well as paid advertisements via digital, social, and print media. This process both participation policies.

Vision Goals & Objectives

The highest level of engagement occurred in the summer of 2020 and focused on the development of MTP goals and objectives.

Key activities included an online and print survey requesting feedback on the draft Goals. Based on survey feedback (including hundreds of qualitative comments), the goals were updated with additional emphasis on:

- Promoting and Expanding Multimodal & Affordable Choices,
- Connecting People and Places,
- Impacts to the Human and Natural Environment and Minimizing Climate Change, and
- Ensuring Equity and Participation.

Vision & Goals	
Activity	Performance #
Survey Participants	2,169
Survey comments	400+
Email Comments Received	2
Detailed Website	
Communications Toolkit for Partners	
Paid Digital and Print Media Ads	



Alternatives Analysis

Working with a variety of partners and based on the first phase of engagement, as well as incorporating engagement results from other CAMPO studies, three different transportation system alternative future scenarios were developed and analyzed – comparing the system alternatives to one another and to performance measures. During the Alternatives Analysis engagement, in the summer of 2021, the goal was for the community to help identify the most important elements of the modeled improvements that should be emphasized in the final approved plan. Again, public feedback heavily asserted the need to focus on providing transportation choices, increasing access to transit especially among low-income and zero car households, reducing reliance on vehicle miles travelled and single occupancy vehicle usage, increasing facilities for bicycles and pedestrians, as well as the need for additional improvements to roadways to reduce congestion. The online survey also attempted to gauge community members' willingness to support additional future funding for transit, bike/ped, and roadway improvements. While the majority unanimously supported additional funding for all modes, the greatest support for additional funding was seen for transit funding increases at the state and federal levels, and bike/ped funding increases at the local level.

Alternatives Analysis	
Activity	Performance #
Two online public info sessions	20
Survey Participants	763
Survey Comments	1,000+
Email Comments	9
Joint Meeting Public Comment Speakers	13
Detailed website; Interactive maps by scenario Communications Toolkit for Partners Paid Digital and Print Media Ads	

Draft 2050 MTP

Following review of the public feedback from the Alternatives Analysis, and additional discussions with the Technical Coordinating Committee (TCC) and Executive Board, a Draft 2050 MTP was released for public review from October 28th to December 8th. Each MPO held a public hearing in November of 2021. A spreadsheet of public comments received was posted and maintained with regular updates on CAMPO's 2050 MTP Development Process webpage. A list of comments received can be found in the Appendices. Special outreach was also made during this phase to environmental, cultural and other resource agencies, with local chambers of commerce and convention and visitors bureaus, and with providers of Transportation Demand Management services.



Adopted Plan – February 2022

One of the commitments in a consultative process is to circle back with public participants and inform them of any final decisions or outcomes, and how their input influenced those outcomes. Upon adoption of the 2050 MTP document in early 2022, both MPOs sent a media release, email update, website update, and social media posts promoting the adoption as well as posted on the websites a spreadsheet of comments received including a staff response regarding the disposition. Appendix 8 contains additional detail on comments received during the preparation, refinement, and adoption of this 2050 Plan.

Figure 5.2.1, Summary of Public Involvement Activities, demonstrates the breadth and depth of this public involvement effort by listing the many activities that occurred in each stage of the MTP's development for both CAMPO and DCHC MPO.

There are some notable details for the activities listed in Figure 5.2.1. For example, the media effort was especially intensive and usually included:

- Draft documents and detailed supporting data available on the MPOs' websites;
- Notices in newspapers for online information sessions, hearings and other public involvement activities;

- Email lists to notify members of the community who have participated or indicated an interest in related planning activities. This included information about online surveys, public meetings, and input events as well as public hearings.
- Information was shared using social media platforms such as Facebook, Instagram, and Twitter, including multiple targeted social media advertising campaigns that covered the entire Triangle region.
- Online focus groups to understand the transportation needs of minority, lower-income, youth, senior and disabled residents.
- Various formats for residents to provide public comments, including email, paper feedback forms, online information sessions, flyers at community events, hearings and presentations at elected officials' meetings.
- Together, the two MPOs deployed two unique online surveys during the overall development process – one during the Goals and Objectives phase; the second occurring during the Alternatives Analysis phase. Together, the two surveys had over 2,900 participants and over 1,500 written comments.

Figure 5.2.1 – Summary of Public Involvement Activities for 2050 MTP Initial Adoption

Activity	2050 MTP Development Milestone				
	I. Goals & Objectives	II. Growth Guide Totals & Analysis Methods	III. Alternative Scenarios	IV. Preferred Option	V. Adopted Plan
Written Materials					
Reports	✓	✓	✓	✓	✓
Maps	--	✓	(interactive)	(interactive)	(interactive)
Infographics/Visuals	✓	--	✓	✓	✓
In-Person & Virtual Engagement					
Events	--	--	✓ (online/call-in)	✓	--
Public Hearing	DCHC ✓	DCHC ✓	DCHC ✓	✓	✓
Public Comment Period	✓	✓	✓		
Presentations	✓	✓	✓	✓	✓
Online Tools					
Websites	✓	✓	✓	✓	✓
Social media	✓	✓	✓	✓	✓
Videos	--	--	✓	--	--
Online survey	✓	--	✓	--	--
Interactive Map	--	--	✓	✓	✓
Mailing list	✓	--	✓	✓	✓
E-newsletters/ Brochures	✓	--	✓	✓	✓
Media and Ads					
Press releases	✓	--	✓	--	✓
Ads – Social and Print	✓	--	✓	✓	✓
Multi-lingual Outreach Materials & Community-based Engagement					
Respond to Comments	✓	✓	✓	✓	✓

Public Engagement for Amendments to the Initially Adopted Plan

When the plan is amended, each MPO uses its public involvement process to notify stakeholders of potential changes and engage them in consideration of these changes. At a minimum, the MPOs undertake the same activities as were used to initially adopt the 2050 MTP and report.

Involving Traditionally Under-represented Populations

To respond to the ever-changing demographics of our population we must use a range of methods to reach all populations. The end goal is to involve minority, low-income, and limited English proficiency populations in the transportation decision-making process. Both MPOs made strides to increase participation of underserved populations by conducting on-line focus groups, using targeted advertising on social media, translating public input documents into Spanish; attending community events or hosting pop-up events located outside traditional meeting places, in transit accessible locations, and at various times of day and days of the week; and holding multiple meetings.

Visualization Techniques

The use of visuals in reviewing a plan not only makes good sense but is a federal transportation policy requirement. The goal is to help the public and decision makers visualize and interact with transportation plans and projects, alternatives, large data sets and land-use information more effectively. The MPOs used extensive visual techniques throughout the 2050 MTP planning process to present data to the public, elected officials and staff. Visual highlights are summarized directly below. *Figure 5.2.2 Examples of Visualization Techniques* provides some samples; however, the MPOs' MTP Web sites demonstrate the extensive use of interactive maps, tables and graphics used throughout the 2050 MTP planning process.

Socioeconomic Data

There are "dot-density" maps and heat maps of population and job growth to the year 2050. Examples: see section 6.2 of this report, and the Land Use or SE Data Web pages on the MPOs' 2050 MTP Web sites.

Projects

All the highway, bus transit, rail transit and bicycle projects have been depicted on maps and listed in tables that included the project attribute data. Examples: see section 7 and appendices 1 through 4 of this report; and the 2050 MTP Web pages on the MPOs' Web sites, which include links to interactive online maps.

Deficiency Analysis

The deficiency analysis provided interactive and static maps of roadway congestion levels, travel time between key points and travel time isochrones. Examples: see section 6.3 of this report; and the deficiency analysis Web pages on the MPOs' Web sites, which include links to interactive online maps.

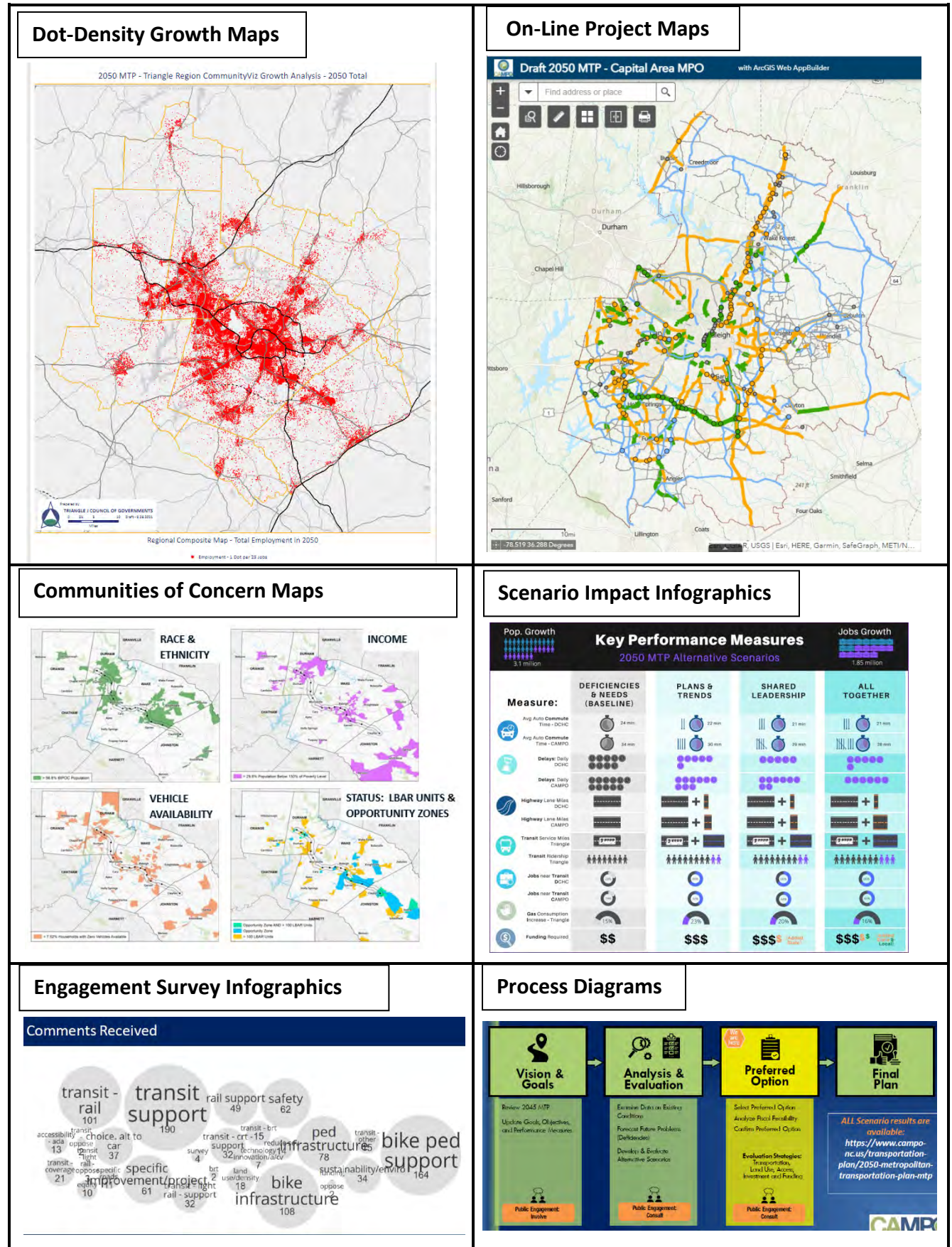
Financial Plan

The financial plan used pie and bar charts to present data. Examples: see MPOs' Web sites for draft reports and presentations throughout the planning process.

Others

The presentations throughout the 2050 MTP planning process and this final report have dozens of maps and graphics to depict everything from the status of the planning process to the relationship of the MTP, CTP and TIP.

Figure 5.2.2 -- Examples of Visualization Techniques



5.3 Supportive Tools: CommunityViz and the Triangle Region Transportation Model

Two tools are the basis for the quantitative analysis in the MTP, the CommunityViz growth allocation model and the Triangle Region Transportation Model. The two are inter-related: CommunityViz growth allocations are influenced by major transportation assets like highway interchanges and bus rapid transit and rail stations, and the use of transportation facilities and services are influenced by the allocation of future growth.

A [CommunityViz website](#) provides details on the inputs for the model and the 2050 MTP results. See Section 6.2 later in this report for a synopsis of the CommunityViz results.

The Triangle Regional Model (TRM) is a tool that was developed for understanding how future growth in the region impacts transportation facilities and services. The TRM can help identify the location and scale of future transportation problems, and proposed solutions to those problems can be tested using the TRM. The TRM is developed and maintained by the TRM Service Bureau housed at the Institute for Transportation Research and Education on behalf of the DCHC MPO, CAMPO, North Carolina Department of Transportation, and GoTriangle, the four organizations that fund the modeling effort and guide its development and use.

The modeled area covers about 3,400 square miles, including all of Wake, Orange and Durham counties and part of Chatham, Franklin, Granville, Harnett, Nash, Person, and Johnston counties. This area is divided into over 2,800 geographic areas (traffic analysis zones) for which detailed population and employment data are maintained. The highway system is represented by roadway links consisting of 12,460 lane miles in 2016 (the calibrated base year) and 15,040 lane miles in 2050, an increase of 2,580 lane miles (20%) by 2050. The roadway links include detailed characteristics: length, number of lanes by direction, speed, and traffic carrying capacity. Transit services operated by GoRaleigh, GoDurham, Chapel Hill Transit, GoTriangle, GoCary, Wolfline, and Duke Transit are represented as well. Transit services are described by detailed characteristics, including length, stop locations, speed, frequency of service, and average rider-perceived fare.

The model produces summary statistics including: vehicle miles of travel, vehicle hours traveled, degree of traffic congestion, number of trips taken by travel mode, and transit ridership. The model also computes trip statistics for each of the approximately 2,800 traffic analysis zones, categorized by mode, trip purposes, and origin or destination zone. These statistics are shown elsewhere in the report in tables and maps. Statistics on speed and vehicle miles of travel by type of roadway are used to calculate air quality impacts for the plan.

The model is an advanced four step travel demand forecasting model. Models like the TRM forecast travel using the following sub-models, or steps:

- Trip Generation – based on population and employment data for each traffic analysis zone, calculate the number of trips people will make for various trip purposes, and the number of trips likely to go to destinations throughout the region.
- Trip Distribution – based on the number of trips generated for each purpose, the cost to travel from zone to zone, and the characteristics of the zones, calculate the trips from each zone to other zones.
- Mode Choice – based on the trips calculated in trip distribution, characteristics of the traveler, transit service characteristics, highway congestion, and other service characteristics, calculate for each trip purpose the number of trips made by automobile, carpooling, and transit.
- Trip Assignment – based on highway speeds and transit speed, find a route that takes the shortest time to get from one zone to another zone and sum the trips on that roadway or transit route. The model includes feedback to allow the travel times to include the effects of traffic congestion on the calculation of the shortest time on roadway links or transit services.

Model relationships were developed using 2006 household survey data, 2010 census data, transit survey data, traffic counts throughout the region, and a survey of travelers entering or leaving the modeled area. The model inputs were updated to 2016 and validated to traffic counts and transit ridership counts. The model version used for this analysis was adopted for use in December 2020 by the Durham-Chapel Hill-Carrboro MPO, Capital Area MPO, North Carolina Department of Transportation and GoTriangle and is referred to as TRM Version 6.

5.4 Related Plans and Studies

Although the Metropolitan Transportation Plan (MTP) serves as the main guiding document for regional transportation investments, many related transportation plans and studies feed into the development of the MTP and provide a more detailed look at project designs, priorities, and project selection issues.

This section highlights past and current plans and studies that have been used to inform the development of the 2050 MTP. Section 7.12, later in this document, identifies future plans and studies that are recommended to clarify issues and provide details for project prioritization and selection.

Examples of studies undertaken in the region to better inform the development of the 2050 MTP, include: Corridor plans that address roadway design and operations on specific roadways; Small area plans that identify multimodal transportation investments and related development issues in a particular part of the region; Functional plans that focus on a particular mode or strategic issue and, Transit plans that range from broad regional vision to short-range investment plans for specific transit providers. Those that apply specifically to one MPO or the other are color-coded. CAMPO projects have this **yellow background** and DCHC MPO projects have this **green background**. Projects with no background color apply to both MPOs.

	Plan or Study	Type
1	<u>CORE Bicycle & Pedestrian Plan</u> . A linked network of pedestrian, bicycle and greenspace facilities within the jurisdiction of 7 local governments and several regional agencies in the Center of the Region.	Functional Plan
2	<u>Triangle Region Long Range Transportation Demand Management Plan</u> . Recommended investment strategy to provide regional TDM services, local TDM services in specified hubs and an administrative structure to fund, manage, monitor and evaluate TDM services across both MPOs.	Functional Plan
3	<i>Congestion Management Plan (CMP)</i> . Collects travel and safety data for vehicles, pedestrian, bicycles and transit services to identify current and short-term trends. Also, it defines congestion, identifies specific mitigation measures for congestion and provides a state of the system report to meet federal requirements. The DCHC MPO has a <u>System Status Report and Mobility Report Card</u>. The Capital Area MPO has a <u>Congestion Management Process (CMP)</u> and System Status Report.	Functional Plan
4	<u>Triangle Regional Freight Plan</u> . Evaluated current freight system needs and identified policy and project recommendations for future improvements to the freight network. The study included truck, rail, and air components and initiated the creation of the Regional Freight Stakeholder Advisory Committee.	Functional Plan
5	<u>RDU Vision 2040</u> . A master plan of short-, medium-, and long-term development plans needed to meet future aviation demand, while considering potential environmental and socioeconomic issues.	Functional Plan
6	<u>ITS Strategic Deployment Plan Update</u> . Plan includes a snapshot of best practices, list of projects, regional ITS architecture, and guidelines for maintaining the Plan.	Functional Plan
7	<u>NC 98 Corridor Study</u> . Recommends a multimodal transportation plan that includes roadway improvements and bicycle and pedestrian facilities to address the variety of transportation demand and match the different land use characteristics of this corridor, which traverses both the CAMPO and DCHC MPO planning areas.	Corridor Study

	Plan or Study	Type
8	<u>Triangle Strategic Tolling Study</u> . Analyzes toll and express lanes for the region, identifies potential toll projects for inclusion in the long-range plans, and creates a framework for the MPO to discuss and evaluate toll projects.	Functional Plan
9	<u>Bus on Shoulder Study</u> . Evaluated the need and feasibility for expanding BOSS operations to major travel corridors in the Triangle and identified BOSS project opportunities on appropriate roadways.	Functional Plan
10	<u>Wake County Transit Plan</u> – Operating plan and capital program for transit services in the Wake County portion of the Capital Area MPO from 2021 through 2030. This plan was developed to guide the public transportation improvements paid for by the local option sales and vehicle taxes.	Transit Plan
11	<i>US 1 Phases I & II Corridor Studies</i> . Recommended a comprehensive multimodal transportation and growth plan that will preserve the functional characteristic of this corridor, manage the overall growth within the area, enhance the quality of life of its surrounding communities, and provide for the local and regional transportation needs along US-1 between I-540 and the northern MPO boundary http://us-1corridornorth.com/	Corridor Study
12	<i>NC 50 Corridor Study</i> . A comprehensive corridor study that recommended implementation actions designed to; Improve transportation mobility and traffic safety along the corridor, Preserve the residential and rural nature of the corridor while supporting regional economic development, and support activities to protect recreation, water quality, and the environment in the Falls Lake watershed http://www.kimley-horn.com/projects/nc50study/index.html	Corridor Study
13	<i>NC 54 and More Study</i> . A feasibility study that investigated the costs and impacts of proposed facility upgrades to the NC 54 Corridor from NC 540 to Northwest Maynard Road, within the Municipalities of Morrisville and Cary and recommended roadway widening, intersection improvements, improvements for pedestrians, bicyclists, and public transit services, potential railroad grade separations, crossing consolidation, proposed rail transit, and proposed railroad expansion plans for freight, intercity passenger rail and commuter. http://www.townofcary.org/Departments/Engineering/Streets_and_Sidewalks/Streets_Projects/NC54_MoreFeasibilityStudy.htm	Corridor Study
14	<u>Southwest Area Study Update</u> . Evaluated the dependence of local commuters on regional routes such as NC 55, US 401, NC 42, NC 540 and NC 210, coupled with potential demand for increased development in the southwest area of the MPO jurisdiction. Recommended initiatives addressed strategic improvements to regionally significant corridors, provision of increased transit/fixed guideway services, and sustainable development patterns.	Special Area Study
15	<u>Northeast Area Study Update</u> . Identified a sustainable transportation strategy for the growing communities of Wake Forest, Knightdale, Raleigh, Wendell, Zebulon, Rolesville, Bunn, Franklinton, and Youngsville. This region encompasses a unique mix of a large metropolitan area, small towns, suburbs and farming communities painted across a broad expanse of rural tapestry in both eastern Wake and southern Franklin counties. The study evaluated the dependence of local commuters on regional routes such as I-87/Future I-87, US 401, NC 98, NC 97, NC	Special Area Study

	Plan or Study	Type
	540, I-95, US 70, NC 42, NC 540, and NC 50, coupled with increasing development pressures in southeast Wake and northwest Johnston Counties. Recommendations addressed improvements to regionally significant corridors, provision of increased transit/fixed guideway services, and more sustainable development patterns.	
16	<i>Southeast Area Study</i> . Evaluated the dependence of local commuters on regional routes such as I-40, I-95, US 70, NC 42, NC 540, and NC 50, coupled with increasing development pressures in southeast Wake and northwest Johnston Counties. Recommendations addressed improvements to regionally significant corridors, increased transit/fixed guideway services, and more sustainable land use patterns.	Special Area Study
17	<i>Raleigh-Cary Rail Crossing Study</i> . The study evaluated potential improvements to the at-grade roadway/rail crossings from NE Maynard Road in Cary to Gorman Street in Raleigh, with a focus on how changes at the crossings will affect future land uses and connectivity within the community. In addition to looking at existing crossings, this study also considered possible new roadway extensions across the railroad within the corridor. http://www.rcrxstudy.com/	Corridor Study
18	<i>NC 56 Corridor Study</i> . A joint effort among the Town of Butner, City of Creedmoor, Granville County, CAMPO, Kerr-Tarr RPO, and North Carolina Department of Transportation (NCDOT) to evaluate improvements for a 4.5-mile segment of NC 56 from 33rd Street in Butner to Darden Drive in Creedmoor. The goal of the study was to clarify the long-term vision for the corridor, while also identifying opportunities to address existing needs over a shorter timeframe.	Corridor Study
19	<i>CAMPO-FAMPO Rail Corridor Study Phase I</i> . A joint effort among FAMPO and CAMPO to evaluate potential passenger rail connections between the two MPOs. The goal of the study was to analyze the CSX and Norfolk Southern rail corridors to identify challenges and opportunities for future passenger rail service connections.	Corridor Study
20	<i>Triangle Bikeway Implementation Study</i> . This study will build upon preliminary work and deliver a functional design and a recommendation for a phased implementation approach for the entire length of the corridor. This connection would serve commuters between Raleigh, Durham, Cary, RTP and Morrisville.	Corridor Study
21	<i>US 401 Corridor Study</i> . This study will result in a functional design of the future 401 corridor, and an implementation strategy with short and long term and recommendations that will lead to the successful implementation of future US 401.	Corridor Study
22	<i>RED Lanes Study</i> . As transit services in the region continue to expand, the MPO will analyze on the applicability and necessity for transit-dedicated lanes on congested roadways. These lanes would also be used for Right turn lanes, Emergency vehicle access, and Driveway access, hence the term R.E.D. lanes.	Transit Study
23	<i>Commuting Corridors Study</i> Strategic analysis and evaluation of major commuting corridors across the MPO region to identify how to better manage the forecasted growth in trips and identify mitigation options to deal with the anticipated growth. This was accomplished through technical analysis of the region's major commuter corridors and help identify reasonable projects that can be advanced for for funding through available funding sources.	Special Study
24	<i>Western Wake Signal Integration Study</i> . This study defines implementation steps for the successful integration of all traffic signals in the western portion of Wake	Functional Study

	Plan or Study	Type
	County, along with future implementation steps and additional work needed for the potential integration of all traffic signals within western Wake County.	
25	DCHC MPO Comprehensive Transportation Plan (CTP) . Maps and project lists of highway, public transportation, bicycle, pedestrian and multiuse path facilities and improvements needed in the long-range.	Long-Range Plan
26	Durham County Transit Plan and Orange County Transit Plan . Identifies transit projects, services, facilities and vehicles and funding from Tax District Revenues.	Transit Plan
27	North-South Bus Rapid Transit . Adopted locally-preferred alternative for Chapel Hill transit project that was accepted into the FTA Small Starts program.	Corridor Study
28	US 15-501 Corridor Study . Traffic analysis to identify policies and facilities to meet future travel demand and safety objectives, from Chapel Hill to Pittsboro.	Corridor Study
29	NC 54/I-40 Corridor Study . Study and recommendations to guide land use and transportation decisions and investments in the NC 54 corridor, from US 15-501 in Chapel Hill to I-40 in Durham.	Corridor Study
30	Southwest Durham/Southeast Chapel Hill Collector Street Plan . Small area plan recommending location of future collector streets and street designs to ensure future connectivity and multimodal street functioning.	Functional Plan
31	Local Bicycle Plans: <ul style="list-style-type: none"> • Carrboro Comprehensive Bicycle Transportation Plan (2020) • Chapel Hill Mobility and Connectivity Plan (2020) • Chatham County Bicycle Plan (2011) • Durham Bike+Walk Implementation Plan (2017) • Durham City and County Comprehensive Bicycle Plan (2006) • Hillsborough Community Connectivity Plan (2009, revised 2014 & 2017) • Orange County Comprehensive Plan: Transportation Element (2008) • Research Triangle Park Bike/Ped Plan (2017) 	Functional Plan
32	Local Pedestrian Plans: <ul style="list-style-type: none"> • Chapel Hill Mobility and Connectivity Plan (2020) • DurhamWalks! Pedestrian Plan (2006) • Durham Bike+Walk Implementation Plan (2017) • Hillsborough Community Connectivity Plan (2009, revised 2014 & 2017) 	Functional Plan
33	Local and Regional Multiuse Path Plans: <ul style="list-style-type: none"> • Chapel Hill Mobility and Connectivity Plan (2020) • Durham Trails and Greenways Master Plan (2011) • Research Triangle Park Trails Study (2020) • Triangle Bikeway Study (2022) 	Functional Plan

In addition, many plans that informed the development of earlier Metropolitan Transportation Plans continue to be used to support the development of the 2050 MTP, including:

- US 15-501 Major Investment Study, Phase II Report (December 2001).
- I-40 Express Lanes Feasibility Study (from I-85 to Wade Avenue, Orange, Durham and Wake Counties (FS-1205A), (2015).
- NC 147 Feasibility Study (from I-40 to NC 55) (FS-1205C), (2016).
- NC 54 widening, I-40 (exit 273) to NC 55 (FS 1005C), (2011)
- NC 751 widening, NC 54 to US 64 (FS-1008B), (2012)
- Northern Durham Parkway, I-540 to US 501, (Roxboro Rd.), (2014)

KEY POINTS FROM THIS SECTION:

- Metropolitan Planning Organizations, or MPOs, are the organizations charged with creating and adopting Metropolitan Transportation Plans. MPOs are made up of all the local governments in the area, the NC Department of Transportation, plus other organizations with transportation responsibilities. This document includes the plans for the two MPOs in the Research Triangle Region: the Capital Area MPO and the Durham-Chapel Hill-Carrboro MPO.
- MPOs have 3 main organizational components: (i) a Policy Board, which is made up of local elected officials and a NC Department of Transportation board member; (ii) a Technical Committee, made up of technical staff from local, state and regional organizations that provide technical input; and (iii) a Lead Planning Agency, or LPA, which provides the staff support to carry out the MPO's responsibilities.
- Each MPO has an explicit, written Public Involvement Policy, which was used to guide public engagement in the plan and provide opportunities for public review and comment. Using maps, graphs, charts and other visual tools is an important part of conveying transportation-related information to a variety of stakeholders.
- Two related tools are used to understand the region's transportation challenges and the impacts of investments to address these challenges: the CommunityViz growth allocation model that forecasts the locations of future growth, and the Triangle Regional Travel Demand Model (TRM), which uses these growth forecasts and transportation network data to estimate impacts of future transportation investments. An updated version of the model was used in the development of the 2050 Metropolitan Transportation Plan.
- Many related transportation plans and studies are undertaken both to feed into the development of Metropolitan Transportation Plans and to provide a more detailed look at issues identified in or related to MTPs. These plans and studies are available on each MPO's website.

6. Analyzing Our Choices

This section explains what we did to better understand the choices facing our region, develop population and employment growth forecasts that reflect market trends and community plans, create and test alternative transportation scenarios, and compare these alternatives to one another and to performance measures that reflect the MPO's adopted goals and objectives. Special emphasis was placed on defining and identifying "REINVEST Neighborhoods" – places with the greatest amounts of equity-centered households, and looking at how transportation investments and related strategies might best serve their travel needs.

6.1 Land Use Plans and Policies

Each community in the Triangle develops a comprehensive plan to outline its vision for the future and set policies for how it will guide future development to support that vision. So an important starting point for transportation plans is to understand these comprehensive plans and reflect them in the future growth forecasts used to analyze transportation choices.

Local planners from communities throughout the region, along with experts in fields such as real estate development and utility provision, contributed insights to translate community plans and market trends into the parameters used by the region's transportation model to generate travel forecasts: population and jobs by industry (see Section 5.3 for a more detailed explanation of the transportation model). To make sure the forecasts were consistent, transparent and based on the best available evidence, the region used sophisticated growth allocation software, called CommunityViz, to guide the forecasting effort.

The land use plans and a quantitative analysis of pre-COVID job locations revealed that a set of regional-scale centers, depicted in Figure 6.1.1, contain large concentrations of employment and are planned for intense mixes of homes, workplaces, shops, medical centers, higher education institutions, visitor destinations and entertainment venues. These areas include:

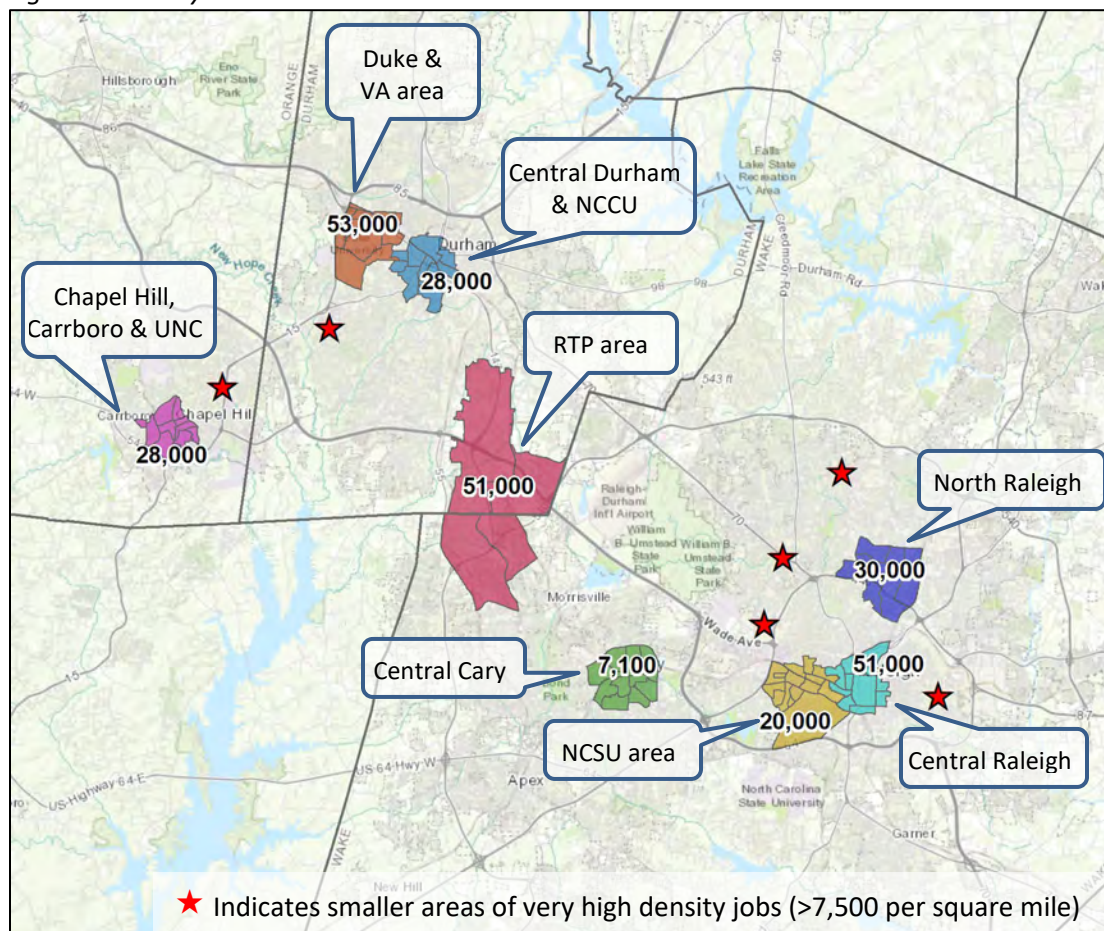
- Central Raleigh, including NC State University;
- Central Durham, including Duke University, North Carolina Central University and the Duke and Veterans Administration medical complexes;
- Central Chapel Hill & Carrboro, including UNC-Chapel Hill and UNC Hospitals;
- The Research Triangle Park area;
- North Raleigh; and
- Central Cary.

Together, the locations outlined on the next page account for about 270,000 jobs, 100,000 of which have low or moderate earnings, 29% of all jobs in the region and 22% of low and moderate earning jobs, all on less than 2% of the region's land. Linking these centers to each other, and connecting them to communities throughout the region with a range of travel choices, can offer more opportunities for where people live and work.

In some cases, such as in central Cary, Durham, Raleigh and Chapel Hill & Carrboro, existing plans and the ordinances that implement the plans promote increased development of the activity centers. In addition, the Research Triangle Park has a master plan that is resulting in more compact, mixed-use development in selected locations, including a new hub in the heart of the RTP.

The review of community plans also identified places that are most environmentally sensitive, including water supply watersheds, and places where established neighborhoods warrant protection. Understanding the unique roles that different areas and different communities will play in the region as it grows established the framework for forecasting growth and designing transportation choices to serve this growth.

Figure 6.1.1 Key Job Hubs



6.2 Socio-economic Forecasts

One of the initial critical steps in developing a Metropolitan Transportation Plan is to forecast the amount, type and location of population and jobs for the time frame of the plan. Based on community plans and data from local planning departments, the Office of State Budget and Management, the US Census Bureau and independent forecasters, estimates of “base year” (2020) and “plan year” (2050) population and jobs were developed by local planners for each of the 2,800 small zones (called Traffic Analysis Zones or TAZs) that make up the area covered by the region’s transportation model, called the Forecast Area.

Both to track and document the socioeconomic forecasts, and to permit analysis of different development scenarios, a robust land use mapping and analysis tool was used to account for the more than 750,000 individual parcels of land in the region. Using software called “CommunityViz,” each parcel was assigned one of 40 “place types” by local planners, reflecting the kind of development anticipated by community plans, such as office building, retail center, mixed use development, single family home or apartment complex. In addition, each parcel was assigned a development status to indicate whether it was vacant, already fully developed, or partially developed or redevelopable. Depending on both the place type and the specific jurisdiction in which a parcel is located, average residential and employment densities were applied to determine the supply available to accept additional residential or commercial development.

Any constraints to development, such as water bodies, floodplains, stream buffers, or conservation easements were assigned to applicable parcels. The combination of place type, development status and development constraints established the “supply” side of the CommunityViz growth allocation model. Special attention was given to anchor institutions, such as the major universities and the RDU Airport. Future growth in these areas was based on information from these institutions.

Panels of experts were convened to help determine the principal influences on where future development would occur, and to develop quantitative measures, called “suitability factors,” that could be applied to the parcels based on these influences. Examples of factors that influence development include availability of sewer service, proximity to highway interchanges or transit stations, and distances to major economic centers like the region’s universities.

Finally, population and job control totals were developed from state and national demographic sources to establish the “demand side” of the model. Guide totals are available online at this link: <http://bit.ly/2AN8Qri>. CommunityViz was used to allocate single family housing units, multi-family housing units and jobs based on the available supply and the attractiveness of each parcel based on the suitability factors.

Figure 6.2.1 summarizes the major elements of the socioeconomic forecasts for different portions of the Forecast Area covered by the region’s transportation model, both the areas within the MPO boundaries and areas beyond the MPO boundaries (refer to Figure 2.2.3 for a map of the MPOs and the modeled area). More detailed information on a range of socioeconomic data for each TAZ is available from the Capital Area MPO and the Durham-Chapel Hill-Carrboro MPO and in documents available from the Triangle J Council of Governments describing the application of the CommunityViz model and its 2050 MTP results.

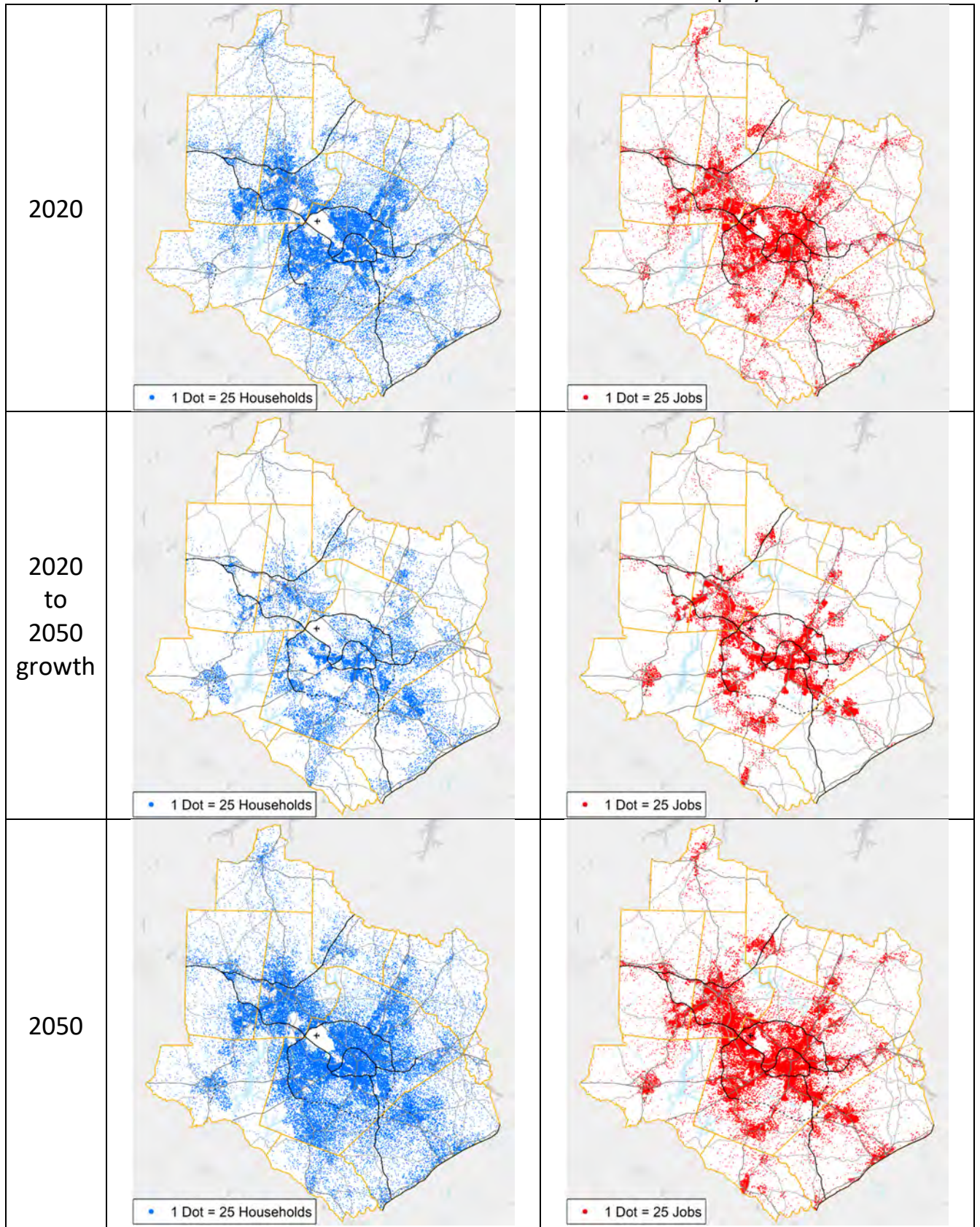
<i>Figure 6.2.1 Estimated 2020 and Forecast 2050 Jobs, Population and Households (1)</i>	2020			2050		
	Population	Households	Jobs	Population	Households	Jobs
Capital Area MPO	1,357,025	520,652	659,514	2,195,353	842,636	1,268,563
Franklin County (part)	46,847	17,553	8,605	80,702	30,767	15,313
Granville County (part)	22,758	8,698	4,768	45,206	17,341	9,685
Harnett County (part)	21,343	8,130	4,012	35,316	13,092	6,513
Johnston County (part)	136,212	49,031	27,395	253,974	91,427	60,741
Wake County	1,129,865	437,240	614,734	1,780,155	690,009	1,176,311
Durham-Chapel Hill-Carrboro MPO	483,582	196,644	311,136	675,956	278,242	519,273
Chatham County (part)	27,610	12,051	4,690	38,669	16,618	4,899
Durham County	324,784	134,634	235,002	463,414	193,987	401,926
Orange County (part)	131,188	49,959	71,444	173,873	67,637	112,448
Areas outside MPO boundaries	175,073	66,563	70,322	309,942	116,783	97,113
Chatham County (part)	24,603	9,944	7,582	65,726	26,950	19,555
Franklin County (part)	13,413	5,244	6,477	14,151	5,527	6,614
Granville County (part)	14,785	4,283	8,435	22,035	7,114	12,616
Harnett County (part)	18,803	6,693	5,820	30,577	10,833	11,334
Johnston County (part)	49,884	18,478	27,528	116,241	41,397	29,984
Nash County (part)	4,170	1,620	842	4,710	1,838	1,466
Orange County (part)	17,692	7,191	3,277	19,764	7,965	3,893
Person County (part)	31,723	13,110	10,361	36,738	15,159	11,651
Total for forecast area	2,015,680	783,859	1,040,972	3,181,251	1,237,661	1,884,949

(1) These totals represent the values within the regional travel model’s traffic analysis zones, and may differ from values derived using other sources and methods; note that population includes people who are not in households, such as university dormitory residents.

The maps below show the distribution of households and jobs within the Forecast Area for the 2020 “base year,” the 2050 “horizon year” and the growth from 2020 to 2050. Larger versions are available from the MPOs.

Households

Employment



6.3 Trends, Deficiencies, and Needs

With the large increases in people and jobs expected in the region over the 30-year period between 2020 and 2050, the amount of travel -- often measured in Vehicle Miles Traveled (VMT) -- in the Triangle is expected to similarly grow significantly. Future stress on the regional transportation network is exemplified by the levels of congestion predicted in 2050.

Figure 6.3.1: I-40 congestion

The congestion maps on the next page show the average volumes during the afternoon peak hour as predicted by the Triangle Regional Model. The 2016 “calibration year” Congestion Levels map indicates travel conditions in the year 2016, the year on which the model is based. The 2050 Deficiencies Map, or “Existing plus Committed” (E+C), forecasts travel conditions in the year 2050 using the current highway, transit and other transportation facilities and any facilities that are well on their way to being completed. This deficiencies network is often called the “no build” condition, since it typically is the result of past decisions, not ones that still need to be made.



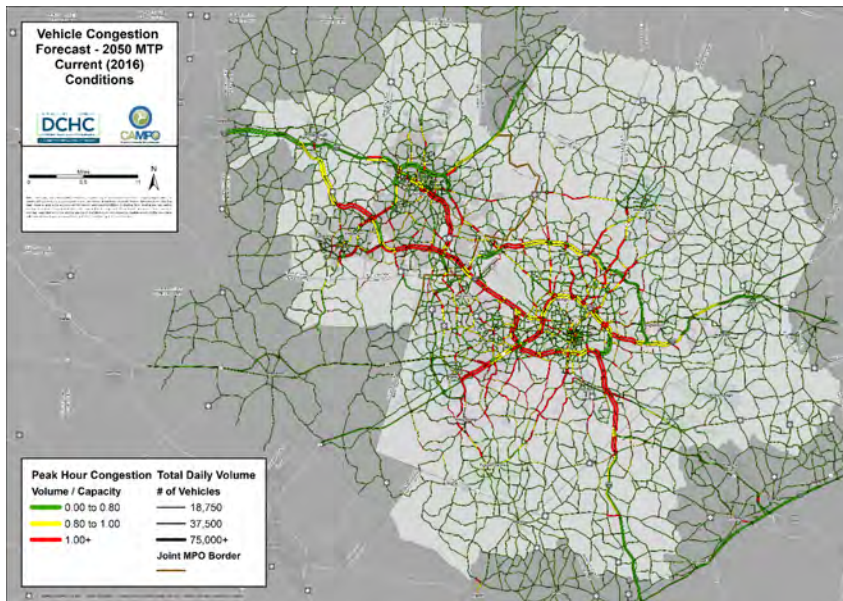
This worst case scenario is not intended to represent a likely outcome. Rather, comparing E+C to the 2050 adopted MTP network illustrates the inability of our committed transportation improvements to meet the growth in anticipated travel demand that is forecasted to occur. In reality, as congestion and travel delay began to reach unacceptable levels, other contributing factors would almost certainly shift. Additionally, commute patterns will change as people begin to make different travel decisions.

The third map on the next page is the 2050 adopted MTP network congestion map, showing levels of congestion if we provide all the transportation facilities and services included in the Metropolitan Transportation Plan.

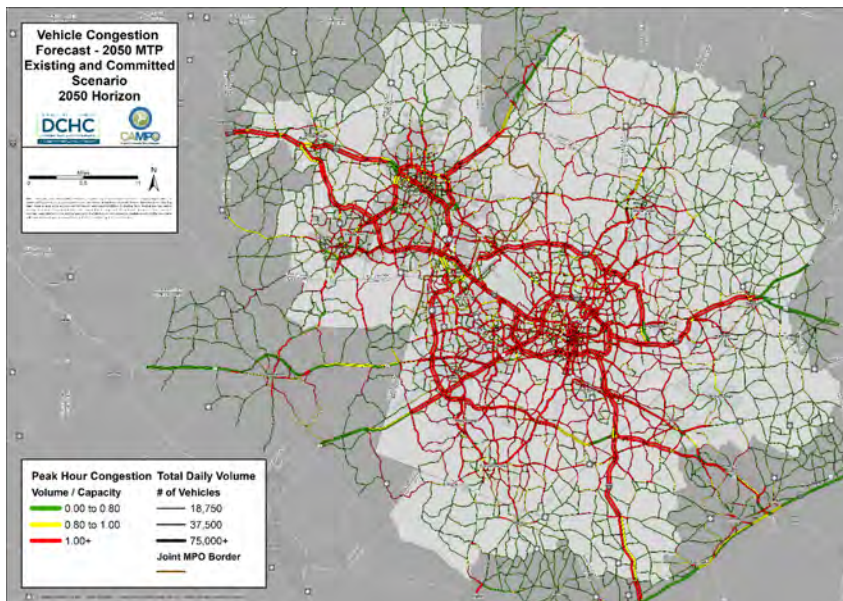
The maps presented on the next page provide a picture of the challenge we face in developing realistic transportation investments that meet the diverse needs of our communities. Larger versions of these maps are available on the MPOs' web sites. In addition, the MPO web sites have many other maps and tables that present the results of the Deficiency Analysis.

Trip Volumes and Capacity

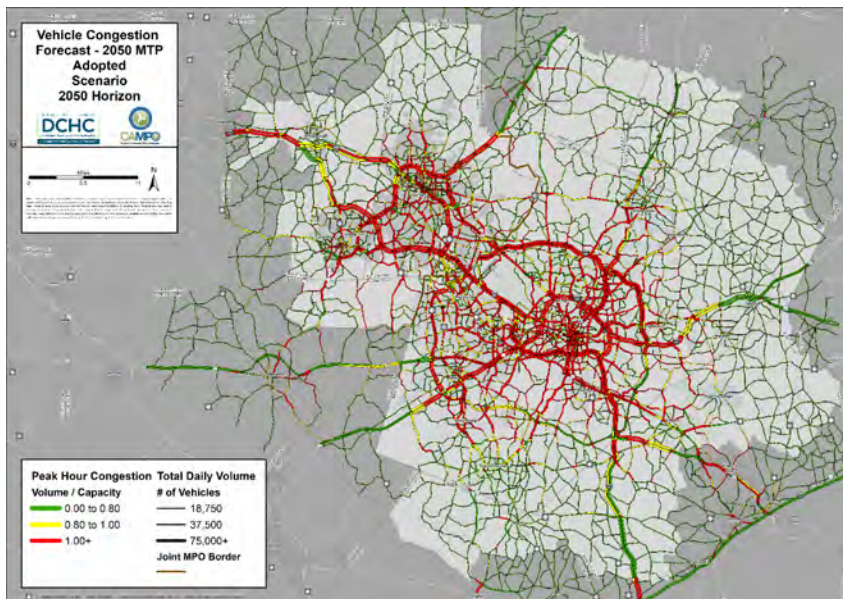
The roadway networks shown on the next page are simplified representations taken from the region's travel model. Thicker lines depict roadways with higher traffic volumes, thinner lines segments carrying lesser volumes. The colors correspond to Volume/Capacity ratios (this is the number of vehicles divided by the theoretical capacity of the road); greater Volume/Capacity ratios correspond with more congestion. A Volume/Capacity ratio below 0.8 (in green) is indicative of a relatively free flowing roadway with little or no congestion. Once the Volume/Capacity, or V/C ratio, rises towards 1.0, motorists will experience more periods of congestion. Volume/Capacity ratios greater than 1.0 (in red) represent roadways which are consistently congested throughout and beyond the peak hours of travel. The first map shows conditions in 2016. The 2050 E & C map shows that without significant new investments, chronic congestion will occur on major arterials and freeways throughout the region, and particularly within Wake County. The 2050 MTP map shows forecast conditions if we build and operate the facilities and services in this plan.



Roadway congestion in the 2016 Transportation Model Calibration Year



Estimated roadway congestion in 2050 if we only had the road and transit networks in place or under construction today



Estimated roadway congestion in 2050 if we build all the projects contained in this 2050 Metropolitan Transportation Plan



6.4 Alternatives Analysis

This section describes what we did to create and test alternative land use and transportation *scenarios*, and compare these alternatives to one another in order to select a future scenario that is both feasible and reflects the MPOs’ goals. Special emphasis was placed on defining and identifying places with the greatest amounts of equity-centered households, and looking at how transportation investments and related strategies serve their travel needs and link them to job hubs. To help understand, analyze and engage with a range of participants on the scenarios, *Connect2050* developed three evidence-based types of places:

1. Key Job Hubs – the places with the most significant concentrations of jobs, including locations with large amounts of low- and moderate-earning jobs. The map in section 6.1 shows the largest clusters of job hubs, and an on-line navigable map allows more detailed exploration.
2. REINVEST Neighborhoods – the places with the most significant concentrations of equity-centered households, based on race and ethnicity, income and vehicle availability – people who are most reliant on transit and have a greater propensity to use it.
3. Travel Choice Neighborhoods – the places in a scenario where transit service is provided, making a choice for how to travel to and from these places feasible.

Scenarios have two foundations: a *development* foundation – which describes a regional pattern of land use, and a *mobility investment* foundation – which defines the road, transit and cycling & walking networks and transportation services that relate to the development pattern. The two foundations can be combined in different ways to form a matrix of scenarios, as shown in the green boxes below.

Connect 2050 Scenario Framework

		 Mobility Investment Foundation				
		Existing & Committed	Trend	Mobility Corridors	Complete Communities*	Comprehensive Transport Plan
		 Development Foundation	Existing or Underway	basis for all scenarios		
Community Plans	Deficiency & Needs Scenario		Plans & Trends Scenario			
Opportunity Places (Key Hubs and REINVEST Neighborhoods)				Shared Leadership Scenario	All Together Scenario	
Build-Out						If unlimited \$ & capacity growth

* More focused investment on Complete and Safe Streets, Active Transport, and Transit

Since the transportation facilities and services we invest in are not just functions of our values, but the resources we are willing to commit, each scenario was given a name that reflected the level of collaborative effort and resources that would be needed to achieve it. Two of the scenarios are straightforward:

- The *Deficiency & Needs Scenario* can be thought of as a worst-case scenario: it is what would happen if we absorb the expected future growth that is reflected in our current plans, but only have a transportation system composed of existing facilities and services and those that are already underway.
- The *Plans & Trends Scenario* can be thought of as our “lightest lift;” it won’t be easy, but we wouldn’t be making changes to our land use plans, and we would be relying on tried-and-true revenue streams and current prioritization processes.

Our final two scenarios would require local elected officials to make some fundamentally different -- and difficult -- decisions, and perhaps collaborate in new ways. The scenarios involve both changes to current land use plans and additional revenues to make more transportation investments.

- The *Shared Leadership Scenario* can be thought of as a stronger partnership between local governments and state and federal governments, emphasizing multi-modal investments in key corridors, which the scenario terms “Mobility Corridors.” Communities would reorient land use in specific places and ways to enable more sustainable and efficient travel, with an emphasis on linking equity centered neighborhoods to major job hubs along the Mobility Corridors. State and federal governments would provide both more funding, and more flexibility in the use of funding to match what residents and businesses say they want. With the recent passage of the federal Infrastructure Investment and Jobs Act (IIJA), the federal government has provided an infusion of funds that is aligned with the Shared Leadership Scenario. The NC FIRST Commission has recommended an analogous increase in state support and flexibility.
- The *All Together Scenario* is our most ambitious. It is based on the same Opportunity Plans land use as Shared Leadership, and also requires the added flexible revenues from the NC FIRST Commission recommendations. It further relies on increased local tax revenues to be able to achieve the transit, active transportation and complete streets investments of the Complete Communities mobility foundation.

For the Opportunity Places development foundation, four specific land use changes were made to the Community Plans development foundation to better align land use and mobility investment goals:

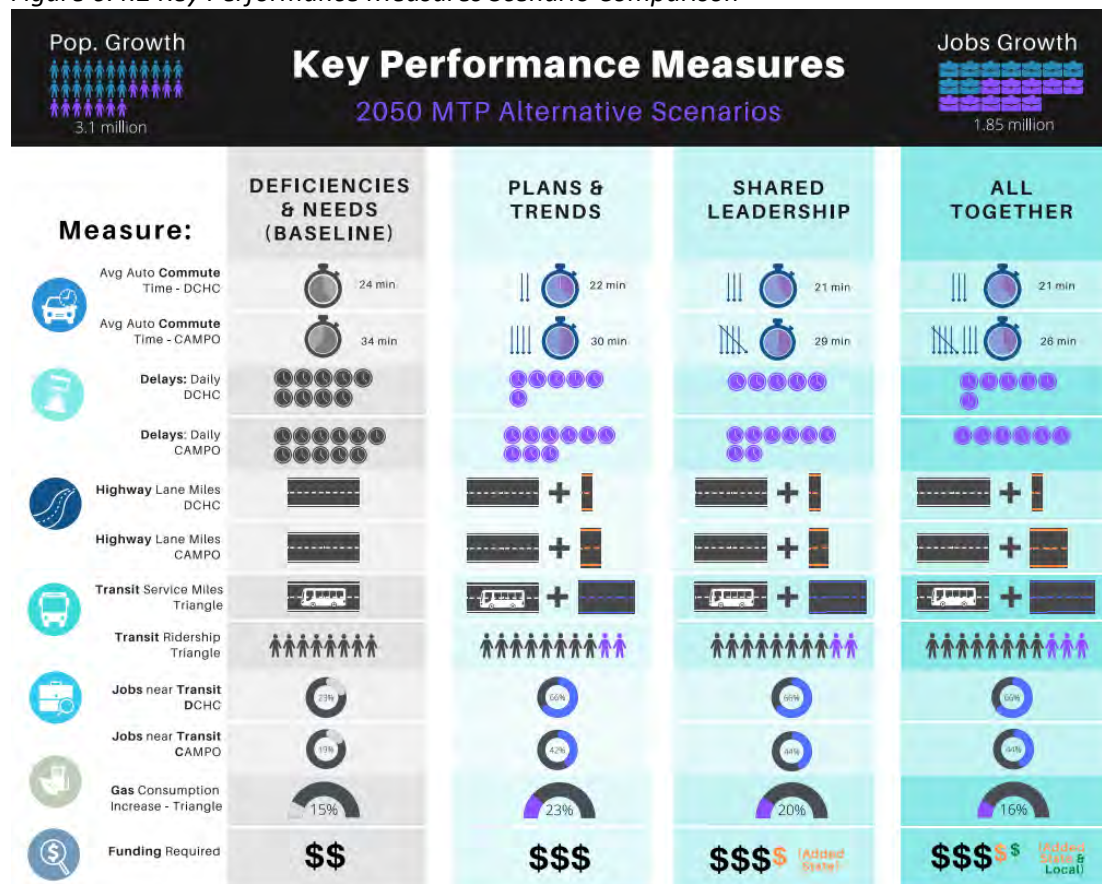
1. Four Anchor Institutions received 20% higher job growth, resulting in 5,000 more on-campus jobs
2. 23 Mobility Hubs along major corridors at designated activity centers largely from prior studies were assigned transit-supportive intensities on undeveloped or redevelopable parcels.
3. Equitable TOD areas around BRT and CRT stations and along frequent-bus lines were similarly assigned transit-supportive densities.
4. Affordable Housing Opportunity Sites based on public ownership and parcel shape and size criteria were assigned a total of 10,000 multi-family units to represent mixed-income development.

The first and last of these steps directly assigned development in the scenario. The Mobility Hubs and eTOD steps allowed more growth, but the degree to which growth occurred was based on the allocation model.

Scenarios are simply to help understand the range and relative impacts of different choices and do not serve as a constrained menu from which a single choice must be selected. Public engagement on these options resulted in a “preferred option” that drew on elements from the scenarios and included additional elements that were not in any of the scenarios. the preferred option was most closely aligned with the All Together Scenario.

The MPO staffs in conjunction with staff from the Triangle Regional Model Service Bureau worked together to create and run the model scenarios during the spring and summer of 2021. Figure 6.4.2 shows some of the measures that were used to compare scenarios. More detailed metrics are in Appendix 10.

Figure 6.4.2 Key Performance Measures Scenario Comparison



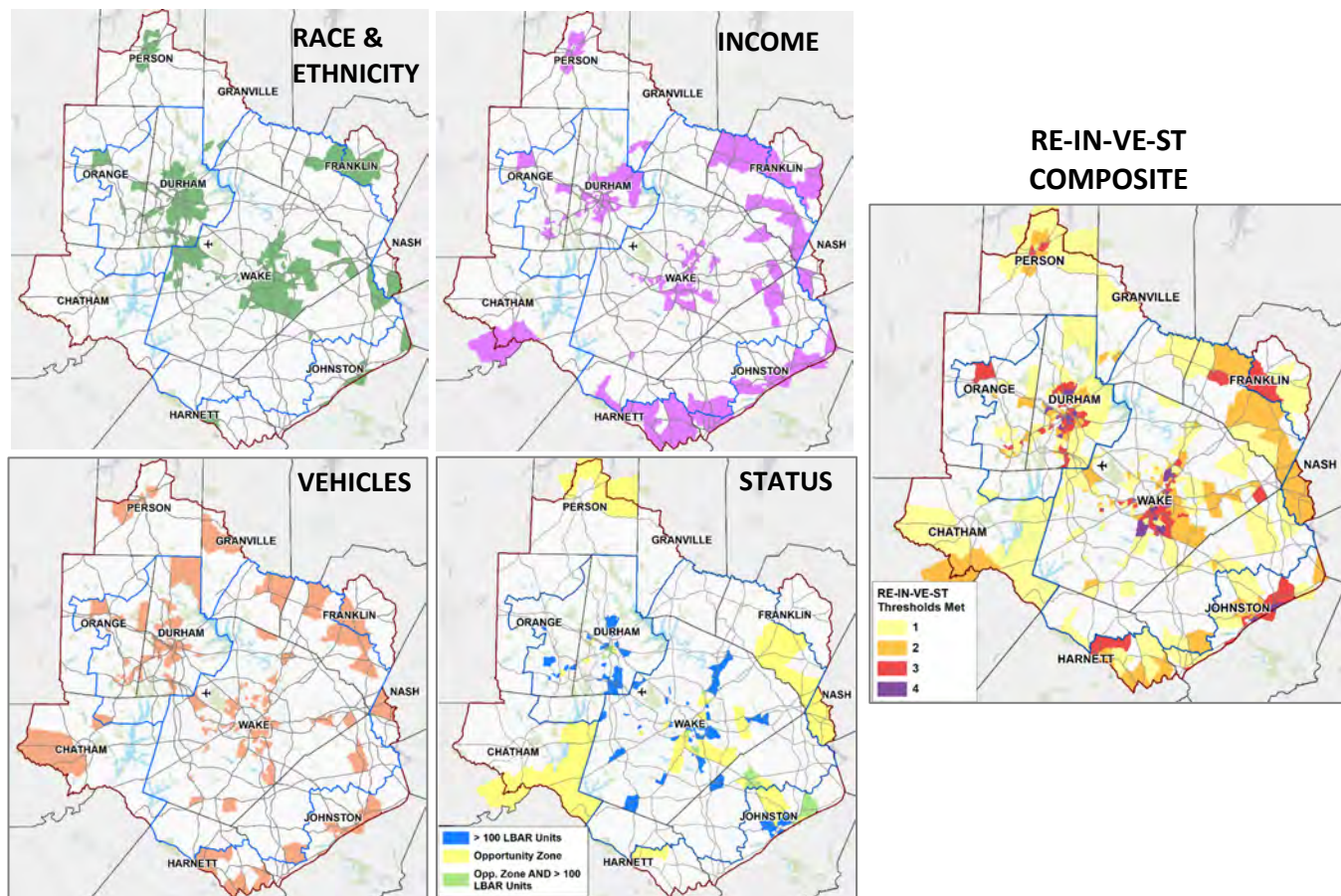
To aid in the comparison of alternatives the MPOs created a set of evidence-based, equity-centered places termed “REINVEST Neighborhoods, created from the building blocks of Communities of Concern that are discussed in more detail in Chapter 9 of this report. REINVEST neighborhoods are identified based on four characteristics most influential in determining who is most likely to rely on and use transit services, each characteristic represented by two letters in RE-IN-VE-ST:

RE	Race/Ethnicity – a neighborhood is home to people who are Black, Indigenous or People of Color (BIPOC)
IN	Income – households in a neighborhood have annual incomes below designated thresholds
VE	Vehicles – households in a neighborhood report having no vehicles available
ST	Status – neighborhoods with a specific designation of particular interest for transportation investment. In this analysis, the following status characteristics are used: i) # of legally-binding, affordability-restricted (LBAR) housing units, and ii) designation as an Opportunity Zone

The maps in this section show neighborhoods -- represented by block groups -- that meet one, two, three or all four of selected REINVEST thresholds.

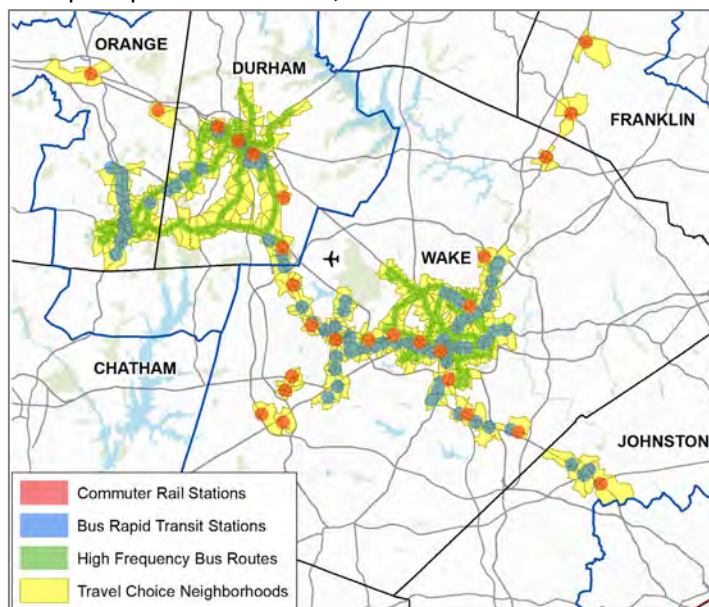
Different environmental justice and equity studies define thresholds in different ways, and the technique used will affect the amount and distribution of REINVEST neighborhoods. There is no single right way to define equity-centered neighborhoods, and the data allow a range of definitions. Because the 2050 MTP is a regional-scale investment plan that covers both MPOs, this plan continues the method used to identify Environmental Justice populations in previous plans, which used the 75th percentile of block groups in each measure as a threshold (i.e., one quarter of all block groups are identified for each measure, then block groups that meet 0, 1, 2, 3 or all 4 thresholds are identified). Note that thresholds can be set for the region as a whole (which is done for this analysis) or for each component MPO or County.

The first three maps below are threshold maps for race & ethnicity, income and vehicle availability. Each shows the top quartile of block groups in the region for the threshold. A fourth map is a special status map: it shows all block groups that have 100 or more legally binding, affordability-restricted housing units, or are a designated federal Opportunity Zone. The final map combines these maps to show block groups that meet one, two, three or all four of the status thresholds. Larger versions of these maps are available on-line.



As a final step in the analysis, the job-based Key Hubs and the equity-centered REINVEST Neighborhoods were compared to the Travel Choice Neighborhoods for the adopted plan investments, shown below. Between 2020 and 2050, about 170,000 dwelling units and over 600,000 jobs are expected to be added to Travel Choice Neighborhoods, bring the totals in 2050 to 390,000 dwelling units and 1,200,000 jobs.

735 Traffic Analysis Zones (TAZs) overlap REINVEST Neighborhood block groups that met at least two of the four thresholds; 426 (58%) were also Travel Choice Neighborhoods. Of the key job hubs shown in Figure 6.1.1, including the 6 smaller hubs that are starred, all of them overlap to a significant degree with Travel Choice Neighborhoods, although in some of the larger hubs -- such as around the Research Triangle Park -- some parts of a hub may have little or no transit access.



6.5 Performance Evaluation Measures

Evaluation measures provide a set of metrics for quantitative comparison of transportation investments and land use scenarios. Detailed comparison tables addressing a range of roadway use, transit use, congestion and delay are included in Appendix 10.

The appendix tables compare the transportation network performance for the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO planning areas for the Year 2016, Year 2050 Deficiency network, and the 2050 Metropolitan Transportation Plan network. The Year 2016 represents the state of the system at the time transportation data like traffic counts, transit ridership and household travel surveys were collected, and is similar to pre-COVID conditions in the Triangle. The Year 2050 E+C (existing plus committed) network includes only those projects that will be operational in the next few years, but serving the forecast Year 2050 population and employment. The 2050 system represents the highway and transit networks from the 2050 MTP, serving the forecast Year 2050 population and employment.

The performance evaluation measures in Appendix 10 are system-wide metrics and therefore do not provide performance information on specific roadways or travel corridors, or at the scale of a municipality. The congestion maps (V/C maps), presented in Section 6.3 and available on-line, provide a more localized picture of transportation performance for individual roadways or roadway segments.

The conclusions drawn from the performance evaluation measures (system-wide) and congestion maps (roadway specific) tend to be similar. For example, the 2050 Deficiency congestion map illustrates a high degree of regional congestion as compared to the 2016 congestion map. This is validated by comparing performance measure values for the 2050 Deficiency and 2050 MTP networks for such metrics as daily “Vehicle Hours Traveled” (VHT). Vehicle Hours Traveled is highest for the 2050 Deficiency roadway network as compared to the 2016 calibration year and 2050 adopted MTP networks.

Key points from this section:

- The starting point for analyzing our choices was understanding how our communities’ comprehensive plans envision guiding future growth.
- The next step was to make our best estimates of the types, locations and amounts of future population and job growth based on market conditions and trends and community plans.
- Based on these forecasts, we looked at future mobility trends and needs, and where our transportation system may become deficient in accommodating these trends and meeting these needs.
- Working with a variety of partners and based on public input, we then developed different land use and transportation system alternatives and analyzed their performance.
- We compared the performance of system alternatives against one another and to performance targets derived from our goals and objectives. To understand transit investment impacts, we looked at “Travel Choice Neighborhoods,” places where travelers would have an option for transit use.
- This plan placed particular emphasis on understanding how our investments would serve “REINVEST Neighborhoods,” places with the greatest combinations of BIPOC, low-income and zero-car households, and where large amounts of existing legally-binding, affordability-restricted housing is located.

7. Our Metropolitan Transportation Plan: What We Intend To Do

Section 7 is the heart of our region’s Metropolitan Transportation Plan. This section describes the investments we plan to make, when we intend to make them, and the associated land use development strategies we aim to pursue to achieve an effective and efficient transportation system.

The transportation investments are summarized in the following categories:

- Roadways (with accompanying project list in Appendix 2)
- Public Transportation
- Active Transportation Projects serving bicyclists and pedestrians
- Freight Movement
- Aviation and Intercity Rail
- System Optimization including:
 - Programs to manage transportation demand
 - Intelligent transportation systems: technology investments
 - Transportation/congestion systems management: lower-cost roadway projects that do not add more travel lanes, but improve safety and/or operational efficiency.

7.1 Land Use & Development Strategies

Land use in the Triangle is the responsibility of each local government, not the MPOs. But few things influence the functionality and effectiveness of our transportation system as much as the locations, types, intensities and designs of existing and new developments in our region. If we are to successfully provide for the mobility needs of the 2 million people here today and the additional 1.2 million expected to be added over the life of this plan, we will need to do a top-notch job of matching our land use decisions with our transportation investments.

The ties between regional transportation actions and local land use decisions are significant in three cases:

1. Transit Corridor Development.
2. Major Roadway Access Management.
3. Complete Streets & Context-Sensitive Design.

Transit Corridor Development. *Connect2050* includes billions of dollars of bus and rail capital investments to connect our region’s largest activity centers and link these centers to neighborhoods across the region. Ensuring that affordable, well-designed, compact, mixed-use development occurs within a half mile of frequent transit corridors is a key element in determining how cost-effective major transit investments will be. Working with a range of local and regional partners, the Triangle J Council of Governments and GoTriangle have been leading efforts to develop and share key land use and affordable housing practices that can be used by local governments and other organizations to support fixed guideway and frequent bus investments. Continuing to build on this collaborative approach is an important and cost-effective way to match local land use and affordable housing decisions with regional transportation investments. Strategy work will be built on a firm analysis foundation that focuses on (i) travel markets, (ii) land use plans and policies, and (iii) affordable housing inventories, programs and opportunity sites. Where applicable, leveraging joint development for affordable housing as part of major transit capital projects will be pursued.









Major Roadway Access Management. Roads serve two main purposes: mobility and access. Mobility is the efficient movement of people and goods. Access is getting those people and goods to specific sites. A road designed to maximize mobility typically does so in part by managing access to adjacent properties. An example is an Interstate Highway. While long distance travel on an Interstate Highway is efficient, the number of access points is restricted to a limited number of interchanges. This type of road serves primarily a mobility function. At the other end of the spectrum, local streets provide easy and plentiful access to adjacent properties, but long distance travel would be time consuming. This type of road serves primarily an access function. Many costly road investments involve widenings to provide more capacity. Where these investments are made, the MPOs will work with the NCDOT and local communities so that new capacity is not inappropriately degraded by a pattern of “strip development” requiring numerous driveways and median cuts.

Complete Streets & Context-Sensitive Design. Street rights-of-way are the biggest share of our communities’ public realm: the spaces we share with our neighbors and which provide access to the front doors of homes and businesses. Where roads traverse town centers, walkable neighborhoods and important activity centers such as college campuses, the MPOs will work with the NCDOT and local communities to ensure that roads are appropriately designed to accommodate the full range of travel choices and that adjoining development is sited and designed to promote alternatives to auto travel. As the benefits of walking and cycling are better understood, creating safe and healthy streets is becoming a higher priority for MPO support.

For these three issues -- transit corridor development, major roadway access management and complete streets whose designs are sensitive to the neighborhoods of which they are a part -- the DCHC MPO and CAMPO are committed to work with their member communities and regional organizations such as the Triangle J Council of Governments and GoTriangle to coordinate land use decisions and transportation investments.

7.2 Shared Regional Investments

Shared Regional Investments are programs, projects or groups of related projects that transcend the boundary between the Durham-Chapel Hill-Carrboro MPO and the Capital Area MPO. Both MPOs include shared regional investments in their project lists and financial plans. For shared roadway projects especially, facility types and design details may differ between the MPOs, but each MPO’s component is intended to complement the investments made by the other MPO. The *Connect2050* Shared Regional Investments are:

<p>North Carolina Railroad Corridor Passenger Rail (1st phase from Durham to Garner or Clayton)</p>		<p>Regional Transit Center Relocation (serving regional buses, future BRT and future passenger rail)</p>	
<p>Triangle Bikeway along I-40 (NC 54 in Chapel Hill to I-440 in Raleigh)</p>		<p>Wake-Durham Bus Rapid Transit (extension of Wake Western Corridor BRT from Cary to RTP HUB)</p>	
<p>US 70 Durham: modernization Wake: freeway conversion</p>		<p>I-40 Durham: modernization Wake: managed freeway</p>	
<p>Aviation Parkway Durham: modernization Wake: new alignment</p>		<p>Triangle Transportation Demand Management Program</p>	

7.3 Complete Corridors

A central organizing principle for implementing the projects in this plan is a vision of a connected region composed of complete corridors. A complete corridor is:

- ➔ an equitable, sustainable and resilient set of transportation facilities and services ...
- ➔ ... that connects key neighborhoods and centers across boundaries ...
- ➔ ... to improve the flow of people, goods and information as the region continues to grow.

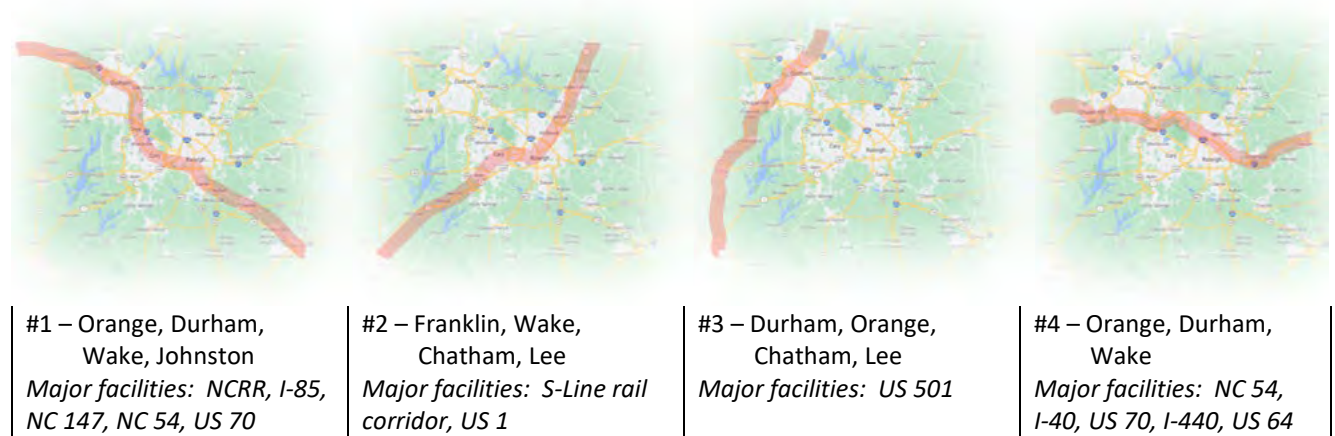
Complete corridors aren't separate and distinct projects – individual projects continue to be described in the remaining sections of this chapter and listed in the appendices. Rather, they are a way to show how sustained, mutually-reinforcing commitments to thoughtful projects can knit the region together in a way that best provides choices for travelers and supports equitable economic development for all.

A complete corridors approach includes:

- ❖ selected corridors that span at least 3 counties and involve more than one MPO or RPO
- ❖ showing how regional principles and priorities can be applied in each corridor context
- ❖ roadway, transitway and active transportation greenway elements
- ❖ depicting job hubs, key equity-centered neighborhoods and affordable housing opportunity sites
- ❖ corridor impact analysis, including measurable criteria related to travel, land use and affordable housing

Below are some examples of regionally significant, multi-county corridors that could become a focus for coordinated investments in transit, active transportation and complementary strategies for land use and housing affordability.

Figure 7.3.1 – Examples of Complete Corridors That Can Be Components of a Regional Vision



The MPOs and other regional partners are collaborating on developing and funding a project to create a guide for a connected region based on complete corridors.

7.4 Roadways

This section contains a list of major road investments in the 2050 Capital Area MPO and Durham-Chapel Hill-Carrboro MPO Metropolitan Transportation Plans. A full listing of all roadway projects, by time period is in Appendix 2, and detailed, navigable maps are on each MPO’s web site.

Projects are separated into four categories based on anticipated date of completion. 2030 projects are projects already underway with full funding and an expected completion date by 2030, derived from the adopted Transportation Improvement Program (TIP). The 2040 and 2050 projects are composed of projects selected through the alternatives analysis process described in Section 6.4 and that can be funded with existing revenue streams or reasonably foreseeable new revenue streams.

Due to funding constraints, a fourth category includes projects that had merit but could not be completed by 2050 with anticipated revenue. These projects that are not part of our fiscally constrained plans are included in the Comprehensive Transportation Plans (CTP) for each MPO. Each project in the fiscally-constrained plan has a project identifier that is shown on the 2050 MTP Road Project Map. The project listing in Appendix 2 includes information on each project’s limits, length, present and future lanes, funded completion year, cost estimation and whether it meets federal definitions for a regionally significant or exempt project.

Projects noted as “modernizations” do not add new general purpose travel lanes, although they can increase the capacity and reliability of roadways through improved intersection treatments and access management, including boulevard or “superstreet” designs with medians or parkway designs with grade-separations designed for slower speed travel. In urban areas, modernizations generally add bicycle, pedestrian, and transit facilities, add turn lanes at intersections, sometimes widen a narrow road, and sometimes improve curves and sight lines. In Rural areas, they typically widen a narrow road and shoulder, add turn lanes at intersections, and sometimes improve curve and sight lines.

Where new interchanges are indicated, they are often grouped with a highway project; if an independent interchange project, it will often involve roadway changes for some distance on either side of the interchange.

One clear message from both elected official discussion and public engagement during the development of the plan is that roadways need to be designed and engineered with much greater care than has been typical in the past, using more flexible and context-sensitive standards that have now been successfully implemented in many places. Especially in urban and urbanizing locations, designs should prioritize steady, safe, reliable, moderate-speed travel, rather than emphasize high-speed travel.



Parkway Design



Boulevard Design



Superstreet Design

Figures 7.4.1 and 7.4.2 list major highway projects by time period in each MPO. Larger, navigable versions of the roadway maps are available on the MPO web sites at the links provided.

Figure 7.4.1. DCHC MPO Major Roadway Projects List (estimated cost > \$100 million) and All Projects Map

Durham Chapel Hill-Carrboro MPO		
2021-30	2031-40	2041-50
East End Connector linking US 70 to NC 147 (Durham Freeway) to form I-885*	US 15-501 modernization (South Columbia in Chapel Hill to Cameron Blvd. in Durham)	
I-40 widening in Orange County (US 15-501 to I-85)	I-40/NC 54 Interchange and NC 54 modernization (TIP# U-5774)	
	US 70 modernization in Durham County (Lynn Road to Wake County)	
	I-85 widening in Orange County (Orange Grove Rd. to Sparger Road.)	
	US 15-501 Synchronized Street (Smith Level Road to US 64 in Chatham Co.)	
	I-40 managed roadway modernization (NC 54 to Wake County; links to CAMPO I-40 project)	
	NC147 modernization (I-40 to Swift Ave.)	

* funded in prior years but open to traffic in indicated time period

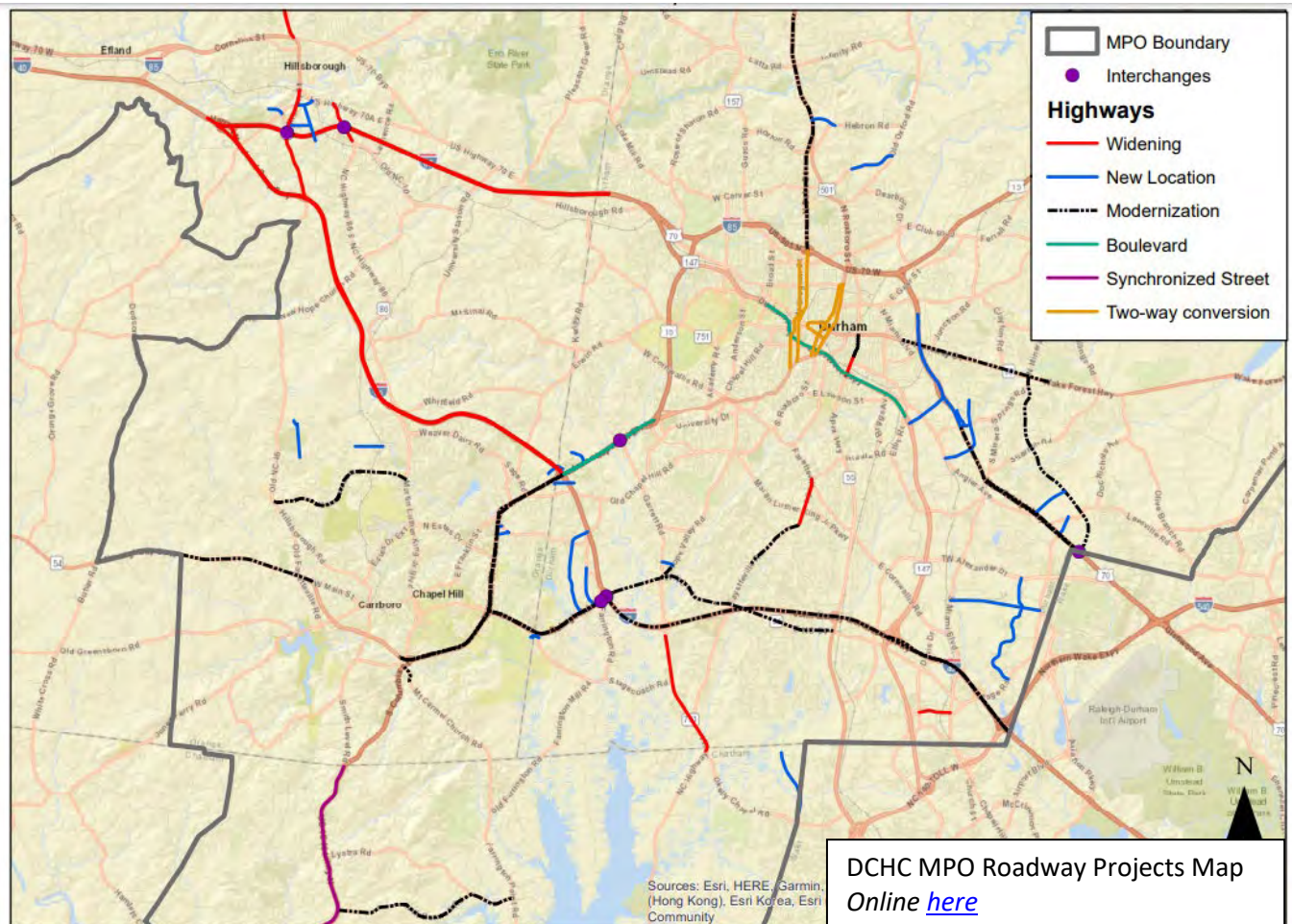
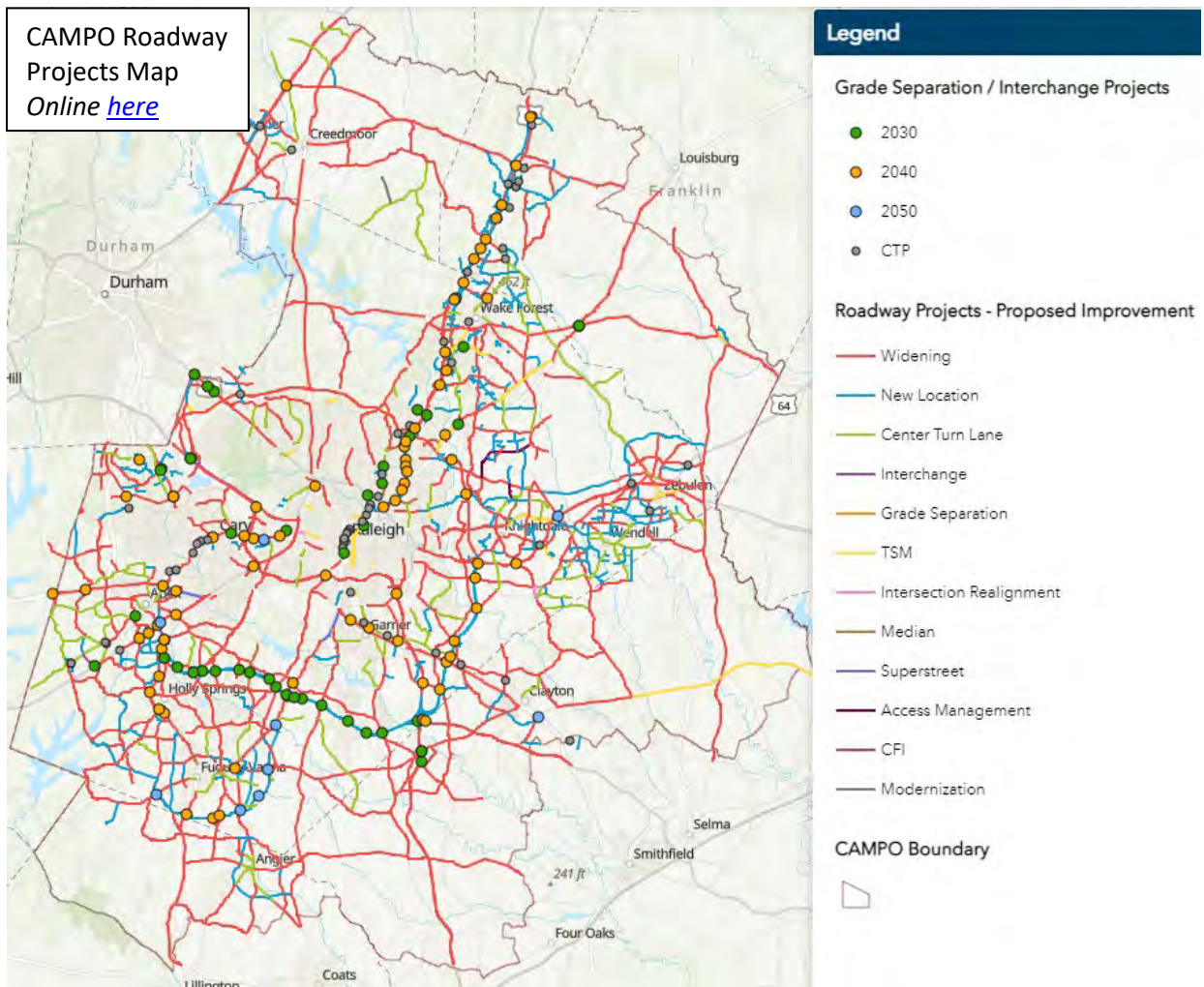


Figure 7.4.2. CAMPO Major Roadway Projects List and All Projects Map

Capital Area MPO		
2021-30	2031-40	2041-50
I-40 widened from Wade Ave. to Lake Wheeler Road	I-40 widened from I-440 to NC 42 in Johnston County	I-87 widened from US 64 Bus to US 264
I-440 widened from Wade Avenue to Crossroads	I-87 widened from I-440 to US 264	NC 210 widened from Angier to Lassiter Pond Rd.
I-40 widened from I-440 to NC 42 in Johnston County	US 1 widened south from US 64 to NC 540	NC 50 widened from NC 98 to Creedmoor
US 64 W corridor improvements from US 1 to Laura Duncan Rd.	Managed lanes added to I-540 (Northern Wake Expressway) from I-40 to US 1	US 401 widened from Fuquay-Varina to MPO boundary in Harnett County
NC 540 toll road extended from Holly Springs to I-40 south of Garner	NC 540 completed as a toll road from Holly Springs to I-87/US 64 bypass	NC 96 widened from US 1 to NC 98
US 70 widened and access management from I-540 to Durham/Wake Co. Line	Managed lanes added to I-40 from Durham County line to MPO boundary in Johnston County	NC 56 widened from I-85 to MPO boundary in Franklin County



7.5 Transit Facilities & Services

Extensive transit planning efforts have recently been completed or are underway, resulting in updated transit plans in Durham, Orange, and Wake Counties. The county plans provide dedicated revenues to finance transit improvements, including enhanced regular bus service, high-quality fixed-guideway projects, improved transit centers and stops, and services to connect job centers and equity-centered neighborhoods.

Among the projects identified in the county transit plans and included in this 2050 MTP are a variety of premium transit investments designed to provide faster, frequent, reliable service in major corridors. Two types of fixed-guideway transit investments are included in this 2050 MTP:

- **Bus rapid transit (BRT)** encompasses a variety of enhancements to regular bus service, such as large stations with off-board ticketing, dedicated lanes that allow buses to bypass congested automobile traffic and improve system reliability, priority treatment at traffic signals, and other improvements.
- **Commuter rail transit (CRT)** service operates in existing rail corridors, serving stations that generally are spaced farther apart than on light rail or bus rapid transit lines. Although originally oriented to conventional 9-to-5 commuters, most CRT systems in the US are increasingly expanding their focus to mid-day, evening, and weekend services to serve more diverse travel markets.

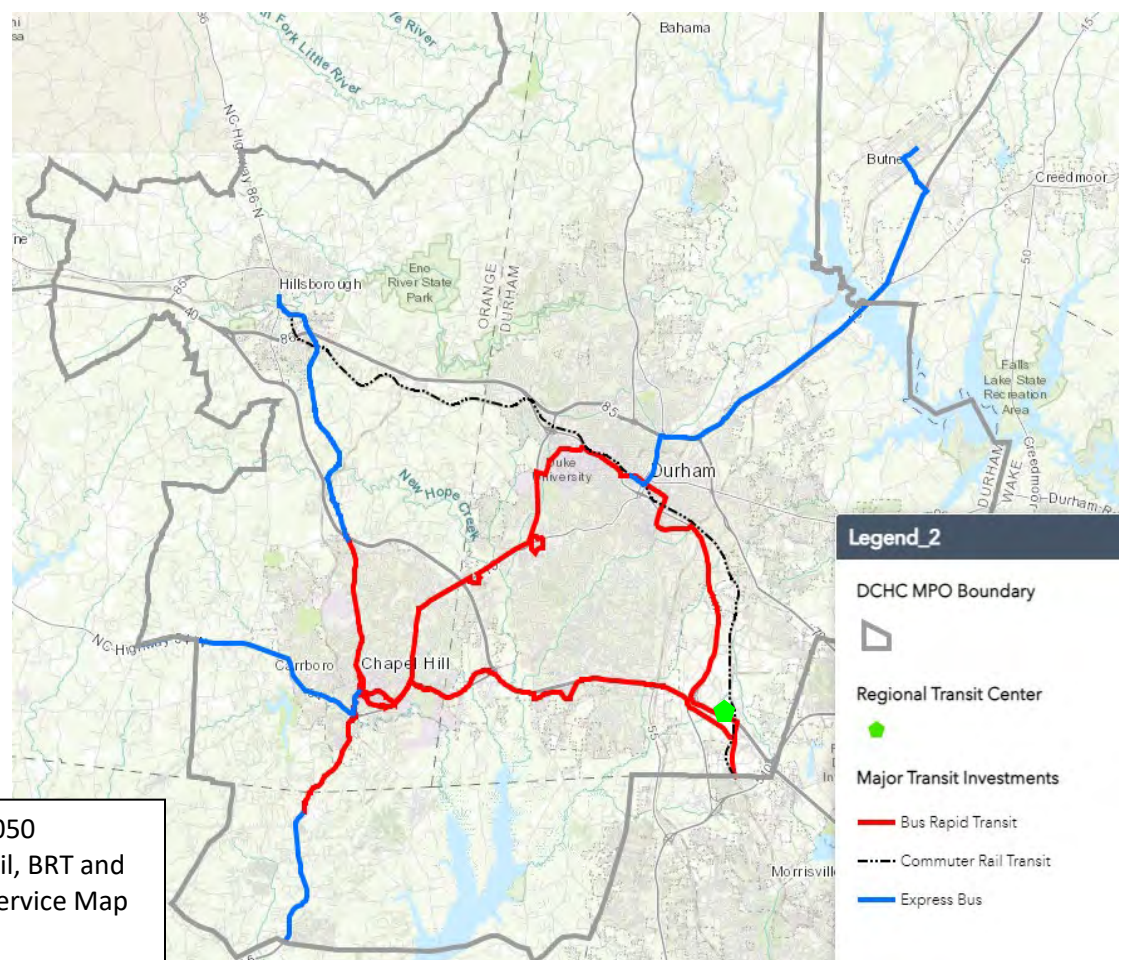
Figure 7.5.1 lists fixed guideway projects and Figures 7.5.2 and 7.5.3 depict interactive on-line transit maps.

Figure 7.5.1 Transit Fixed Guideway Projects

Project Title	Programming Description	MTP Horizon Year	MPO
Commuter Rail Transit (CRT)	CRT using the existing North Carolina Rail Company (NCRR) corridor. West Durham to Clayton by 2030, then extended to Hillsborough and Selma by 2050.	West Durham to Clayton, 2030 Hillsborough to Selma, 2050	DCHC CAMPO
Bus Rapid Transit – Chapel Hill North-South	BRT in Chapel Hill, from Eubanks Road, through the UNC Healthcare complex, and to Southern Village. Part on bus-only lanes and part in mixed traffic.	2030	DCHC
Bus Rapid Transit – Central Durham	BRT in central Durham, from the Duke University and Medical Center area, through downtown Durham and the central bus station, to the North Carolina Central University and Durham Tech area. Part on dedicated lanes and part in mixed-traffic.	2040	DCHC
Bus Rapid Transit – Durham/Chapel Hill	BRT between Durham and Chapel Hill, from UNC Health complex to the Duke University and Medical Center area, via US 15-501. Part on bus lanes or bus-on-shoulder-system (BOSS), part in mixed-traffic.	2050	DCHC
Bus Rapid Transit – Durham/RTP	BRT between central Durham and the Research Triangle Park (RTP), from the North Carolina Central University/Durham Tech area to the regional transfer center in the RTP, via NC 147. In mixed traffic, and part possibly on bus-on-shoulder-system (BOSS).	2050	DCHC
Bus Rapid Transit – Chapel Hill/RTP	BRT between Chapel Hill and the Research Triangle Park, from UNC Health complex to the regional transit center in the RTP, via NC 54 and I-40. Part in mixed traffic, and part bus-on-shoulder-system (BOSS).	2050	DCHC

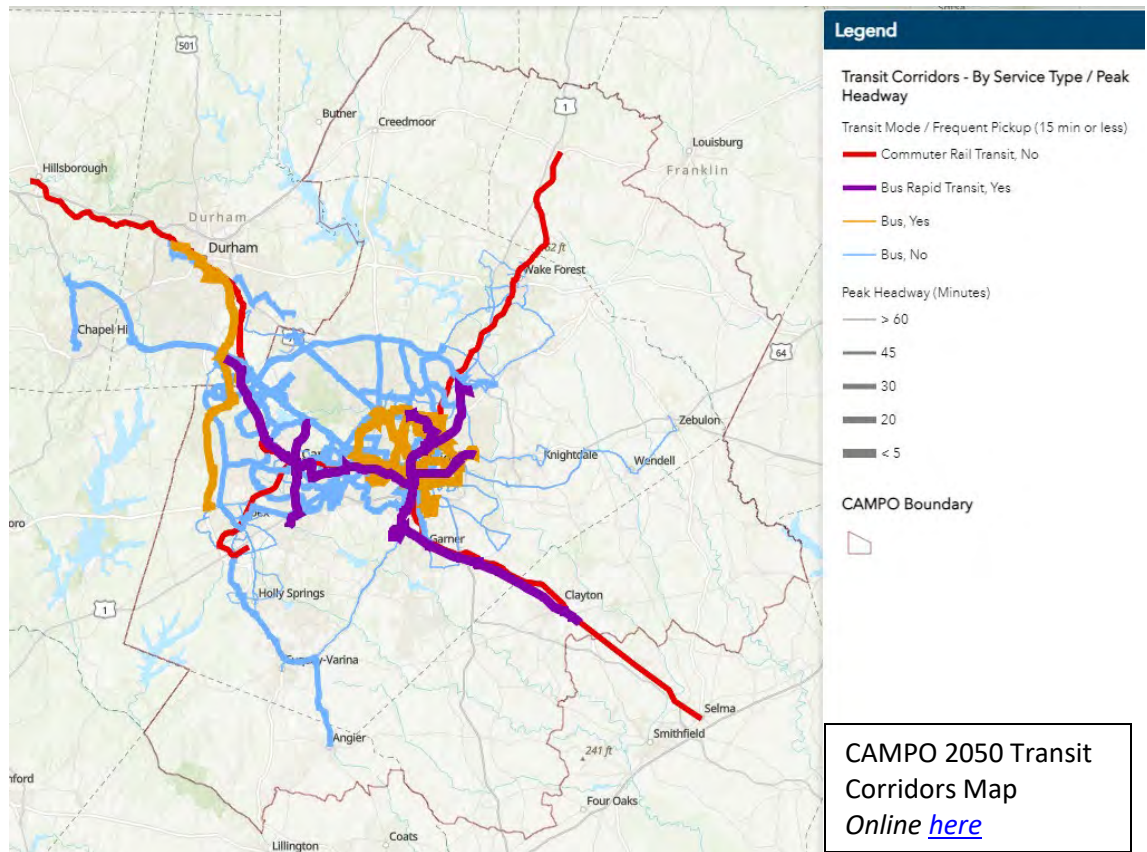
Project Title	Programming Description	MTP Horizon Year	MPO
Bus Rapid Transit – Wake New Bern	BRT - New Bern East - Downtown Raleigh to Stony Brook Rd - Fixed Guideway	2030	CAMPO
Bus Rapid Transit - Wake	BRT - New Bern East - Stonybrook Rd to New Hope Rd - Mixed Traffic	2030	CAMPO
Bus Rapid Transit - Wake	BRT – RTP Hub to Morrisville - Mixed Traffic	2030	CAMPO DCHC
Bus Rapid Transit - Wake	BRT - Morrisville to Downtown Cary - Mixed Traffic	2030	CAMPO
Bus Rapid Transit - Wake	BRT - Downtown Cary to Downtown Raleigh - Fixed Guideway	2030	CAMPO
Bus Rapid Transit - Wake	BRT - Downtown Raleigh to Midtown Raleigh/North Hills - Fixed Guideway	2040	CAMPO
Bus Rapid Transit - Wake	BRT – Harrison/Kildaire Farm, SAS Campus Dr. to and Regency Park, via Harrison Ave., Kildaire Farm Rd., and Regency Dr. - Fixed Guideway	2050	CAMPO
Commuter Rail – S-Line	CRT using the existing CSX S-Line corridor. Apex to Franklinton.	Apex to Franklinton, 2040	CAMPO

Figure 7.5.2
DCHC MPO
Major Transit
Project Maps



DCHC MPO 2050
Commuter Rail, BRT and
Express Bus Service Map
[Online here](#)

Figure 7.5.3
CAMPO
Transit
Projects
Map



Another type of fixed transit investment is a transit center – a place where multiple modes and routes come together to provide easy transfers between routes.

The MTP includes on-going and planned transit center development, including the Raleigh Union Station Bus Center, the relocation of the Regional Transit Center – a shared regional investment of both MPOs, improvements to the downtown Durham Transit Center and proposed additional centers that are anticipated to be part of the forthcoming Durham County Transit Plan update.



Figure 7.5.4 Transit Center Projects: Regional Transit Center Relocation (left) and RUS Bus (right)

Additional information related to transit capital projects is included in Appendix 3.

Although fixed guideway projects and transit centers may be some of the more visible transit investments, most transit use occurs in vehicles operating in “mixed traffic,” that is, on general purpose roadway lanes that are shared with cars and trucks.

These services range from frequent scheduled transit services in high-density, high ridership corridors to on-demand microtransit services and, by their very nature, can adapt to changing conditions. Figure 7.5.5 depicts rules of thumb for the deployment of different types of services. This section discusses the two bookends of mixed-traffic transit services: (i) frequent scheduled transit services and (ii) on-




























LAND USE			TRANSIT	
Land Use Type	Residents per Acre	Jobs per Acre	Appropriate Types of Transit	Frequency of Service
 Downtowns & High Density Corridors	>45	>25	 Light Rail  BRT  Rapid Bus  Local Bus	 10 mins or better
 Urban Mixed-Use	30-45	15-25	 BRT  Rapid Bus  Local Bus	 10-15 minutes
 Neighborhood & Suburban Mixed-Use	15-30	10-15	 Local Bus	 15-30 minutes
 Mixed Neighborhoods	10-15	5-10	 Local Bus  Micro-transit	 30-60 minutes
 Low Density	2-10	2-5	 Micro-transit  Rideshare  Volunteer Driver Pgm	 60 mins or less or On Demand
 Rural	<2	<2	 Rideshare  Volunteer Driver Pgm	 On Demand

Figure 7.5.5 Land Use & Supported Types of Transit (credit: NelsonNygaard)

Where mixed-traffic transit services are deployed is determined by the County Transit Plans, which are incorporated in this MTP by reference and available at the websites below:

- 2021-2030 [Wake County Transit Plan](#)
- 2021-2040 [Durham County Transit Plan](#) (update to be completed in 2022; link is to plan website)
- 2021-2040 [Orange County Transit Plan](#) (update to be completed in 2022; link is to plan website)

The transit plans cover both local and regional transit operators; additional transit services are provided by the university-based Duke Transit and NC State University Wolfline systems. Based on these county transit plans, annual transit work programs are adopted each year detailing specific capital and operating funding. As part of the county plans, transit operators are placing an emphasis on alternatively fueled vehicles, such as electric, diesel/electric hybrid and compressed natural gas vehicles.

Transit investment is more than new buses; ensuring sound maintenance of transit assets and safe, inviting connections to transit facilities and services matter too. Both MPOs have transit asset performance targets, including for State-of-Good-Repair. First-mile, last-mile connections to transit services – such as sidewalks, bike lanes and street crossings -- are funded from both county transit tax revenues and other sources.

Frequent Scheduled Transit Services: A transit axiom is that “frequency is freedom.” As service improves from 2 buses every hour (30-minute frequency) to 3 buses per hour (20-minute frequency) to 4 buses per hour (15-minute frequency), transit begins to serve people’s lives rather than riders needing to plan their lives around transit. Frequent service is usually only cost-effective where densities are high and activity centers aligned along a route, so complementary land use policies are critical to success. Appendix 3, the MTP on-line maps and the County Transit Plans show transit frequency.

Demand-Responsive Microtransit Services: On the other end of the spectrum, where both land use density and conventional bus ridership is low, new app- and phone-based on-demand microtransit services can give users both more timely service and a wider range of destinations than is possible with fixed bus routes. In CAMPO, Morrisville recently launched its [SmartShuttle](#) service, and in DCHC MPO, Durham is piloting a micro-transit project and anticipates expanded microtransit services as part of the 2022 County Transit Plan update.

7.6 Active Transportation and Micro-Mobility Investments

Active transportation by walking and bicycling are becoming integral forms of travel in the Triangle Region. The land use characteristics of local universities, business districts, and major activity centers encourage short trips that can be easily served by biking, walking, scootering or other active and micro-mobility modes. Urban centers retain attractive, grid street patterns with retail and residential developments that lend themselves well to active forms of transportation, and the region's rural landscapes provide opportunities for tourism and recreational cycling. Additionally, the area's geography and mild year-round climate make these modes viable travel options.

Since the adoption of the region's previous long-range plan in 2018, several important initiatives have been undertaken, including the following:

- In 2021 the MPOs jointly adopted a policy priority entitled "Make North Carolina a Leader in Active Transportation," with a goal of surpassing peer states in funding economically beneficial and safety-focused bicycle & pedestrian projects.
- In 2020 the NCDOT released the Great Trails State Plan that focused on a network of shared-use paths in all 100 counties that can serve transportation purposes, providing connections between where people live, work and play.
- In 2019 the N.C. Board of Transportation adopted a revised Complete Streets Policy, which requires NCDOT planners and designers to consider and incorporate multimodal facilities in the design and improvement of all appropriate transportation projects in North Carolina. The policy is supported by the Complete Streets Implementation Guide and other guidance and training.
- During the COVID 19 pandemic beginning in 2020, communities in the Triangle implemented various initiatives to address the desire of residents to find safe, healthy ways to enjoy outdoor activities while supporting physical distancing during the COVID-19 pandemic. Examples included the Shared Streets pilot projects in Raleigh and Durham, reducing the number of travel lanes in favor of walkways in the street on Franklin Street in Chapel Hill, and the reallocation of parking for outdoor dining in several communities.
- The number of motor vehicle crashes involving pedestrians and bicycles has motivated NCDOT and local governments to adopt Vision Zero goals and programs. Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, and equitable mobility for all.
- Communities in both MPOs have expanded Safe Routes to School programs that aim to educate students on how to walk and bicycle safely and encourage programs whereby students walk or bike to school or walk or bike at school during Walk and Bike to School Days.

In response to the increased demand for bike and pedestrian travel, CAMPO and DCHC MPO are promoting the creation of a pedestrian and bicycle system that provides greater access not only to schools but to parks, transit stops, job hubs, grocery stores, and other destinations. Regional and statewide facilities such as the East Coast Greenway, the Neuse River Greenway, and the American Tobacco Trail are heavily used. Many communities have prepared their own city and county bicycle and pedestrian plans and are working toward the development of a safe, accessible, and convenient network of regional bicycle and pedestrian routes.

Pedestrian Facilities

Pedestrian facilities in the region vary in type, condition and level of service. Urban areas in the MPOs often have suitable sidewalk facilities, however many thoroughfares lack any pedestrian accommodations or relegate pedestrians to one side of the roadway. Historically, suburban development has been inattentive to pedestrian needs, leading to incomplete pedestrian networks within highly populated commercial and residential areas. Also, many areas once classified as rural are seeing increases in development, and citizens are demanding pedestrian access from their neighborhoods to nearby destinations. Local governments recognize these pedestrian needs, and are working toward filling missing links in local sidewalk networks.

On a regional level, the MPOs encourage pedestrian projects. Most town and city governments have instituted sidewalk requirements for new development, and sidewalk upgrades are generally included in roadway construction projects. Most roadway projects in the 'Roadway Element' of the MTP are expected to provide appropriate accommodations for pedestrians, concurrent with roadway improvements. Missing links and gaps in the pedestrian networks will be constructed retroactively. Priority is generally given to areas with heavy pedestrian traffic generators, such as schools, parks, transit stops, and business districts, and to address historic inequities the provision of sidewalks.

Figure 7.5.1 – Local Plans and Inventories Used for Pedestrian Facility Recommendations

- | | |
|---|--|
| <ul style="list-style-type: none"> • Chapel Hill Mobility and Connectivity Plan (2020) • DurhamWalks! Pedestrian Plan (2006) | <ul style="list-style-type: none"> • Durham Bike+Walk Implementation Plan (2017) • Hillsborough Community Connectivity Plan (2009, revised 2014 & 2017) |
| <ul style="list-style-type: none"> • Angier Pedestrian Plan (2014) • Apex Pedestrian Plan (2019) • Archer Lodge Bicycle/Pedestrian Plan (2020) • Cary Pedestrian Plan (Imagine Cary) (2017) • Creedmoor Pedestrian Plan (2011) • Fuguay Varina Pedestrian Plan (2013) • Harnett County Bicycle, Pedestrian, and Greenway Plan (2021) • Wake County Greenways Master Plan (2017) | <ul style="list-style-type: none"> • Holly Springs CTP (2013) • Knightdale Comprehensive Pedestrian Plan (2013) • Raleigh Comprehensive Pedestrian Plan (2013) • Wendell Pedestrian Plan (2017) • Youngsville Bicycle/Pedestrian Plan (2015) • NCSU Transportation Master Plan (2017) • Center of the Region Bicycle and Pedestrian Plan (2016) |

Bicycle Facilities

The 2050 MTP recommends extensive integration of bicycle needs into the design and construction specification of new highways and other future or ongoing transportation projects. The bicycle projects include off-road shared-use bicycle paths, on-road bicycle lanes (including protected lanes), and bicycle boulevards in urban areas, as well as paved 4-foot shoulders on rural roads. Highway and transit project designs assume the provision of bicycle racks and other bicycle and pedestrian amenities at key locations such as park-and-ride lots, transit hubs, and major activity centers.



The Triangle Bikeway preferred alignment spans 23 miles from US-15/501 in Chapel Hill to I-440 in Raleigh

The 2050 MTP identifies statewide and regional bicycle routes in the Triangle region. Statewide routes include NCDOT-designated Bicycling Highways as well as the East Coast Greenway. Regional bicycle routes provide links between major destinations and between urban centers; facilitate primarily utilitarian bicycle trips, though the routes can also serve recreational cycling; and serve as a backbone to a finer grained system of local bicycle routes in each jurisdiction. Figure 7.5.2 lists these local plans.

Figure 7.5.2 – Local Plans Used for Bicycle Facility and Trail Recommendations

- | | |
|--|---|
| <ul style="list-style-type: none"> • Carrboro Comprehensive Bicycle Transportation Plan (2020) • Chapel Hill Mobility and Connectivity Plan (2020) • Chapel Hill Mobility and Connectivity Plan (2020) • Chatham County Bicycle Plan (2011) • Durham Bike+Walk Implementation Plan (2017) • Durham City and County Comprehensive Bicycle Plan (2006) | <ul style="list-style-type: none"> • Durham Trails and Greenways Master Plan (2011) • Hillsborough Community Connectivity Plan (2009, revised 2014 & 2017) • Orange County Comprehensive Plan: Transportation Element (2008) • Research Triangle Park Bike/Ped Plan (2017) • Research Triangle Park Trails Study (2020) • Triangle Bikeway Study (2022) |
| <ul style="list-style-type: none"> • Apex Bicycle Plan (2019) • Archer Lodge Bicycle/Pedestrian Plan (2020) • Center of the Region Bicycle and Pedestrian Plan (2016) | <ul style="list-style-type: none"> • NCSU Transportation Master Plan (2017) • Harnett County Bicycle, Pedestrian, and Greenway Plan (2021) • Morrisville Transportation Plan (2008) |
| <ul style="list-style-type: none"> • Cary Imagine Cary Plan (2017) • Creedmoor Bicycle Plan (2011) | <ul style="list-style-type: none"> • Raleigh Bicycle Transportation Plan (2016) • Rollin' in Rolesville Bicycle Plan (2011) |
| <ul style="list-style-type: none"> • Fuquay-Varina Community Transportation Plan (2017) • Garner Forward Transportation Plan (2019) | <ul style="list-style-type: none"> • Triangle Bikeway Study (2022) • Wake County Greenways Master Plan (2017) • Youngsville Bicycle/Pedestrian Plan (2015) |
| <ul style="list-style-type: none"> • Holly Springs Comprehensive Transportation Plan (2013) | <ul style="list-style-type: none"> • Zebulon Multimodal Transportation Plan (2014) |

Note – Additional local bicycle and pedestrian plans are either beginning or in progress to completion by 2022.

Education & Encouragement

In addition to facility improvement projects included in the MTP, the DCHC and Capital Area MPOs devised a series of local education and encouragement programs. Outreach programs are essential elements of any bicycle and pedestrian friendly community, and complement the engineered components of a bicycle and/or pedestrian route network. The following recommendations are intended to increase bicycle and pedestrian safety and provide the incentive to get more people biking and walking in the region.

Education efforts include bicycle skills instruction for youth and adults, educational messages about laws and best practices and on cyclists' rights to use the road. Encouragement efforts include incentives for employee bicycle commuting, annual "Bike-to-Work" activities, and Safe Routes to Schools events. The MPOs and local jurisdictions also provide resources such as bicycle maps, safety and education materials, bicycle racks, and bicycle repair stations. The jurisdictions of Carrboro, Cary, Chapel Hill, Durham, and Raleigh have been recognized as "Bicycle Friendly Communities" by the League of American Bicyclists.

Summary

The 2050 MTP does not specifically list all planned bicycle and pedestrian projects in the region. Local municipalities and counties have identified and prioritized these projects, and have coordinated their interaction at the jurisdiction boundary areas. As a result, the 2050 MTP defers to local government plans.

The DCHC MPO bicycle and pedestrian policy basically expects any roadway or other transportation project, whether it is a new or improved facility, to include appropriate pedestrian and bicycle accommodations. That policy provides extensive integration of bicycle and pedestrian needs into the design and construction of all transportation projects. In addition, the "NCDOT Complete Streets Implementation Guide" and other guidance from the American Association of State Highway Transportation Officials (AASHTO), the National

Association of City Transportation Officials (NACTO), and the Federal Highway Administration (FHWA) provide planning and design guidance for use when building new projects or making changes to existing infrastructure. For bicycle facilities, the Durham-Chapel Hill-Carrboro MPO adopted a [Comprehensive Transportation Plan \(CTP\)](#) in May 2017 that lists all the local bicycle projects from the jurisdiction and county plans in the MPO area as shown on the Bike-Ped-Multiuse map and the tables in the CTP. Also, Appendix 4 lists statewide and regional bicycle routes in the MPO region.

Although the 2050 MTP does not list the individual bicycle, pedestrian and multiuse path projects, the 2050 MTP requires an estimate of the level of investment for purposes of the financial plan. The DCHC MPO reviewed local plans and made the following estimates of infrastructure in those plans: 175 miles of sidewalk per decade; 70 miles of shared use paths per decade; 80 miles of protected bike lanes per decade; and, 20 miles of bicycle boulevards per decade. A total of approximately 20 miles of the shared use path and 30 miles of the sidewalk/bike lane will be constructed as part of roadway modernization projects. Thus, a total \$2.679 billion is required to complete the projects in the local plans. See the table below.

	Length (mi)	Unit Cost (ft)	Total Cost (\$millions)
Sidewalk	495	\$ 250	\$ 653
Shared Use Path/Sidepath	190	\$ 500	\$ 502
Protected bike lane (both sides)	240	\$ 1,200	\$ 1,521
Bicycle Boulevard	60	\$ 10	\$ 3
Total			\$ 2,679

The Capital Area MPO map in Appendix 4 communicates an extensive regional layout of off-road bicycle and pedestrian facilities in conjunction with on-road facilities that will receive bicycle-pedestrian accommodations only. This on-road/off-road network is congruent in scope, and communicates opportunities for multiple forms of access throughout the region. Note that many roadway projects will incorporate bicycle and pedestrian accommodations in conjunction with capacity improvements; which is consistent with the principle of “universal access” as addressed in the Capital Area MPO Bicycle and Pedestrian Plan adopted in 2003. Roads that will receive bicycle and pedestrian accommodations only are those roads that did not meet strict criteria for capacity improvements; but in practicing good transportation system management would qualify as candidates for bicycle and pedestrian accommodations.

Statewide bicycle and pedestrian corridors are those designated at the national or state level. These corridors are at the highest functional classification level and serve as the backbone and trunk lines for the bicycle and pedestrian network. These corridors typically serve an inter-regional purpose and span multiple regions and/or states. Regional bicycle and pedestrian corridors are those that serve an intra-regional purpose. These corridors are the mid-level functional classification and may have several characteristics: (1) - Provide links between jurisdictions; (2) Facilitate primarily utilitarian trips, though the corridors can also serve recreational purpose; (3) Serve as the main branches of the bicycle/pedestrian network that provide intra-connectivity for the finer grained system of local jurisdiction corridors; and (4) Provide connectivity between other regional corridors and connect between local and intra-regional corridors.

Figure 7.5.3 - Bicycle & Pedestrian Investment

2021-2050 Bicycle and Pedestrian Investment (\$2020)		
Total	CAMPO	DCHC MPO
\$7,634,000,000	\$4,955,000,000	\$2, 679,000,000

* excludes bike/ped elements of complete streets projects

7.7 Strategies to Manage Transportation Demand

Each year, hundreds of millions of dollars are spent in the region on the supply side of mobility: building and maintaining roads, buying and operating buses, building sidewalks and bicycle facilities. Some of the most cost-effective mobility investments we can make are on the demand side: spurring travelers to use our transportation facilities more efficiently by ridesharing, taking transit, telecommuting, walking or bicycling.

Marketing and outreach efforts targeted to commuters and the employers they work for are called Transportation Demand Management, or TDM. The Triangle TDM program – called the *Triangle Transportation Choices Program* – is active in Chapel Hill, Carrboro, Raleigh, Research Triangle Park, Durham County, Orange County, Wake County, Duke University, NC State University, UNC-Chapel Hill, and Wake Tech Community College. Because of its, cost-effectiveness, strengthening support for TDM is one of the joint MPO’s adopted transportation priorities.

Connect2050 calls for continuation and expansion of the TDM approach that combines funding from the two MPOs and NCDOT with significant matching funds from the local and regional service providers. This TDM approach has been shown to be very effective. In 2019, pre-COVID, 96,000 workers were employed at a designated *Best Workplace for Commuters*, places where employers offer commute benefits such as subsidized transit passes, vanpooling, bicycle facilities or telework. The following travel, air quality, and energy saving impacts were calculated due to the collective efforts of Triangle TDM service providers in FY19-20:

- 6.5 million vehicle trips avoided
- 2.9 million gallons of gas saved
- 70 million commute miles reduced
- 58 million pounds of carbon dioxide (CO₂) release prevented

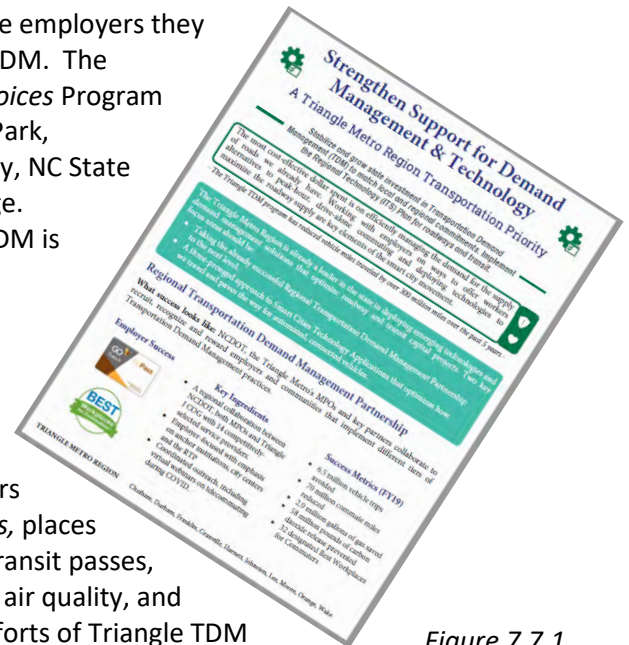


Figure 7.7.1
Triangle Transportation
Priority Addressing TDM

The region's TDM program is based on the *Triangle Region Transportation Demand Management Plan*. First adopted in 2007, the TDM plan was revised in 2014. Goals for a major rewrite of the plan were developed in 2019 and the update will be completed in 2022. Implementing the plan is designed to support the goals of NCDOT’s 2018 Statewide TDM Plan Update: “achieve improved accessibility, connectivity, economic growth, environment, public health and safety through enhanced performance transportation demand management service provisions.” The [Triangle Transportation Choices](#) program provides a systematic framework for TDM coordination and a mechanism for more state and federal funding for TDM.

The TDM approach recognizes that the most effective TDM strategies are targeted to job hubs: places where employment is concentrated, especially sites where transit service is available and/or parking is costly or inconvenient, such as in downtowns and at university campuses. These hubs, based



Figure 7.7.2 TDM Coordinators
tabling at Rex Hospital

on job density metrics, are updated periodically, and used to help service providers understand the evolving employment landscape, and to help funders understand where services are being targeted and how hubs align with existing transit services. In addition to the hubs, the TDM program has mapped the locations of equity-based *REINVEST Neighborhoods* so that TDM efforts can be targeted to link historically under-represented communities to job hubs.

Continuing to implement and extend this TDM Plan is included in the *Connect2050* Plan. Implementation includes a recommendation for more stable, multi-year funding for the TDM program and:

- aggregating funding from the sponsors: state funds from NCDOT and federal funds allocated by the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO,
- issuing a competitive call for projects from providers of TDM services, and
- working with an Oversight Committee of state and MPO staff that works with applicants to refine their proposals and makes recommendations for funding.

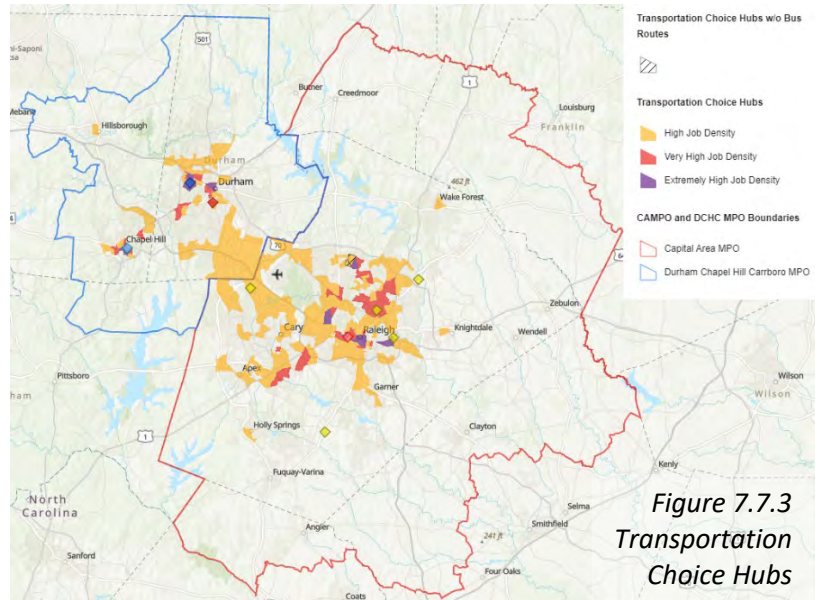


Figure 7.7.3
Transportation
Choice Hubs

Based on this plan and the current level of the region’s comprehensive, coordinated TDM program, the 2050 Metropolitan Transportation Plans include continued funding for TDM services and will follow the existing model where service providers supply a significant cost share to match federal and state funds.

The key Transportation Demand Management strategies in the 2050 Metropolitan Transportation Plan are:

1. Continue to invest in a collaborative regional program between the two MPOs and NCDOT through a single coordinating agency providing administrative, fiscal and measurement services.
2. Periodically review and update the regional TDM plan to serve as the guidance document for regional TDM collaboration roles and responsibilities.
4. Continue and strengthen the regional collaboration’s “three-legged stool” of services:
 - a. “foundational” services provided throughout the region by a designated regional service provider,
 - b. local services in selected hubs provided through a competitive process involving local service provider funding matches, and
 - c. support and recognition programs for measurable “best practice” employers
5. Review and modify “transportation choice hubs” locations where TDM efforts can be most effective.
6. Continue to examine the use of new technologies and innovative demand management techniques such as parking cash-out programs or TDM-based land use criteria.
7. Refine the measurement of TDM program impacts by adding more evidence-based techniques, such as the new FHWA-funded TDM Return-On-Investment (ROI) calculator.
8. Contribute to NCDOT’s Vehicle Miles Traveled (VMT) Reduction Task Force and seek opportunities to implement TDM strategies arising from the Task Force’s work.

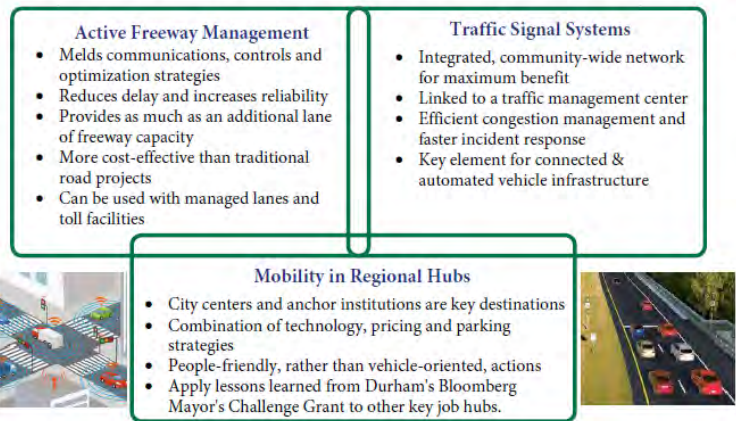
The TDM program can be a crucial component of the overall transportation system, spurring employers to encourage the use of alternatives to driving alone and helping commuters understand and use alternatives.

7.8 Transportation Technologies

Technology has long been an important part of the transportation system, from safety features on private vehicles to traffic information and traffic control signals and devices in public investments. This section of the plan addresses both vehicle technologies and public facility and service investments. Strengthening support for transportation technologies was chosen by the MPOs as one of their top transportation priorities, with an emphasis on active freeway management, traffic signal system integration and mobility in regional hubs.

Smart City Technologies

What success looks like: Technology applications that overcome uncertainty and take evidence-based steps to better manage freeways, local streets and travel in our region's hubs.



Technological advancement is anticipated to significantly affect mobility over the span of this plan. Much of this advancement is expected to be vehicle-oriented, with the continued introduction of connected and autonomous vehicles. Levels of vehicle automation lie along a spectrum:

0	1	2	3	4	5
No Automation	Driver Assistance	Partial Automation	Conditional Automation	High Automation	Full Automation
A human driver is in control of all driving functions.	An advanced driver assistance system (ADAS) can assist the human driver in either steering or braking/accelerating, but never at the same time.	ADAS can control both steering and braking/accelerating simultaneously, but requires the human driver to continue to pay full attention at all times and assume control outside of those two functions.	All driving functions are performed by an automated driving system (ADS) in some circumstances, but the human driver must be able to respond when requested by the ADS. The driver assumes control in environments unmanageable by the ADS.	All driving functions are performed by an ADS in some circumstances, during which the driver does not need to pay attention. The driver assumes control in environments unmanageable by the ADS.	All driving functions are performed by an ADS in all circumstances. Human occupants are now passengers as opposed to drivers.

Although autonomous vehicle technology continues to make in-roads, its market penetration may not result in substantial changes in public infrastructure investment decisions until the long-term period of this plan (post-2040). Forecasts of market penetration vary widely, but Level 4 and Level 5 vehicles may only become a large enough share of the market to affect infrastructure design and capacity in the long-term future. Nevertheless, it may be worthwhile to explicitly consider impacts of faster or slower market penetration in decisions about fixed, costly and long-lived assets, such as parking garages or freeway widenings, especially if assets would be difficult to repurpose for a society with extensive automated and connected vehicles.

Significant market penetration may occur soonest for fleet vehicles such as trucks, buses and other vehicles where vehicle operators are a significant part of the cost of a service and where operator rest time (and thus vehicle down time) is important for safe operation. The MPOs and their regional partners will continue to track and report on information and sources on autonomous and connected vehicles. Appendix 5 lists resources on autonomous and connected vehicles.

In this plan, public investments in technology are grouped under the term "Intelligent Transportation Systems (ITS)," a set of diverse technologies designed to make existing transportation infrastructure, facilities and services more efficient and safer. The MPOs and NCDOT jointly completed the most recent [Triangle](#)

[Regional ITS Strategic Deployment Plan](#) (SDP) update in 2020. The update covers both MPOs and provides a roadmap for near-term, mid-term and long-term deployment of ITS technologies to enhance efficiency and sustainability by pursuing 42 action items and 30 projects:

Triangle ITS Projects		
Unified Transit Farebox System	AVL Technology for Transit	Transit Signal Priority/Bus Rapid Transit
Complete Regional Fiber Network	Corridor Traffic Signal Timing	Adaptive Traffic Signal System
New/Updated Traffic Signal Systems (10 project communities)	Regional Standards: Software, Hardware, Communications	Software/Hardware Platforms for Connected and Autonomous Vehicles
Expand Travel Information Coverage	Current Deployments Inventory	Integrated Corridor Management
Emergency Pre-emption	Managed Motorways	Parking Deck Occupancy Detection
Sub-Region Transportation Management Center	Incident Response Training	ITS Equipment Operation and Maintenance Training
Consolidated Municipal Signal Systems Management	Centralized Data Warehousing and Distribution	System Consolidation and Management Agreements

To accomplish this work, the two MPOs have created a regional ITS working group that is being facilitated by the Triangle J Council of Governments.

The Strategic Deployment Plan is designed to “mainstream” ITS projects into the overall transportation planning process for both MPOs and NCDOT. This is being accomplished in a variety of ways. CAMPO’s Locally Administered Projects Program (LAPP) has funded ITS projects annually using STP-DA funding, including investments in several strategic corridors such as US-64 and I-40. ITS projects are also incorporated through Transportation Improvement Program updates.

7.9 Investments for Safe, Effective Transportation System Management (TSM)

Transportation System Management (TSM) solutions increase efficiency and safety by allowing the current transportation network to operate with fewer travel delays. TSM projects are less costly than building or widening roadways and making new public transit capital investments. They can provide cost effective solutions that are implemented quickly or in phases, and with comparatively few environmental impacts.

Like TDM investments, TSM investments are treated as “programmatic” in this plan: sources and amounts of funding are designated in this Plan for TSM projects, but the individual projects aren’t listed, as they will be selected as needs arise; the nature of the projects will depend on project-specific design characteristics.

The following list provides examples of the types of TSM projects that are expected to be implemented through the 2050 MTP period. This list is not exhaustive because solutions will be designed for the unique challenges of a particular intersection or corridor, and the types of TSM solutions will continue to evolve.

- Widening of approach widths for key intersections;
- Installation and/or adjustment of traffic signals, including dynamic signal timing coordination and signal preemption;
- Provision and lengthening of turn lanes;
- Limitation or prohibition of driveways, turning movements, trucks, and on-street parking;
- Construction of median U-turn, Quadrant, continuous flow and other unique intersection and interchange designs;
- Fixing horizontal/vertical curves, insufficient ramp lengths, weaving sections and other geometric deficiencies;
- Implementing Bus on Shoulder System (BOSS) for transit buses and express shoulder lanes for all vehicles.
- Installation of traffic calming devices for residential neighborhoods; and,
- Traffic circles and roundabouts at appropriate intersections.

7.10 Specialized Investments: Railroads and Airports

Railroads

The region is traversed by several key rail corridors, most notably the state-owned North Carolina Railroad Company (NCR) right-of-way that stretches from Morehead City to Charlotte. Other major lines are owned by the region's two Class I railroads: Norfolk-Southern and CSX. The NCR corridor carries both freight and intercity passenger rail traffic; existing passenger rail stations within the MPO boundaries include Raleigh, Cary and Durham.

The CSX "S" line heading north from central Raleigh and south from central Cary intersects the NCR corridor along a section carrying freight and passenger traffic. The CSX "S" line from Richmond to Raleigh and the NCR from Raleigh to Charlotte is also part of the Federally-designated Southeast High Speed Rail (SEHSR) Corridor.

This *Rail Investments* section of the plan focuses on freight rail and intercity passenger rail that links the Triangle to other regions. Rail services within the region – such as Commuter Rail -- are addressed in *Section 7.5 Transit Services*. General freight issues--including freight carried by rail--are addressed in *Section 7.11 Freight Movement & Logistics*. The recently completed regional freight plan notes that the volume of rail freight carried in and through the Triangle is expected to decrease slightly during the time frame of this MTP, due in part to declines in coal shipments as the region's energy mix changes.

Rail planning and investments are frequently a cooperative effort between owners and operators of rail assets and partner agencies. For example, a project to straighten curves and replace an at-grade crossing with a bridge may involve funding and other contributions from the North Carolina Railroad, Norfolk-Southern and NCDOT's Rail Division. Funding from NCDOT is from state and federal sources, including Federal Railroad Administration competitive grants. Rail-related investments that involve roadway improvements and are included in the Transportation Improvement Program are included in the fiscal constraint analysis and transportation modeling that are part of this 2050 Plan.

Investments that do not affect track capacity or cross streets are not specified in 2050 MTP project lists. Examples include safety improvements at highway-rail crossings or short sidings that serve adjacent properties.

Several projects and studies have been recently completed, are underway, or are planned to improve the performance of rail services within the region. Many were part of NCDOT's Piedmont Improvement Program that received \$520 million in Recovery Act funding targeted specifically for passenger rail improvements. Recent, on-going and planned Triangle rail projects and studies include:

1. Cary Depot (\$2.3 million project completed in 2011)*
2. Raleigh Union Station (completed)
3. Hillsborough Passenger Rail Station (\$7,860,000 in FY22-23)
4. Raleigh West Street Grade Separation
5. NCDOT Capital Yard Railroad Maintenance in Raleigh (\$6.1 million project completed in 2012)*
6. Hopson Road Grade Separation and Nelson to Clegg passing siding (completed in 2015)*
7. Morrisville Parkway Grade Separation (completed in 2016)*



North Carolina Railroad Company/Nick D'Amato

8. "NC 54 and More" Corridor Feasibility Study (road project in Morrisville along the NCRR right-of-way, including proposed grade separations of connecting roads and the railroad)
9. East Durham Siding Project (Ellis/Glover) (\$42,500,000 in F22-29)
10. Cornwallis Road Grade Separation (\$27,478,000 in FY22-24)
11. Piedmont Service Expansion rail car purchases and Piedmont/Carolinian operations funding (statewide projects)
12. Raleigh East 2nd Main Track (study completed in 2013)
13. Morrisville to Cary 2nd Main Track (study completed in 2011)
14. Blue Ridge Road Grade Separation
15. Boylan Junction Improvements
16. Churton Street bridge widening over NCRR
17. NCRR Bridge over NC 54 Replacement (\$5.5 million project completed in 2006)

(* asterisk denotes part of Piedmont Improvement Program)

Current North Carolina intercity passenger rail service consists of four trains in each direction each day operated by Amtrak and serving the Durham, Cary and Raleigh stations. Three of the trains travel between Charlotte and Raleigh, while the fourth continues north from Raleigh to Washington, DC and New York City via a route heading east to Selma in Johnston County, then north along the CSX "A" line that roughly parallels I-95. Pre-COVID, ridership had increased steadily on the service; during the seven months of October 2018-April 2019, ridership on the trains was 274,000. During April 2019, 25,700 passengers boarded or alighted from the trains at the three Triangle stations: Raleigh, Durham and Cary. One additional Raleigh-Charlotte Piedmont daily train is planned to be added.

Planning for Southeast High Speed Rail envisions high performing rail operating within the region along the NCRR corridor east to Raleigh at speeds up to 90 mph, then north along the CSX "S" line at speeds up to 110 mph. The NCDOT Rail Division is leading efforts to provide a "sealed corridor" for higher speeds and additional trains, closing or bridging existing at-grade crossings where feasible to improve both safety and operations. The NCRR has led commuter rail capacity and ridership studies to better understand the interplay of freight and passenger rail operations within the region and the range of track investments that might be needed to accommodate increased shared use.

Due to the complexity of rail investments and the myriad of interested organizations, the MPOs have in the past periodically brought together public and private sector owners and operators of critical rail assets along with the communities and anchor institutions adjacent to the rail lines. These forums can help stakeholders: i) better understand projects affecting the region's main rail corridors, ii) identify interests of primary importance to the stakeholders, and iii) generate collaborative efforts to advance shared interests.

Ensuring that any investments affecting our rail corridors are done with detailed attention to longer term impacts on forecast freight movement, inter-city passenger rail, regional rail connections contained in this MTP, and opportunities for High Speed Rail is a key strategy for the two MPOs in this plan. Ensuring that near term decisions do not constrain choices or drive up costs for mid-term and long-term services is an important consideration for the MPOs. As both in-region rail connections are implemented, and intercity rail services connecting the Triangle to other regions are expanded, taking steps to make sure that service is fast and reliable will be important to attract and retain ridership. For the first half of federal fiscal year 2019, only 64% of Carolinian and 62% of Piedmont intercity passenger trains arrived on time, defined as within 20 minutes of scheduled time for the Carolinian and 10 minutes of schedule time for the Piedmont.

Airports

Raleigh-Durham International Airport (RDU) serves both MPOs with passenger and air cargo services. The airport is located on 5,000 acres near the boundary between the two MPOs in Wake County, and is governed as an authority with board members appointed by the largest jurisdictions in the two MPOs: Wake County, Durham County, Raleigh and Durham City.

Pre-COVID, 2019 was RDU's busiest year on record, with RDU serving 14.2 million passengers, over 80,000 tons of enplaned cargo and 220,000 aircraft operations.



Over the past decade, RDU has undertaken major projects designed to improve aviation services:

- Terminal 2 was completed in 2011; this \$573 million, 920,000 square foot project included 37 boarding gates
- Terminal 1 reconstruction was completed in 2014; this \$68 million project rebuilt the oldest terminal at RDU.

RDU completed a new master plan – [Vision2040](#) – in 2017. Vision 2040's baseline forecast, used for *Connect2050*, envisioned growth in enplaned passengers (those boarding at RDU) from 5.5 million in 2016 to about 8.5 million (RDU reached 7 million enplaned passengers in 2019). Growth was tracking about a decade faster than *Vision2040* projected pre-COVID, but it remains unclear what long-term effect COVID may have on air travel, and especially business travel as employers and workers have become more familiar and comfortable with remote meeting technology. No additional terminal gates are planned in the first ten years of Vision2040 plan. General aviation operations are expected to grow modestly.

Regardless of longer-term passenger volumes, RDU continues to pursue other critical capital projects:

1. The first phase of the Terminal 2 security checkpoint expansion was completed in 2019, adding two lanes.
2. Replacement of the primary runway near Terminal 2, referred to as 5L-23R, which is nearing the end of its useful life.

A [2021 report](#) from a business-led task force on RDU considered the issues of funding and financing of future improvements, given an estimated \$500 million funding gap by 2030 -- after utilizing additional debt capacity -- and additional \$1 billion funding gap by 2040 for recommended improvements. The final report noted the importance of new funding and authorizations for increased passenger facility charges from federal sources and increased authority from the state to attain the vision, but also highlighted strategies that the airport and its local partners could take, including increasing the current municipal and county contributions to the airport, raising parking fees and instituting an airport access fee, monetizing some of the extensive non-airfield land at RDU and devoting some hospitality tax revenues for airport investments.

One other publicly owned general airport is located within the MPO boundaries: the Triangle North Executive Airport in Franklin County, with a 5,500-foot long asphalt runway. About 120 airplanes and six helicopters are based at the airport. The airport has more than 75 tenants, including on-site businesses that provide maintenance and flying lessons, among other services. The airport has recently completed an airfield lighting project and received a \$12 million grant to rehabilitate the airfield and expand the apron to add more tiedown spaces; the current spaces are at capacity.

7.11 Freight Movement and Logistics

Successful economic development depends on the fast and reliable movement of people, goods and information. For the 2050 Metropolitan Transportation Plan, the two MPOs engaged in an extensive and systematic examination of freight trends and opportunities through a new Triangle Regional Freight Plan to ensure that goods movement is a key component of long-term transportation investment decisions. The MPOs formally adopted recommendations in the latter half of 2018, that included some key freight movement forecasts and principles to guide MPO transportation investment decisions.

Also, the two MPOs at a statewide level contain a total of nine (seven highway and two rail) corridors that form the core network of multimodal passageways that are identified as North Carolina's Strategic Transportation Corridors. The state of North Carolina considers these strategic transportation corridors the highest priority when analyzed within the framework of regional or local transportation plans.

The growing regional attention to freight movement has been matched at the state and federal levels. The recently adopted federal *Infrastructure Investment and Jobs Act* (IIJA), along with North Carolina's Strategic Transportation Investments (STI) law places increased emphasis on freight planning and investment. Leveraging state and federal interest is a driving force in the MPO's approach to freight movement.

An examination of trends and forecasts for the regional freight plan found that:

1. The highway system is and will remain the principal freight mode in the region: 80% of both freight tonnage and freight value in the region moves by truck. By 2050, the amount of freight moved by truck is expected to grow by a third. Because of its advantage in moving heavy commodities, rail carries 16% of the region's freight tonnage, but only 2% of its freight value, and is not forecast to grow significantly.
2. "Truck tonnages are expected to increase considerably out to 2050, especially for shipments to and from the Triangle Region."
3. "Projects are needed to ensure that the roadway network keeps up with the rapid increase expected of inbound and outbound shipments....improving the routes that are already congested that provide regional connection to Interstates and the rest of the State."
4. "Total freight rail volumes are forecasted to have minimal growth in the Triangle Region over the coming decades...chiefly due to the decline in coal, which offsets growth in other areas...total tonnage is expected to remain roughly constant out to 2050."

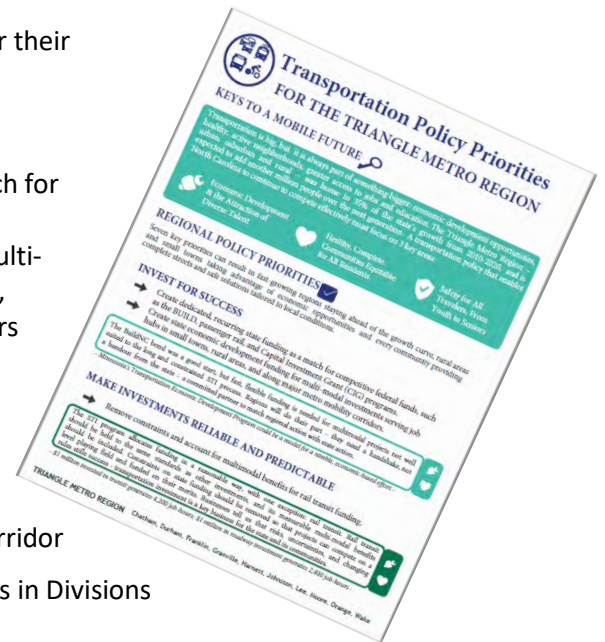
Key freight movement principles that the MPOs will use to inform investment decisions include:

1. As with the movement of passengers, paying close attention to the location of major freight facilities and destinations relative to the transportation network is important; linking industrial land use decisions to the careful design of road and rail access can yield cost-effective solutions. Just as Transit-Oriented Development (TOD) has become a principal tool in regional land use planning to support transit corridor investments, Freight-Oriented Development can help inform industrial land use planning and supply chain logistics along strategic freight corridors and in freight industry clusters.
2. Logistics and supply chain performance expectations change rapidly. In particular, supply chains designed for home deliveries continue to grow in importance with the acceleration of e-commerce.
3. On the road system, freight bottlenecks with significant truck volumes are key priorities, with a tiered approach to address (i) routes that connect the Triangle to other regions, (ii) distribution routes that link freight industry clusters with activity centers, and (iii) critical access routes serving industrial sites.
4. On the rail system, network reliability and speed will be important considerations for goods movement as bulk commodities like coal become less important, with the added benefit that reliability and speed are also important to passenger rail that shares tracks with freight trains.

7.12 Policy Priorities, Special Plans, Projects, Studies & Performance Tracking

Both MPOs have adopted a set of policy priorities to make clear their common interests and focus joint efforts. The priorities are:

- ❖ Invest for Success
 - Create dedicated, recurring state funding as a match for competitive federal funds
 - Create state economic development funding for multimodal investments serving job hubs in small towns, rural areas and along major metro mobility corridors
- ❖ Make Investments Reliable and Predictable
 - Remove constraints and account for multimodal benefits for rail transit funding
- ❖ Enable More Cost-Effective Critical Corridor Investments
 - Relax the cap on statewide tier funding within a corridor
- ❖ Remove Funding Barriers for Small Towns and Rural Areas in Divisions with Large MPOs
 - Exempt Surface Transportation Block Grant-Direct Allocation Funding from the STI Allocation
- ❖ Make NC a Leader in Active Transportation Investments
 - Surpass peer states in funding economically beneficial and safety-focused bicycle & pedestrian projects
- ❖ Strengthen Support for Demand-Management & Technology
 - Stabilize and grow NCDOT's investment in Transportation Demand Management (TDM) to match local and regional commitments.
 - Implement the Regional Technology (ITS) plan for roadways and transit
- ❖ Recognize Statewide Projects in All Modes, Not Solely Roadways and Freight Rail
 - Establish standards and scoring criteria for designated statewide passenger rail and trail investments



These priorities have been used in selecting investments and strategies included in this plan, and will be used for collaborating with federal, state and regional partners in pursuing funding, regulatory and programmatic changes that can be effective in implementing this plan.

Section 5.4 identified corridor studies, small area plans, feasibility studies, functional plans or similar efforts that have been completed and provided input into the development of the Metropolitan Transportation Plan.

This section outlines recommended plans or studies using the same format as the completed plans and studies described in Section 5.4. Although this section is not designed to list every plan or study that may be undertaken, it indicates some of the major efforts that the two MPOs and their partners anticipate pursuing through their annual Urban Planning Work Programs (UPWPs): the planning budgets that guide MPO activities each fiscal year. Also included are major efforts designed to improve the input data, accuracy and functionality of the region's principal analysis tool, the Triangle Region Travel Demand Model (TRM), and increased efforts to better track and report progress towards achieving this plan's vision, goals and objectives.

	Recommended Plan or Study (green cells are DCHC MPO; yellow cells are CAMPO)	Type
1	<i>US 15-501 Corridor Study.</i> An MPO study to further refine a corridor vision that was first completed in 2020 but will be studied additionally to address concerns regarding bicycle and pedestrian movement, transit accommodation, and ensuring the corridor is sensitive to the local urban fabric. The study will be based on public and stakeholder input, identify capacity and safety deficiencies, propose policies and projects, and create an implementation plan. 2025 expected completion.	Corridor Plan
2	<i>US 70 West.</i> An MPO and NCDOT study to evaluate solutions for the US 70 corridor from Mebane in Alamance County to eastern Orange County, including the Town of Hillsborough. It will conduct public and stakeholder outreach, develop improvement projects and strategies, and create an implementation plan. 2023 expected completion.	Corridor Plan
3	<i>US 70 East.</i> This MPO study, to be conducted with the City and County of Durham and NCDOT, will evaluate potential multi-modal solutions to address all transportation needs in the US 70 corridor in eastern Durham County. This study will look at a range of possibilities other than a limited access freeway to accommodate movement for all modes, while still addressing traffic congestion. 2023 expected completion.	Corridor Plan
4	<i>Downtown Durham Freeway Conversion Study.</i> An MPO and City of Durham study to explore in greater detail the 2020 Move Durham study. A recommendation from that study was to investigate converting the Durham Freeway (NC-147) into a boulevard to reconnect the community split in two when the freeway was constructed in the 1970s. This study will look at various alternatives for how the conversion to a boulevard could take place and propose a strategy and projects that allow the facility to balance the current and future operational needs of all users. 2023 expected completion.	Corridor Plan
5	<i>South Churton Street Corridor Study.</i> This engineering study conducted by the Town of Hillsborough will identify a preferred cross-section and project scope for U-5845, Widening of South Churton Street in Hillsborough. Completion is expected in 2024.	Corridor Plan
6	<i>Hillsborough Greenway Special Study.</i> A Town of Hillsborough study to collect data to identify a feasible and constructible greenway connecting the planned train station to housing and commercial developments, including development south of I-40. The study will identify constraints and alternatives, and develop a locally preferred alternative, implementation plan, and construction cost estimates. 2024 expected completion.	Greenway Plan
1	<i>Connected Region Guide.</i> The two MPOs and other public and private sector partners will continue to pursue grant funding to develop a regional-scale guide to align land use, transit investment and affordable housing decisions along key regional corridors.	Land Use, Transit and Housing Plan
2	<i>CommunityViz 4.0.</i> The 2050 MTP and its predecessors developed future growth scenarios based on a land use model called CommunityViz. The model provides population and job growth allocations in a format that can be imported into the Triangle Regional Model (TRM). The CommunityViz4.0 effort will include an update of socio-economic data for use in the next MTP as well as more seamless links to TRM methods and technical changes to improve accuracy and precision of the forecasts.	Transportation Model Improvement
3	<i>Triangle Regional Model Services Bureau Activities.</i> The Triangle Regional Model Services Bureau oversees major model updates as well as shorter term model improvements. Future work will include: (1) introduction of an entirely new G2 model, (2) improved links to CommunityViz, (3) updated parking and other pricing data, (4) continued progress on a regional STOPS (transit ridership) model, and (5) examining ways to better address the travel of visitors and account for special events.	Transportation Model Improvement

	Recommended Plan or Study (green cells are DCHC MPO; yellow cells are CAMPO)	Type
4	<i>MPO Metrics Tracking.</i> The MPOs and partners such as transit agencies will implement methods to support MTP performance measures, targets and project tracking.	Performance Measurement
5	<i>ITS Deployment Plan Update</i> – The regional ITS plan was updated in FY 2018, and recommended several ITS projects included in subsequent TIPs. The plan is anticipated to be updated every 4-5 years to examine technological changes and partnerships that have been developed since the original plan adoption.	Technology Plan
1	<i>Southwest Area Study Update.</i> The MPO completed the update of the Southwest Area Study during FY 2019, with recommendations from that update carried forward to inform the 2050 MTP. The study examined growth forecasts and developed a long-range and interim list of multi-modal transportation improvement priorities. This study is anticipated to be updated every 4-5 years.	Small Area Plan
2	<i>Northeast Area Study Update.</i> The MPO completed the update of the Northeast Area Study during FY 2020, with recommendations from that update carried forward to inform the 2050 MTP. This study included the municipalities Wake Forest, Rolesville, Knightdale, Wendell, Zebulon, Youngsville, Franklinton and Bunn, as well as the surrounding areas of Franklin and Wake Counties. The study examined growth forecasts and develop a long-range and interim list of multi-modal transportation improvement priorities. This study is anticipated to be updated every 4-5 years.	Small Area Plan
3	<i>Southeast Area Study Update.</i> The MPO anticipates beginning the update of the Southeast Area Study during FY 2022 to inform future MTP updates. This study will cover the municipalities of Archer Lodge, Clayton, and Garner. Surrounding areas in Johnston and Wake Counties will also be included. The study will examine growth forecasts in the area, and develop a long-range and interim list of multi-modal transportation improvement priorities for the subarea described. This study is anticipated to be updated every 4-5 years.	Small Area Plan
4	<i>Wake Transit Plan Update.</i> The Wake Transit Vision Plan is required to be regularly updated. This effort will develop the next update as well as serve as the foundation for the transit element of the Comprehensive Transportation Plan and MTP. It will identify, evaluate and prioritize future transit needs and will use a needs-based planning process and engage transit stakeholders, including local governments and the public, throughout the process. It will include a detailed analysis of current and future transit system needs and provide recommendations for a decision-making framework to guide future policy decisions. Results should be a prioritized set of infrastructure improvements necessary to implement the required Wake Transit Vision Plan update.	Transit Plan
5	<i>Major Corridors Study.</i> The MPO and NCDOT will create a transportation vision that will propose a strategy, projects, and programs that balance the current and future mobility needs, particularly in commuting corridors, for all users.	Corridor Study
6	<i>Raleigh-Fayetteville Passenger Rail Study</i> – Following an effort in FY 19 to examine opportunities for passenger rail between Raleigh and Fayetteville, this study is anticipated to act as a Phase II of that work. It is anticipated to begin in FY 22 in partnership with the NCDOT and Fayetteville Area MPO, and will conduct additional detailed study on the possibility of passenger rail, and will recommend possible operational scenarios, needed capital improvements, and cost estimates.	Corridor Study

	Recommended Plan or Study (green cells are DCHC MPO; yellow cells are CAMPO)	Type
7	<i>North-Central Area Study</i> – In prior fiscal years, CAMPO has conducted studies of NC 50, NC 56 and NC 98 in the north-central portion of the planning area. In lieu of updating those individual corridor studies, it is anticipated that an area study may be conducted to do a more comprehensive network and land use analysis in that area of the region. This study could start in FY 24.	Small Area Plan
8	<i>NC 751 Corridor Extension</i> – The 2018 Southwest Area Study update identified the need for additional NC Highway network connectivity between US Highway 64 and US 401 through a combination of existing roads (New Hill Olive Chapel/Holloman Rd) and new location roadways. <i>MTP Project A173, A190</i>	Future Route Designations
9	<i>NC 55 / NC 55 Business Corridors</i> – The 2011 Southwest Area Study and the 2018 update identified the benefits of re-routing a portion of the NC 55 corridor in Fuquay-Varina around the existing congested corridor and historic Varina business district. This would be accomplished using the northeast portion of Judd Parkway and a new location grade separation over US 401, connecting to existing NC 55 south of the existing NC 42/NC 55 intersection. The existing corridor would be designated as NC 55 business. <i>MTP Project A679ab</i>	Future Route Designations
10	<i>NC 42 / NC 42 Business Corridors</i> – The NC 42 corridor in Johnston County is co-located with US 70 business and Lombard Street corridors through the Town of Clayton. Analysis conducted during the 2016 Southeast Area Study identified the network benefits to re-locating a portion of NC 42 around the existing congested corridor using the Ranch Road and US 70/Clayton Bypass corridors. The existing corridor would be designated as NC 42 business. <i>MTP Project Jhns13abc</i>	Future Route Designations

8. Our Financial Plan

There is an axiom that “if you don’t have a plan to pay for it, you don’t have a plan.” Federal law requires that Metropolitan Transportation Plans include a financial plan; this means that the cost of the transportation facilities and services in the plan must be covered by state, federal, local, private and other transportation revenues that can be reasonably expected to be available. The Financial Plan provides a comparison of expected revenues and project costs from 2021 through 2050 – the 30-year period of this plan.

All financial data in this section is presented in Year 2020 “Constant Dollars,” meaning the values indicate what it would cost to build the system if we paid for and built all the projects today. In reality, projects will be built over a 30-year time frame and inflation will affect costs. The example on this page shows how dollar figures would change over time between Year 2020 Constant Dollars and the “Current Dollars” of future years, often termed “Year of Expenditure” dollars, or YOE dollars, based on a long-term annual discount rate (or inflation rate) of 2% used in this plan. The example illustrates that it would take \$106 in 2023 to pay for a project that would cost us \$100 if we built it in 2020. During the life of the plan, inflation will be higher in some years and lower in other years, but 2% annual inflation has been a typical long-term pattern.

Time Value of Money @ 2% annual inflation rate	2020	2021	2022	2023
Constant 2020 \$	\$100	\$100	\$100	\$100
Current \$ for Year Shown	\$100	\$102	\$104	\$106

Appendix 11 provides additional information on both revenue and cost assumptions and translations between constant dollar values and year-of-expenditure values that takes inflationary effects into account. Aggregate categories of costs and revenues are rounded, but individual project costs are reported precisely in the appendix to aid in the review and subsequent update of estimates.

The 2050 MTP assigns projects to one of three time periods, based on when a project would first be open to being used (projects may be under construction in the prior time period):

- Near-term: 2021 to 2030;
- Mid-term: 2031 to 2040; and
- Long-term: 2031 to 2050.

These periods are used not only to distribute the total costs and revenues over the 30-year planning period, but also so we can analyze the impacts of our investments against air quality benchmarks.

Although this financial plan addresses revenues and costs as if they were independent of one another, in North Carolina’s transportation prioritization process they are tightly linked – many revenues are *only* available if corresponding costs are associated with narrowly-defined project types. The revenues section below discusses how this inflexibility affects the financial plan.

8.1 Revenues

Revenues fall into one of two broad categories: “traditional” revenues from long-standing state and federal sources, and “special” revenues from locally controlled sources or projected new state or local revenue streams. This section also highlights where “discretionary” or grant revenue sources are assumed, typically as federal shares of rail or bus rapid transit infrastructure projects.

For the near-term period of the plan, covering the 2021-30 ten year period, costs and revenues are based on the current 2020-29 TIP, on county-based transit tax revenue spreadsheets maintained by GoTriangle and on local government Capital Improvement Programs. Where projects from these sources begin between 2021-30 but continue to rely on revenues post-2030, the amount of revenues needed to complete the projects are deducted from the available amount in the 2031-40 period.

Traditional State and Federal Transportation Revenues

To calculate a reasonable share of traditional state and federal revenues for complete corridors and roadways, which largely flow through the NCDOT's Strategic Transportation Investment (STI) process, this Plan uses two primary sources:

1. actual 2020-2029 State Transportation Improvement Program (STIP) estimates for the 2021-30 near-term period.
2. NC Moves 2050 revenue projections for the 2031-2050 mid-term and long-term periods.

STI represents the majority of state and federal funding available for capital projects. STI revenues are divided into three categories of funding: Statewide Mobility, Regional Impact, and Division Needs. The method assumed that CAMPO and DCHC would receive a portion of the Regional Impact and Division Needs revenues commensurate with the MPOs' portion of the population within their respective regions and divisions (based on the most recent 2020 Census Data), and that CAMPO and DCHC could assume up to a portion of the Statewide Mobility revenues commensurate with the average proportion of this funding that has gone to each MPO in previous cycles under the STI policy (34% for CAMPO and 10% for DCHC). Since statewide tier revenues can only be expended on statewide tier projects, the actual amounts of statewide tier revenues in each revenue was then adjusted to match total statewide tier project costs in the adopted plan.

A similar approach was used for projecting growth of the Highway Fund, which is used for maintenance and operations projects. For the Highway Fund, each MPO was assumed to receive an amount proportional to its population within the state. Because the population of the area is projected to grow faster than the state as a whole, this results in a growing percentage of funds for the MPO areas over time—this plan used 2040 population forecasts to calculate the percentage for each MPO: CAMPO at 16.7% of the state population and DCHC MPO at 5.5% of the state population.

Congestion Mitigation and Air Quality (CMAQ) funds are exempt from STI, so they were calculated separately. The amount of funding for CMAQ is based on the amounts in the current federal transportation funding bill, the Infrastructure Investment and Jobs Act, and grow at an annual rate derived from that law.

The financial model assumes a long-term 2% annual discount rate (or inflation rate) to translate between 2020 constant dollars and future current year or Year of Expenditure (YOE) dollars, since different data sources use different reporting methods. All revenues in this chapter are reported in year 2020 constant dollars. Although revenues are generally considered either "roadway" or "transit" revenues, some funds, such as in the federal Surface Transportation Program (STP), are not restricted to highways and can be "flexed," or transferred, to programs for other transportation modes such as transit, pedestrian and bicycles.

The method used the fiscal year 2020-2029 State Transportation Improvement Program (STIP) for the years 2021 through 2030, adjusting for the one-year difference. The STIP identifies the budgeted state and federal funding source for transportation projects and therefore is the best available source for near term revenue forecasts.

Funding vs. Financing *an important distinction*

Funding is the actual revenue source used to pay for transportation facilities or services. **Financing** is a way to move future revenues through time to pay for facilities or services sooner. But financing doesn't "fund" these facilities or services; it is the underlying revenue source that does.

As an example from this plan, the regional passenger rail line that could link Durham, Wake and Johnston Counties is expected to be funded mostly by a combination of federal "New Starts" competitive grant funding and local transit taxes. But in order to pay for the construction and open the project by 2030, borrowing will be used for both the portion that will be reimbursed by federal grants and the portion that will be repaid by local transit taxes.

Similarly, the first section of the NC540 toll road in western Wake County was completed in 2012 using bond financing. The funding sources to repay the bonds include both toll revenues from users and an annual \$25 million payment from NCDOT.

The NCDOT financial model and STIP do not represent all of the available complete corridor and roadway revenues. The MPOs expect to have additional funding available from the following sources:

- Toll Revenues – A portion of revenues for managed lane and toll road projects are assumed to come from toll revenue bonds, which are paid back over time by users.
- Local Funding – Local governments often issue bonds to finance specific projects such as roadways, intersection improvements, street paving, bicycle facilities and sidewalks; the revenue to repay these bonds is typically the property or sales tax revenues received by the local government over time. These amount are often shown in a local government’s Capital Improvement Program (CIP).
- Private Funding –Sections of some of the roads in the 2050 MTP, or widenings of existing roads, will be paid for by private developers as they develop adjacent property. Additionally, some of the rail crossing related projects include private funding from railroad partners.

Appendix 11 provides additional detail on the revenue source assumptions and calculations. Figure 8.1 summarizes the complete corridor/roadway revenue sources and calculation assumptions.

Figure 8.1: Roadway Revenue Assumptions

Item	CAMPO Assumptions	DCHC Assumptions
Capital - Federal / State (STI)	2020-2029 STIP for near-term period. May 2020 NC MOVES 2050 Revenue Forecast for 2031-50. Division Needs and Regional Impact category amounts based on MPO population within Division or Region. Statewide Mobility category amount based on average performance from previous STI cycles.	2020-2029 STIP for near-term period. May 2020 NC MOVES 2050 Revenue Forecast for 2031-50. . Division Needs and Regional Impact category amounts based on MPO population within Division/Region. Statewide Mobility category amount based on average performance from previous STI cycles.
Maintenance -- Federal/State/Other	Portion of anticipated NCDOT Highway Fund revenues relative to MPO population. Future revenue based on May 2020 NC MOVES 2050 revenue forecast.	Portion of anticipated NCDOT Highway Fund revenues relative to MPO population. Future revenue based on May 2020 NC MOVES 2050 revenue forecast.
Congestion Mitigation and Air Quality	Amount of CMAQ funding suballocated to MPO is grown at an annual rate consistent with the annual growth rate authorized in the 2021 IJJA act.	Amount of CMAQ funding suballocated to MPO is grown at an annual rate consistent with the annual growth rate authorized in the 2021 IJJA act.
Toll roadway	MPO Staff forecast.	MPO Staff forecast.
Local (Capital Improvement Program)	MPO Staff forecast.	MPO Staff forecast.
Private	MPO Staff forecast.	MPO Staff forecast.
Translation between \$2020 Constant and \$YOE	2% annual discount (inflation) rate.	2% annual discount (inflation) rate.

Existing Transit Revenues

The transit financial models discussed in an earlier part of this section are used to forecast transit costs and revenues. In April 2009, the North Carolina House passed the Congestion Relief and Intermodal 21st Century Transportation Fund (House Bill 148). The legislation permits a local voter referendum to increase the sales tax to raise revenues for transit systems. The half-cent sales tax increase has been approved in Durham, Wake and Orange Counties. There are several major transit revenue assumptions in Figure 8.2 that forecast the implementation of new revenue sources permitted by House Bill 148, including the ½ cent sales tax for transit services. In addition to these major assumptions, there are many detailed bus and rail transit revenue

assumptions that are important enough to be identified in this report, including municipal set-asides for transit and/or “non-supplementation” amounts required as a part of the conditions for county transit taxes.

Figure 8.2 summarizes the major assumptions used for calculating the bus and rail transit revenues from existing sources at existing rates. Additional detail is in Appendix 11.

Figure 8.2: Major Transit Revenue Assumptions

Item	CAMPO Assumptions	DCHC Assumptions
Year ½ cent sales tax began	Wake County: 2016	Durham County: 2013 Orange County: 2013
Transit sales tax revenues (after 2021)	Wake County: 4% and 5% (FY23)	Durham County: 2.8-6.1% annual growth rate (see Appendix 11) Orange County: 2.8-4.5% annual growth rate (see Appendix 11)
GoTriangle Vehicle Registration Fee	Wake County: \$8, grows at 2% annual rate.	Durham County: \$8, grows at 1.5% annual rate. Orange County: \$10, grows at 1.5% annual rate.
County Vehicle Registration Fee	Wake County: \$7; grows at 2% annual rate.	Durham County: \$7; grows at 1.5% annual rate. Orange County: \$7; grows at 1.5% annual rate.
Rental Car Tax (5%)	Wake County: 2.5% annual growth rate.	Durham County: 2.5% annual growth rate. Orange County: 2.5% annual growth rate.
Local Property Tax for Transit	Continued “non-supplementation” required by HB148	Continued “non-supplementation” required by HB148
University-Based Systems	Continued Wolfline services at current levels, paid from university resources.	Continued Duke Transit and NCCU Eagle Shuttle services, paid from university resources; continued UNC-CH contribution to Chapel Hill Transit System.
Projects that include Federal Capital Investment Grant \$	All CRT and BRT projects (50% federal funding assumed)	All CRT and BRT projects (50% federal funding assumed)

Additional/New Revenue Sources

The current transportation revenue sources will not produce enough revenue to finance the multimodal transportation projects that are considered essential in the Triangle, and that are included in this plan.

Therefore, the MPOs have assumed Additional/New Revenue Sources to address this funding gap. The MPOs have a reasonable expectation to realize these new revenue sources based on the many local and statewide commissions that have studied transportation financing and recommended new funding sources.

It is important to note the following background information on the Additional/New Revenue Sources proposed in the 2050 MTP:

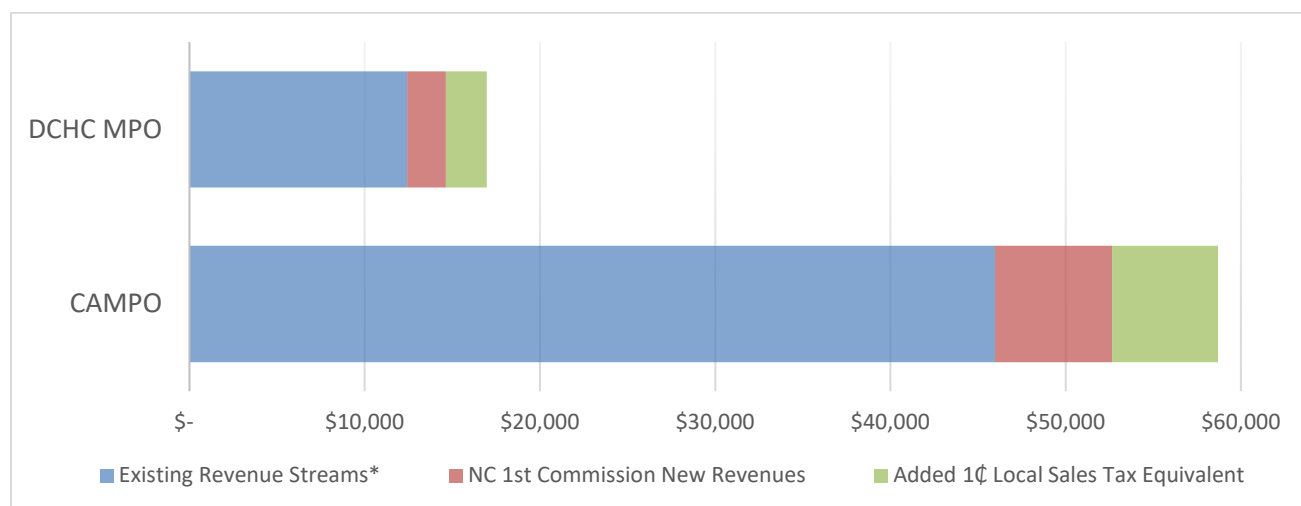
- These new revenue options would require legislation from the North Carolina General Assembly. The MPOs are not currently authorized to make these tax and revenue program changes.
- The plan assumes these new or additional revenue sources would only be available in the mid-term and long-term time periods, so would not start yielding revenue until 2031.
- The exact type and mechanism for increasing these revenues, e.g., sales tax, property tax, VMT fees, is not specified.
- New or additional revenues are assumed to be put in place without the constraints of existing revenues; i.e., the MPOs could program them to any transportation projects in this plan. Figure 8.3 presents the assumptions for Additional New Revenue Sources.

Figure 8.3: Assumptions for Additional/New Revenue Sources

Item	Revenue Assumptions	CAMPO Amount (\$ millions)	DCHC MPO Amount (\$ millions)
Sales Tax (or equivalent) in MPO Counties	Level of effort equivalent to an additional one cent sales tax increase in 2031 for transportation improvements. Revenue increases commensurate with projections for existing sales taxes. Requires NC General Assembly action.	\$ 6,040	\$ 2,340
NC First Commission Revenues	New funding for transportation improvements based on 2040 population-based share of NC First Commission-recommended levels of additional funding. Available for 2031-2050 time periods. Requires NC General Assembly action.	\$ 6,690	\$ 2,200
Total		\$ 12,730	\$ 4,540

The result of adding First Commission proportionate-share revenues and additional county-based sales-tax equivalent revenues would be an increase of \$17 billion in revenues to the region over the 30-year horizon, an increase of 30% over the revenues that would be available without these sources.

Figure 8.5 Revenues by Category by MPO (\$millions)



*existing revenue streams include revenues from discretionary federal grants

Airport Revenues and Costs

The Vision 2040 Master Plan for Raleigh-Durham International Airport (RDU) projected revenues to 2040 and defined a list of projects to be constructed with those revenues. Through 2040, the Airport forecast \$2.7 billion in revenue (in year of expenditure dollars), from the following sources:

- \$1.57 billion from RDU funds
- \$659 million from RDU debt
- \$182 million from federal funds
- \$281 million from customer facility charges
- \$10 million from NCDOT

The Vision 2040 Master Plan showed the following expenditures through the year 2040, using the revenues identified above:

- \$905 million in critical infrastructure preservation projects
- \$1.8 billion in discretionary infrastructure projects

The Master Plan also identifies additional projects that could be constructed if demand warrants and additional funding can be secured:

- \$677 million in private equity projects
- \$2.04 billion in deferred projects

2021 Federal Infrastructure Investment and Jobs Act (IIJA)

The Infrastructure Investment and Jobs Act (IIJA), also called the Bipartisan Infrastructure Law, was signed on November 15, 2021. The bill provides for substantial increases in transportation funding over five federal fiscal years, starting October 1, 2021 and running through September 30, 2026, which is within the first 10-year period of this plan. Federal transportation revenues will be provided both through increases in traditional “formula” funds (revenues that flow automatically to eligible recipients based on criteria) and through existing and new “competitive” grant programs, such as the RAISE, INFRA, Bus & Bus Facility, and Capital Investment Grant (CIG) programs; the latter program is the source for federal shares of the rail and Bus Rapid Transit investments in this plan.

A large portion of these funds are guaranteed, although some will still be subject to annual appropriation by Congress. Of the \$661 billion allotted to US DOT agencies, \$567 billion (85%) is in guaranteed funding.

Estimates are that North Carolina will receive about \$7.7 billion over the five years in formula funding for highways and bridges, and close to a billion dollars in formula funding for transit – a 32% increase over FAST-Act formula transit funding levels.

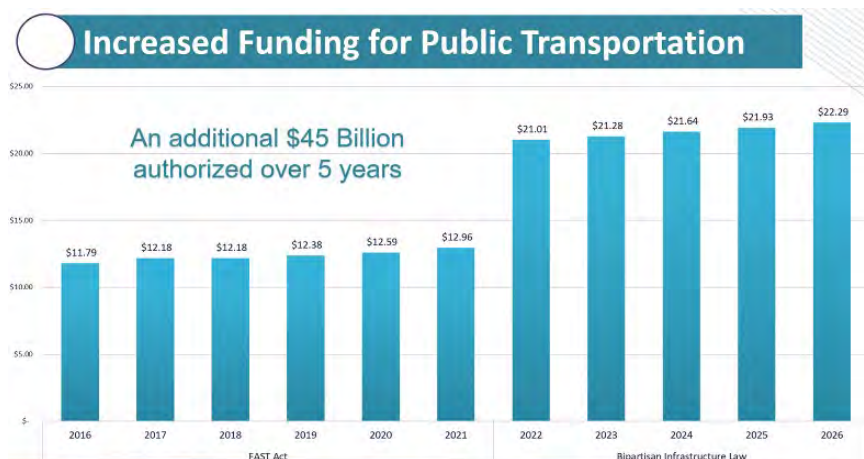


Figure 8.6 Federal FAST Act and IIJA Transit Funding Levels

The increased highway and bridge funding comes at a critical time, as NCDOT has indicated that the current STIP, covering FY20-29 – and which represents the first 10 years of this MTP, can’t be achieved with the funding originally assumed, and that the next version of the STIP, covering FY24-33, will show large increases in current project costs and the delay of many currently programmed projects.

For this reason, the MPOs have decided that for the purpose of this version of the 2050 MTP, the new IIJA highway and bridge funding will be reserved to address higher costs of projects already in the current STIP and the first decade of this plan. If the cost picture improves, then these added IIJA revenues can be used to advance projects already in this plan, and will be addressed through an MTP amendment at the time the FY24-33 TIP is adopted.

The increased transit funding and any competitive grant revenues make it more likely that the ambitious transit projects in this MTP can be funded, and possibly advanced as well, and potentially lessen the need for borrowing to implement transit infrastructure projects on the schedules anticipated in this MTP.

In summary, *Connect2050* revenues:

1. include existing revenue sources, rates and proportionate shares as reflected in the current TIP and the NC MOVES 2050 forecasts
2. reflect current local transit tax revenue calculations from county-based fiscal spreadsheets, plus additional municipal transit revenues, as available. University-operated services are assumed to be continued, but their revenues and equivalent costs are not included in summary totals.
3. include toll funding directly tied to toll road projects
4. include municipal and private roadway funding based on local CIPs and past trends
5. include airport-based revenues in RDU's Vision2040 plan plus NCDOT STI programming for airports, directly tied to airport costs
6. add a new NC First Commission-based revenue source for 2031-50, based on population shares
7. add a new county-based sales-tax equivalent revenue source for 2031-50
8. treat new federal Infrastructure Investment and Jobs Act (IIJA) revenues over and above baseline FAST-Act levels as a "reserve" for expected higher project costs in the 2024-33 STIP – neither these reserve revenues nor an estimate of higher costs are reflected in this plan's spreadsheets, but are expected to be added when this MTP is amended as part of the 2024-33 TIP process.

8.2 Costs

The two MPOs used the same cost assumptions for the major parts of the plan, including:

- Complete Corridor and Roadway: The plan used the following hierarchy for highway costs. For example, the TIP cost was used for projects in the TIP, but if none is available (i.e., the project is not yet in the TIP), then the SPOT cost was used, and so on:
 - FY 2020-2029 Transportation Improvement Program (TIP);
 - Available feasibility studies
 - Strategic Planning Office of Transportation (NCDOT SPOT) data from the prioritization process.
 - 2015 highway cost estimate spreadsheet from NCDOT.
- Bus Transit and Rail Transit: Used GoTriangle-maintained financial models used for the Durham County, Orange County and Wake County transit plans and annual work plans. Commuter Rail costs from the Phase I Commuter Rail Study (West Durham to Clayton segments).
- Travel Demand Management (TDM): Used cost estimates from the regional plan administered by the Triangle J Council of Governments.
- Intelligent Transportation Systems (ITS): Used cost categories from the project list in the Triangle Region ITS Strategic Deployment Plan Update. (June 2020). For projects with a TIP number or where a feasibility study had been prepared, the most recent TIP or feasibility study costs were used. For other projects, the mid-point of the cost range was used as a first-pass estimate. Time periods used in the MTP may differ from the time periods in the ITS plan update.
- Airports: costs match revenues from the RDU Vision2040 Plan and STI airport projects.

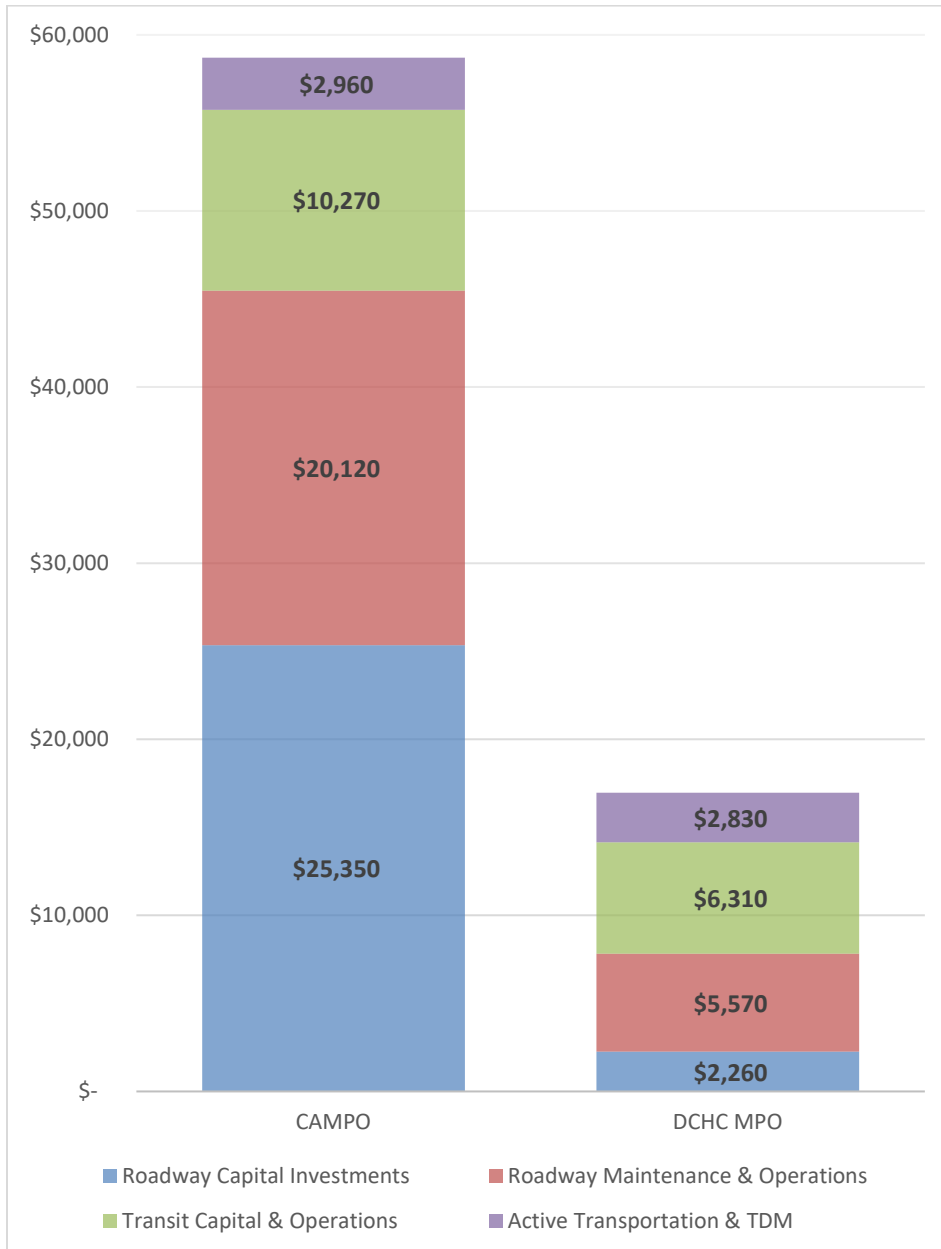
Lists of projects and associated costs are shown in Appendices 2, 3 and 4, categorized by mode.

8.3 Balancing Costs and Revenues

DCHC MPO

Figure 8.7 summarizes the sources and uses of revenues for each MPO, demonstrating that projects can be delivered based on revenues that can be reasonably expected during the time frame of this plan.

Figure 8.7: Transportation Investment by Category by MPO (\$millions)



9. Critical Factors and Emphasis Areas in the Planning Process

Our transportation investments influence more than just our ability to get from one place to another. How and where we develop roads, transit lines and other transportation services impact other things we value. The health and well-being of the natural environment, our neighborhoods, and those who live in them are vital to maintaining the quality of life our region is known for. Federal law recognizes these important considerations by requiring that Metropolitan Transportation Plans specifically address thirteen planning factors:

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
- Increase the safety of the transportation system for motorized and nonmotorized users.
- Increase the security of the transportation system for motorized and nonmotorized users.
- Increase accessibility and mobility for people and freight.
- Protect and enhance the environment.
- Promote energy conservation.
- Improve quality of life for the community.
- Promote consistency between transportation improvements and planned State and local growth and economic development patterns.
- Enhance the integration and connectivity of the transportation system for all modes.
- Promote efficient system management and operation.
- Emphasize the preservation of the existing transportation system.
- Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation
- Enhance travel and tourism

The matrix on the next page summarizes the extent to which the particular MTP Goals support the critical factors. The MTP Goals are presented in section 4.3 of this report along with the objectives and performance measures that correspond to each Goal. An examination of the objectives under a particular Goal helps to further define that Goal and explain how it supports a critical factor. In the matrix, if a Goal directly supports a critical factor, then a completely filled circle ● is shown. If the Goal supports a critical factor but in a less direct manner, then a half-filled circle ◐ is shown. When little relationship exists, no circle is shown.

In addition to a review of the link between MTP Goals and critical factors, this chapter highlights three topics in greater detail:

- *Air quality and climate change*: demonstrating that transportation plans will further clean air goals, meet air pollutant standards and minimize climate change emissions;
- *Environmental Justice*: showing how transportation plans relate to communities that have been historically underserved or disproportionately impacted by transportation investments; and
- *Safety and Security*: addressing how the transportation plans and the organizations that implement them promote safer and more secure travel choices.

Connect People & Places	Promote & Expand Multimodal & Affordable Travel Choices	Manage Congestion & System Reliability	Stimulate Inclusive Economic Vitality & Opportunity	Ensure Equity and Participation	Improve Infrastructure Condition & Resilience	Protect the Human & Natural Environment and Minimize Climate Change	Promote Safety, Health & Wellbeing
	Ensure All People Have Access to Multimodal & Affordable Travel Choices						
Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency							
●	◐	●	●		●		
Increase the safety of the transportation system for motorized and nonmotorized users							
◐		◐			◐		●
Increase the security of the transportation system for motorized and nonmotorized users							
						◐	●
Increase accessibility and mobility for people and freight							
●	●	●	●		◐		
Protect and enhance the environment							
	◐				◐	●	◐
Promote energy conservation							
	◐	◐				●	◐
Improve quality of life for the community							
●	●	●	●	●		●	●
Promote consistency between transportation improvements and planned State and local growth and economic development patterns							
●			●	◐			
Enhance the integration and connectivity of the transportation system for all modes							
●	●	●	●	◐			
Promote efficient system management and operation							
●	●	●	◐		●		◐
Emphasize the preservation of the existing transportation system							
		◐	◐		●	●	
Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation							
		●			●	◐	
Enhance travel and tourism							
◐	◐	◐	●				◐

Additional Environmental Justice Measures. There are four additional Environmental Justice measures that do not have an equivalent federal critical factor. In the same manner as the previous matrix, the matrix below evaluates the extent to which the MTP Goals support these Environmental Justice measures.

Connect People & Places	Promote & Expand Multimodal & Affordable Travel Choices	Manage Congestion & System Reliability	Stimulate Inclusive Economic Vitality & Opportunity	Ensure Equity and Participation	Improve Infrastructure Condition & Resilience	Protect the Human & Natural Environment and Minimize Climate Change	Promote Safety, Health & Wellbeing
	Ensure All People Have Access to Multimodal & Affordable Travel Choices						
Equity							
●	●		●	●		●	●
Social Cohesion or Disruption							
●	●			●		●	●
Aesthetics							
					●	●	
Displacement							
●	●		●	●		●	●

Planning Emphasis Areas. In addition to the 13 critical planning factors, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) issued [guidance](#) identifying eight planning emphasis areas which NCDOT and MPOs are encouraged to use in crafting their annual Unified Planning Work Programs and Statewide Planning and Research Programs – these two programs are foundations for advancing project designs and mobility strategies.

The table below shows the results of a review of how these planning emphasis areas align with three prominent outcomes of the *Connect2050* Plan: (i) the vision, goals, objectives and engagement efforts that served as the foundation of the plan, (ii) the projects and strategies that implement the plan, and (iii) the studies that will hone the details of both current and future projects and strategies. As in the previous tables, a full circle indicates full alignment, a half-circle indicates partial alignment, and a blank cell indicates little alignment.

Tackling the Climate Crisis	Equity & Justice in Transportation Planning	Complete Streets	Public Involvement	Strategic Highway Network	Federal Land Management	Planning & Environment Linkages (PEL)	Transportation Planning Data
Vision, Goals, Objectives & Engagement (Chapters 4 and 5)							
●	●	●	●	●		●	●
Projects & Strategies (Chapter 7, Sections 1 through 11)							
●	●	●	●	●		●	●
Plans, Studies & Performance Tracking (Chapter 7, Section 12)							
●	●	●	●	●		●	●

As the DCHC MPO and CAMPO work with NCDOT, FHWA and FTA in implementing this Metropolitan Transportation Plan, the planning emphasis areas will be key drivers of project scopes and processes.

9.1 Sustainability and Resiliency: Critical Environmental Resources

The Capital Area MPO and DCHC MPO evaluated the 2050 MTP's impact on the sustainability and resiliency of critical environmental factors. The MPOs recognize that the MTP is one of the first steps in developing viable transportation projects that meet state and federal laws and regulation designed to protect public health and safeguard natural resources. In addition, the MPOs recognize the impact that transportation projects have on land development patterns. The transportation network and land use regulations must be complimentary and work together to protect critical environmental resources.

This environmental evaluation at the long-range planning phase is the beginning of more extensive review. The NCDOT uses the Merger process to more effectively implement Section 404 of the Clean Water Act during the NEPA/SEPA decision-making phase of transportation projects. The MERGER process is supported by USACE, NCDENR, FHWA, stakeholder agencies and local units of government to more effectively mitigate environmental impacts such as those from storm water runoff.

The MPOs' environmental analysis was a voluntary effort coordinated with representatives from environmental and cultural resource agencies. At the Metropolitan Plan state, a comprehensive analysis of the impact each project may have on the environment isn't possible and does not substitute for the more thorough project-level analysis that is required as part of the National Environmental Protection Act. The analysis below was intended to identify and flag early in the process projects that might have significant impacts on the environment and that might require costly and disruptive mitigation measures.

For this analysis, the MPOs looked at all of the projects in the Comprehensive Transportation Plan project lists to ensure that a comprehensive record of all of the potential future projects was being evaluated. Many of the CTP projects are not in the final adopted 2050 MTP, and are considered to be beyond the 2050 time horizon of the plan. The MPOs created maps of the CTP projects overlaid on several environmental and cultural GIS files. The maps are grouped in the following themes with the following datasets:

- Biodiversity and Wildlife Habitat
 - NC Conservation Planning Tool – Biodiversity and Wildlife Habitat Assessment – this dataset classifies areas from 1 to 10 based on several metrics
 - Managed Areas
 - Conservation Tax Credit Properties
- Development
 - Hospitals
 - Schools (Public and Private) Colleges or Universities
 - Airports
 - Water and Sewer Service Boundaries
- Farmland
 - NC Conservation Planning Tool – Farmland Assessment – this dataset classifies areas from 1 to 10 based on several metrics
 - Voluntary Agricultural Districts
- Forest
 - NC Conservation Planning Tool – Forestry Lands Assessment – this dataset classifies areas from 1 to 10 based on several metrics
- Gamelands, Hunting Buffers, and Smoke
 - Gamelands
 - Gameland Hunting Buffers
 - Smoke Awareness Areas

- Hazards
 - Hazardous Waste Sites
 - Animal Operation Facilities
 - Active Permitted Landfills
 - Hazardous Substance Disposal Site
- Historic Sites
 - Local Landmarks
 - Local Historic Districts
 - National Register Historic Sites
 - National Register Historic Districts
- Jurisdictions
 - Jurisdictional Boundaries – This map is designed to identify the local jurisdiction that has planning and zoning authority in the vicinity of a project. Since each jurisdiction has different zoning classifications and methodologies, a comprehensive zoning map could not be developed for the entire region.
- Parks and Recreation
 - Open Space and Conservation Lands
 - Boat Access Ramps
 - Trails
 - Greenways
 - Local and State Parks
- Water Resources
 - Impaired Streams
 - Outstanding Resource Management Zones
 - Ecosystem Enhancement Program
 - Target Local Watersheds
- Water Supply
 - Public Water Supply Sources
 - National Pollutant Discharge Elimination System (NPDES) Permitted Sites
 - Surface Water Intake
 - Water Supply Watersheds
 - Nutrient Sensitive Waters
- Wetlands and Floodplains
 - Floodplain Mapping Information Systems (FMIS)
 - Floodplains Wetlands

In addition, the DCHC MPO also sent GIS shape files to resource agencies during the public review process. The agencies contacted were:

- United States Army Corps of Engineers
- NC Department of Natural Resources
- NC Wildlife Resources Commission
- United States Environmental Protection Agency
- United States Fish and Wildlife Service
- NC Department of Cultural Resources
- NC Department of Commerce
- NC Department of Environment and Natural Resources

The maps are shown in Appendix 12. Larger versions of the maps are posted on the MPOs' websites.

9.2 Transportation, Air Quality and Climate Change

Transportation-air quality conformity ("conformity") is a way to ensure that Federal funding and approval goes to transportation activities that are consistent with air quality goals. Conformity applies to metropolitan transportation plans—such as this one, to transportation improvement programs (TIPs), and to projects funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) in areas that do not meet -- or have recently not met -- air quality standards for ozone, carbon monoxide, particulate matter, or nitrogen dioxide. These areas are known as "non-attainment areas" or "maintenance areas," respectively.

A conformity determination demonstrates that the total emissions projected for a plan or program are within the emissions limits ("budgets") established by the State Implementation Plan (SIP) for air quality, and that transportation control measures (TCMs) – specific projects or programs enumerated in the SIP that are designed to improve air quality – are implemented in a timely fashion. The MPOs no longer need to conduct a regional emissions analysis to demonstrate air quality conformity, but are still required to prepare a Conformity Determination Report to demonstrate continued adherence to federal standards and processes.

Although the region is no longer required to calculate emissions for air quality conformity, both MPOs are committed to protecting air quality and health through transportation investments, for example, by continuing to operate a robust regional Transportation Demand Management program to encourage travelers to use lower polluting forms of transportation such as transit, ridesharing, cycling and walking. The MPOs recognize that good air quality is a key component of the region's quality of life and that continued effort is needed to accommodate rapid growth in ways that won't harm air quality. Appendix 7 has results from the air quality evaluation conducted on the land use pattern and transportation projects in the 2050 MTP.

Air Quality Analysis

Although not required, the two MPOs calculate the regional emissions that would be produced by the highway and transit usage predicted in this transportation plan, using the latest EPA air quality model, MOVES. The projected emissions for the plan are compared to the emissions limits (or "budgets") that were last established by the air quality State Implementation Plan (SIP). Appendix 7 reports those emissions so that the region can continue to understand and respond to air quality conditions. The MPOs undertake this voluntary analysis to recognize the importance of clean air to our region.

Climate Change Emissions

Reducing greenhouse gas emissions and transitioning the region's transportation sector to a clean energy, resilient future are hallmarks of the *Connect2050* Plan. From electrification of transit vehicles fleets, to implementing alternative fuel corridors along the region's interstates, to pursuing land use and pricing strategies that influence travel behavior, the MPOs are committed to projects and strategies that will reduce the region's climate impact and increase the region's resilience to climate change.

Addressing Climate Change *a resilient, clean energy future*

FHWA and FTA seek to ensure that transportation plans and infrastructure investments help achieve the national greenhouse gas reduction goals of 50-52% below 2005 levels by 2030, and net-zero emissions by 2050, and increase resilience to extreme weather events and other disasters resulting from the effects of climate change.

The MPOs will leverage the following orders and tools in their efforts to combat and adapt to climate change:

- *EO 14008 on "Tackling the Climate Crisis at Home and Abroad."*
- *EO 13990 on "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis."*
- *EO 14030 on "Climate-Related Financial Risk."*
- *FHWA Order 5520 "Transportation System Preparedness and Resilience to Extreme Weather Events."*
- *FTA's "Hazard Mitigation Cost Effectiveness Tool."*

9.3 Environmental Justice

Environmental justice adds an important focus to the 2050 MTP analysis by specifically evaluating environmental issues through a diversity, equity and inclusion lens. The intent of environmental justice is to avoid, minimize, or mitigate disproportionately high and adverse effects on minority and low-income populations; and ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.

Environmental justice addresses fairness toward the disadvantaged and often addresses the possible exclusion of racial and ethnic minorities, low-income people, the elderly, and persons with disabilities or communication barriers from decision-making. The federal government has identified environmental justice as an important goal in transportation, and local and regional governments must incorporate environmental justice into transportation planning. Capital Area MPO and DCHC MPO have multiple goals that directly support this endeavor including: Protecting the Human and Natural Environment; Ensure Equity and Participation; Ensure that All People Have Access to Multimodal and Affordable Transportation; and, Stimulate Inclusive Economic Vitality.

Even though the term “environmental justice” is not in federal legislation, the concept and its application have been developed through a succession of court cases, transportation regulations, agency memoranda, and Executive Orders. Much of the legal application is based on Title VI of the Civil Rights Act of 1964 that provides protection from discriminatory actions or results from federal, or federally assisted or approved, actions. In terms of transportation planning, environmental justice seeks to ensure that the disadvantaged:

1. Have access to the decision-making process;
2. Realize benefits from investments that are commensurate with the population as a whole;
3. Do not shoulder a disproportionate share of the negative effects and burden resulting from the implementation of transportation projects; and,
4. Do not incur a disproportionate share of the financial cost.

The Capital Area MPO and DCHC MPO have carried out a comprehensive and thorough set of activities to ensure that disadvantaged persons, as characterized in federal regulations, do not suffer discrimination in the transportation planning and implementation process. These activities have been in the area of both public participation and plan analysis. The following sections describe the environmental justice activities that occurred as part of the 2050 MTP.

Access to the Decision-making Process

The Capital Area MPO and DCHC MPO ensured that all individuals, regardless of race, ethnicity, income, age, or disability, had access to the planning process. The MPO began conducting public outreach for the 2050 MTP in June 2020 with the development of the MTP Goals and continued through early 2022 with the review of alternatives, the preferred plan and the adopted plan.

In June 2020, the MPOs developed a joint *2050 MTP Development Public Engagement Plan*; an electronic copy can be found here: <https://bit.ly/3zoYVrH>. The key features of the Engagement Plan include:

- Public engagement goals that include access for low-income, minority and other communities that have often not been involved, and an active effort to engage these communities.
- Multiple ways to review materials and provide feedback including workshops, surveys and focus groups.
- Accessible documents including infographics, short videos, interactive maps, and e-newsletters.

Section 5.2 of this report presents a summary of the MPOs' public engagement activities and demonstrates the activities and effort to engage people from communities of concern. Key elements include:

- Four focus groups of minority, low-income, elderly and youth to receive input on the preferred option.
- Social media advertising that was focused on communities of concern;
- Public engagement notices in Hispanic and African-American newspapers.
- Documents in Spanish;
- Community events or pop-up events located outside traditional meeting places, in transit accessible locations, and at various times of day and days of the week.

Plan Benefits

Transportation infrastructure investments in the 2050 MTP will benefit the MPO's population in many ways, including increased mobility, safety, time savings, economic development, and leisure opportunities. The investments in transit and bicycle and pedestrian infrastructure in particular will benefit low-income populations that do not have access to personal vehicles and person with disabilities who may not be able to operate vehicles. Currently, tens of thousands of households in the Triangle do not have personal vehicles.

The 2050 MTP is noteworthy for the unusually high level of investment in modes that are important to communities of concern, i.e., transit, bicycle and pedestrian. The DCHC MPO plans to invest 37% and 17% in transit and bicycle/pedestrian projects, respectively. CAMPO has similar levels of investments in these modes. The transit, bicycle and pedestrian network assumed in the 2050 MTP is a compilation of the local government and transit system plans. These plans typically included intensive public engagement practices, such as focus groups and targeted in-person workshops, to engage people from the communities of concern.

The 2050 MTP process has been concerned with measuring plan benefits in relation to communities of concern. The MPOs developed a set of performance measures that align with the MTP Goals and Objectives. See section 6.5 Performance Evaluation Measures in this report. A significant number of the performance measures are related to equitable benefit of the transportation investments, including:

- Percentage of work and non-work trips by transit less than 40 minutes for the entire MPO area and for low-income, minority and zero-car households.
- Percentage of work and non-work trips by automobile less than 20 minutes for the entire MPO area and for low-income, minority and zero-car households.
- Number of non-motorized fatalities and serious injuries for the entire MPO area and for low-income, minority and zero-car households.
- Daily minutes of delay per capita for the entire MPO area and for low-income, minority and zero-car households.
- The percentage of environmental justice population that lives within an accessible distance (e.g., ¼ mile for bus transit) of transit.

Negative Project Impacts

The investments in transportation infrastructure included in the 2050 MTP will also have some negative impacts to some of the MPOs' population. While road widening projects may increase overall mobility, the residents near the project may be impacted negatively. Some of the negative impacts to nearby residents include increased traffic through their neighborhoods, increased vehicle speeds, land acquisition for necessary right-of-way, relocations of homes and businesses, and a change in neighborhood character and land uses. A project's net impact is not always clear and may be perceived differently by different residents. A project that increases property values, mobility, and economic development may also increase traffic, relocate homes and businesses, and change neighborhood character. Although it is difficult at this stage of project development to conclusively assess the overall impact of the highway projects included in the 2050 MTP, the two MPOs did complete several analyses of the potential negative impacts the projects may have on environmental justice communities.

During the development of the 2050 MTP, MPO staff often qualitatively evaluated individual projects for potential negative impacts and often eliminated projects that had significant potential negative impacts. Staff eliminated some projects based on factors such as limited right-of-way, neighborhood and community characteristics, and the historical impact of urban renewal.

The two MPOs analyzed the potential impact of the 2050 MTP highway projects and transit corridors to ascertain whether the potential negative project impacts might be disproportionately impacting environmental justice communities and whether benefits appeared to be equitably distributed. This analysis was completed for the plan as a whole. Individual projects in the 2050 MTP will be studied in more depth during the project development and design stage to better understand the negative impacts and positive benefits of that particular project. The negative impacts can often be mitigated by context sensitive design.

Determining A Community of Concern (CofC)

The MPOs explored different methods to get at the fundamental question, “What is a community of concern?” Three principles guided the analysis:

1. If everyone is special, no one is special; we do not want to set the threshold too low or it could mask real and important differences between locations,
2. Be as inclusive as possible in light of the above; we do not want to leave areas out that could sustain meaningful negative impacts from the decisions we make, and
3. The final analysis should yield a pattern that allows for targeted outreach and a meaningful analysis of overall transportation investments.

The MPOs gave careful consideration to the data values and sources used for the protected classes we evaluated:

1. Use of Census Block Groups as the geographic unit. This is because block groups are updated each year and some socioeconomic data are not available at a smaller scale. It also helps compare urban, suburban, and rural areas in an “apples-to-apples” way.
2. Choice of which metric we use. By choosing to use the “median” as our measure, it gets around any extremes, such as income, that may exist within the block group. By using a median, the primary makeup of the block group is reflected because extremes will not have much impact.
3. Measuring each item we evaluate as a percentage. This also helps to create an “apples-to-apples” comparison for urban, suburban, and rural parts of the region.

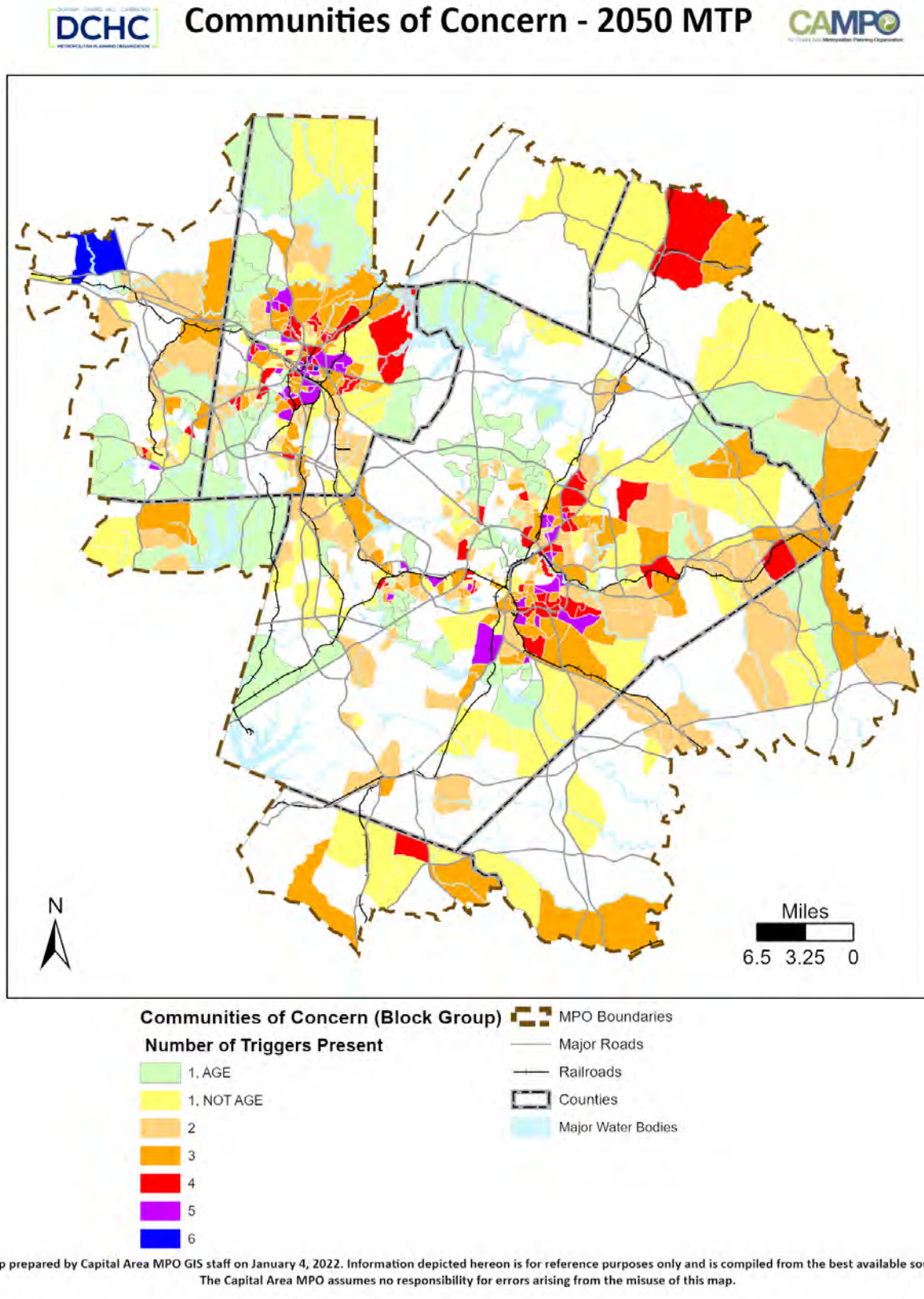
The MPOs also tried to match the data that are available to the protected classes under the Title VI Program Coverage umbrella. In 2017, the MPOs worked closely with the Triangle J Council of Governments, the NCDOT Community Studies and Office of Civil Rights staffs and FHWA to review methodologies and determine data thresholds. Given the even distribution of men and women and disabilities, gender and disability were not protected classes that were used in this analysis. Zero-car households was included because it is a group that is greatly affected by transportation investments.

Using a composite “minority” measure may miss some key groups. As an example, a block group that might be included for “Black alone” only needs around 32% of the block group to identify as Black. In a single minority measure, the threshold is around 57%, and if no other minorities are present this might miss too many people that need to be included. The final selection of how to measure led to using “Non-white Race” and “Hispanic/Latino Origin” as separate variables. Some block groups with Asian minority presence that may not meet the combined race threshold for minority trigger under “Linguistic Isolation” and are included.

It is important to understand that these are regional-scale, planning level proxies for actual EJ communities. When working with individual projects or specific outreach efforts, this analysis is just a guidance or screening tool to begin the identification of the actual communities.

The results of this selection process are depicted in *Figure 9.3.1*. An online, interactive map that displays the communities of concern and the highway, bus transit and regional transit projects can be viewed [here](#).

Figure 9.3.1



The two MPOs determined the percent of total 2050 MTP highway project length and the percent of total 2050 MTP cost by project type that were in any block group with the presence of any protected class in the top quartile (top 25%). The results of this analysis are shown in *Figure 9.3.2*. Transit investment corridors were also analyzed for length, but not cost since they are not project-specific.

Figure 9.3.2 Project Portfolio Impact on Communities of Concern

Region CofC = Community of Concern	Total Miles	Miles in CofC	Percent in CofC	Total Investment	Total Investment in CofC	Percent in CofC
New Location Highway	329	193	59%	6,469,482,993	3,830,341,563	59%
All Other Highway	404	236	58%	4,792,839,402	2,561,212,120	53%
Existing Highway Widening	1,090	567	52%	18,029,755,489	9,316,896,576	52%
Transit Corridors	1,956	1,381	71%	Cost Not Reported-Corridor not Project		

CAMPO	Total Miles	Miles in CofC	Percent in CofC	Total Investment	Total Investment in CofC	Percent in CofC
New Location Highway	307	173	56%	\$6,225,161,993	\$3,672,312,058	59%
All Other Highway	313	161	52%	\$4,345,470,402	\$2,137,433,311	49%
Existing Highway Widening	1,062	550	52%	\$17,711,928,489	\$9,123,674,281	52%
Transit Corridors	1,151	740	64%	Cost Not Reported-Corridor not Project		

DCHC MPO	Total Miles	Miles in CofC	Percent in CofC	Total Investment	Total Investment in CofC	Percent in CofC
New Location Highway	21	20	91%	\$244,321,000	\$158,029,505	65%
All Other Highway	92	75	82%	\$447,369,000	\$423,778,810	95%
Existing Highway Widening	28	17	61%	\$317,827,000	\$193,222,296	61%
Transit Corridors	805	641	80%	Cost Not Reported-Corridor not Project		

Project Portfolio

Table 9.3.2 above, shows the investment in terms of miles and cost for the 2050 MTP highway and transit projects in the region, CAMPO, and DCHC MPO. Overall, the percent of highway investment in the region and CAMPO in communities of concern is slightly greater than one-half, i.e., 52% to 58%. The same investment in the DCHC MPO is much higher, ranging from 61% to 95%, in communities of concern. This higher percentage level results from the DCHC MPO having much more area in communities of concern such as low-income and minority populations.

There are a few values in the table that are worth noting and explaining. The miles of new location highway are 91% in the DCHC MPO. These new location highways are exclusively extensions of existing local collector roads and one two-lane boulevard (i.e., Northern Durham Parkway) that are intended to provide access to the neighborhoods and do not bring the noise, pollution, land encroachment, and safety concerns associated with multilane arterials roads. Also, the total investment of all other highway in the DCHC MPO is 95%. These roadways are exclusively modernization projects that are considered friendly to neighborhoods and communities. Roadway modernizations do not add additional roadway lanes but do add bicycle, pedestrian and transit facilities, and improve intersections for all modes.

The percentage of miles of transit projects for communities of concern are considerably higher than the percentage for roadway projects – 64% in CAMPO and 80% in DCHC MPO. Transit service is higher in the denser urbanized areas where the communities of concern are concentrated. It is also higher, of course, where potential ridership is concentrated, which includes areas of prevalent low-income and minority populations. In the 2050 MT), the transit service is highest in these communities of concern by design. It should be noted that the 2050 MTP includes improved demand-responsive service that serves the rural areas and those without fixed-route transit. The demand-responsive service cannot be accurately mapped and thus is not part of this environmental justice analysis.

For the most part, the bicycle and pedestrian projects are not identified as projects or mapped in the 2050 MTP. The MTP sets a budget for investing in these projects and references the many local government plans that identify bicycle and pedestrian projects in a detail.

Potential Benefits, Burdens and Mitigation Strategies

It is difficult to assess overall benefits and burdens at a regional scale. As each transportation project moves into the development and design stage, the benefits and burdens can be more accurately assessed and identified. Nonetheless, at the regional planning stage we can generally identify potential benefits and burdens for different types of projects to provide a template for planners, engineers, residents and elected officials to evaluate projects. The series of tables below provides a template that lists the general benefits, burdens and mitigation strategies (for the indicated burden) for different types of transportation projects.

Bicycle and Pedestrian		
Potential Benefits	Potential Burdens	Mitigation Strategy Examples
Reduced emissions	Impact to motor vehicle capacity	Use ITS to make timing of ped crossing and roadway signals as efficient as possible for all users
Reduced parking need	Impact to motor vehicle travel times	Grade separate bike and pedestrian crossings where feasible
Community health improvements	Additional conflicts at intersections	Add pedestrian crossing time to signal; add safety features in design, e.g., bike boxes, shorter vehicle turning radius
Increased cyclist and pedestrian safety	Need for additional right-of-way	Reduce vehicular lane width--has added benefit of slowing motor vehicle speeds around bike and ped facility users
Access for households without vehicles	Need for additional structures/other construction concerns	Fund and build roadway and bike/ped facilities through single integrated project, i.e., Complete Streets

Roadway Operational Improvements		
Potential Benefits	Potential Burdens	Mitigation Strategy Examples
Reduced crashes and/or serious crashes	Increased congestion and reduced access to adjacent land during construction	Re-route traffic to major roads where possible; limit construction closures to nights and weekends
Better bicycle, pedestrian and transit travel	Additional shoulder or other changes can increase corridor width	Use curb and gutter instead of open swale to reduce footprint
Reduced travel time	Adjustment period for user behavior (roundabouts, DDIs, often confusing at first)	Education and outreach campaign prior to opening of new traffic pattern

New Location Roadway		
Potential Benefits	Potential Burdens	Mitigation Strategy Examples
Increased connectivity and mobility	Induced Demand--Add VMT	Construct new facilities as variable rate tolled facilities that can have dynamic pricing based on peak hour demand; include bike and ped facilities to encourage short trips to not use motor vehicles
Increased operational efficiency and network redundancy	Noise and emissions impacts to existing land uses & neighborhoods	Construct noise walls where warranted; reduce speeds and minimize signalized intersections for idle reduction
Economic impacts-freight efficiency, catalyst for land use changes	New traffic patterns can push congestion to new locations	Find those locations in the model and plan for them accordingly in the MTP
Reduced travel time	For freeways --benefits only to motor vehicle users; transit benefits only to express bus service	Include bike & ped provisions as part of roadway project; provide for BRT stops along access limited corridor

Transit Corridors		
Potential Benefits	Potential Burdens	Mitigation Strategy Examples
Improves mobility for people without access to vehicles	Diesel buses are noisy and emit noxious fumes	Convert bus fleets to electric, hybrid or natural gas propulsion
Increased travel capacity by adding service instead of increasing the physical footprint of the facility	Bus stops in the travel lanes reduce overall roadway capacity and create a negative image of bus transit	Get enabling legislation to require motorists yield to left-signaling buses; work with transit agencies to incorporate bus lane pull outs into roadway projects
Reduction in vehicle miles traveled (VMT)	Transit trips are not time-competitive	Add bus-only lanes, signal queue jump, etc.; increase headways and service hours; add cross town routes
Net reduction in traffic congestion	Fixed route transit does not serve the entire region	Work with on-demand service providers and human service agencies to fill service gaps where fixed routes are not feasible financially or operationally

EJ and Project Maps

Readers can view an interactive, online map of the Environmental Justice Communities of Concern with the 2050 MTP highway and transit projects as an overlay to view the distribution of the MTP investments. The online map is available on the 2050 MTP web page for both CAMPO and DCHC MPO, and can be found at the following link at the publication time of this report, i.e., February 2022. Readers can also view regional-scale copies of these maps in Appendix 12 of this report.

Financial Impact

Finally, environmental justice also requires that the disadvantaged population not bear a disproportionate share of the financial cost of the plan. The 2050 MTP is financed by both traditional and new revenue sources. The 2050 MTP does not include changes to traditional funding sources, which are mostly state and

federal gas taxes, vehicle registration fees, highway use taxes, and some general funding (e.g., individual and business taxes). Given the ongoing status of these revenue sources, this environmental justice discussion does not address the traditional sources.

The 2050 MTP is reliant on new sources of revenue:

1. Sales tax increase for public transit;
2. Car registration fee increase;
3. Toll roads and managed lanes; and,
4. Sales tax equivalent increase for transit, roadways and bicycle and pedestrian facilities.

Sales taxes are generally considered regressive. Lower income households pay a higher percentage of their income in sales taxes than do higher income households. Higher income households pay more in *actual* dollars in sales tax than lower income households, but these payments represent a smaller *proportion* of the total income of higher income households. Current transit sales taxes mitigate the “who pays” side of the equation by excluding many necessities from the sales tax, including food, medicine, utilities and shelter. By excluding these items, a typical household in the lowest 20% income group would pay about \$3 per month for the ½ cent transit tax, based on analysis by the North Carolina Budget & Tax Center. Households in the top 1% income bracket would average \$57 per month and those rounding out the top 5% income bracket would average \$17 per month. Also, one financial analysis showed that the impact of a one-dollar increase in the price of a gallon of gasoline is about ten times worse for low-income households than the impact of a ½ cent sales tax. Both CAMPO and DCHC MPO propose a one-cent sales tax increase in the 2050 MTP.

Looking at who pays is only part of the story; who benefits is equally important. Transit service is disproportionately used by people with lower incomes and by zero-car households. Currently, tens of thousands of households in the Research Triangle Region report having no vehicle available. Our region’s travel forecasts estimate that the majority of transit trips after we invest in rail service and greatly expanded bus service will be made by people from households without cars and low-income households with cars. So looking at the whole equation, a sales tax that is spent entirely on transit would provide a net benefit to households that are most dependent on transit service to reach jobs and educational opportunities.

Toll roads, such as the I-40 managed lanes project in CAMPO, would require the payment of tolls to use the express lanes. Low-income populations will still have the option to use the facility by using the existing general purpose lanes free of charge. In addition, public transit vehicles will be able to use the managed lanes, which operate at faster speeds during congested periods, free of charge. High-occupancy vehicles might also be able to use the new managed lanes free of charge but that determination would not be made until the project financial plan is completed.

Toll roads and managed lanes projects will require a detailed environmental justice review during project development. The MPOs will advocate for mitigation measures if there are significant negative impacts for communities of concern. The *Triangle Strategic Tolling Study* (October 2019) identified some potential mitigation measures and further discusses this issue.

The 2050 MTP financial plan also identifies a new revenue stream as a sales tax equivalent. Given that there is already a ½ cent sales tax in Wake, Durham and Orange counties that is dedicated to transit, this language is used to provide readers the sense of scale the new revenue stream might have in terms of revenue and economic impact. This report cannot assess the financial impacts to the communities of concern because the new revenue vehicle is unknown at this time. The revenue vehicle could be an increase in property, gas or sales taxes, or implementation of a local income tax. And, the property and income taxes could have progressive provisions that exclude or advantage lower-income households, thereby nullifying any financial impacts to that group.

9.4 Safety and Security

Metropolitan Planning Organizations are being encouraged to effectively address safety and security issues in accordance with policies outlined in the Fixing America's Surface Transportation (FAST) Act.

Federal requirements maintain the existing core program called the “Highway Safety Improvement Program” (HSIP). This program is structured and funded to make significant progress in reducing fatalities on highways as well as other modes that use highway, railroads, and other conduits within the transportation network. The HSIP increases the funds for infrastructure safety and requires strategic highway safety planning focused on measurable results. Other programs target specific areas of concern such as work zones and older drivers. Pedestrians, including children walking to school, are also a focus area for the program.

Both the Capital Area MPO and Durham-Chapel Hill-Carrboro MPO have been proactive in addressing safety and security as a component of our overall transportation processes by pursuing the following actions:

- Vision Zero, a new approach to traffic safety, maintains that the loss of even one life or serious injury on our roads is not an acceptable price to pay for mobility. Designers and users of the roads share responsibility for the safety of all road users under the Vision Zero approach. Vision Zero views human error on roadways as inevitable, and advocates for roadway and vehicle design that accounts for human mistakes. Vision Zero uses the “5 E Strategy” – education, encouragement, enforcement, engineering, and evaluation – to achieve zero fatalities and severe injuries on roadways. First implemented in Sweden in the 1990s, Vision Zero has achieved great success in Europe and continues to gain momentum internationally and throughout the US.

The North Carolina Department of Transportation (NCDOT) adopted a Vision Zero program, NC Vision Zero, in 2016. NC Vision Zero serves as an umbrella organization for Vision Zero programs throughout the state. NC Vision Zero provides data, research, and other resources to support Vision Zero programs throughout North Carolina. NC Vision Zero has also assembled a statewide Vision Zero stakeholder group in order to facilitate communication between traffic safety stakeholders.

On September 18, 2017, the Durham City Council adopted the Vision Zero Durham Resolution making Durham the first city in North Carolina, and the first among its peer cities nationally, to officially adopt a Vision Zero program. The Vision Zero Durham Resolution affirms the Durham’s commitment to eliminating traffic deaths and serious injuries on Durham roadways, and provides a framework for City departments and community stakeholders to work together to achieve this goal. The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) passed a resolution in support of Vision Zero Durham on August 9, 2017. At the time of the 2050 MTP adoption, several other DCHC jurisdictions have begun to take action to adopt and implement Vision Zero programs.

- Video surveillance. The transit agencies in both MPOs (i.e. GoRaleigh, GoDurham, Chapel Hill Transit, GoCary, GoTriangle, and area human service providers) have or are in the process of providing on-board video surveillance cameras and transit station camera detection as a deterrent to crime; as well as providing Mobile Data Computers/Automatic Vehicle Locators on their vehicles. GoCary’s paratransit vehicles have automated vehicle locator systems as well as video surveillance via DriveCam.
- Safe Routes to Schools (SRTS). The Capital Area MPO has created a regional Safe Routes to School program that is designed to coordinate SRTS activities throughout the MPO as well as provide policy leadership and technical assistance to local agencies and schools. Agencies within the Capital Area MPO are continuing to develop and implement SRTS activities that will benefit elementary schools and their adjacent neighborhoods throughout the community. Many local communities also have Safe Routes to Schools initiatives.

- Safety Metrics. Both MPOs include “Accident/Safety” metrics when determining the technical scoring and prioritization of roadway projects for their Transportation Improvement Programs.
- “Four Es” for Biking and Walking. Both MPOs have adopted bicycle and pedestrian plans that include four significant pillars to strengthen the role of bicycle and pedestrian facilities in overall transportation planning. The “Four-Es” (i.e. education, engineering, enforcement, and encouragement) bring attention to the importance of safety through various public service announcements in the local media focused attention to these key areas of transportation network development. Furthermore, both MPOs continue to remain active in promoting bicycle and pedestrian activities through events such as Bike to Work Week. These programs impact the region’s overall transportation culture by promoting bicycle and pedestrian traffic and travel as a valuable mode of movement through the region.
- Watch for Me NC Campaign. Both MPOs have incorporated within those adopted bicycle and pedestrian plans expansion of bicycle accommodations and walkway infrastructure through both on-road and off-road facilities. The presence of walkway infrastructure will have a significant impact in the reduction of pedestrian crashes (particularly an 88 percent reduction in “walking along road” pedestrian crashes). The concern about pedestrian safety in the state of North Carolina (currently recognized by FHWA as a “Pedestrian Emphasis” state) has encouraged NCDOT to host pedestrian safety classes. These classes have been taken by staff from both MPOs. Both MPOs, in cooperation with the North Carolina Highway Safety Research Center (HSRC) and NCDOT are participating in the initial “Watch for Me NC” campaign. This campaign is intended to improve pedestrian safety through educational messages directed at pedestrians and drivers as well as encouraging police enforcement of current pedestrian laws. The MPOs, along with NCDOT and HSRC, continue to build off of the initial campaign in Raleigh, Durham, Chapel Hill, and Carrboro. Both MPOs continue work to extended the campaign to the region’s other communities in future years.
- Incident Management. Both MPOs have funded an Incident Management Plan, which includes strategies for improving:
 - Responder safety
 - Safe, quick clearance activities
 - Prompt, reliable, interoperable communications

The program directly addresses eight of the twelve strategies aimed at improving responder safety and safe, quick clearance of incidents; particularly along I-40, and other Interstate/freeway candidate facilities in the region. Both MPOs have been active with Incident Management Planning. Working on a project to improve the Traffic Incident Management Program in the Triangle, the two MPO pursued goals that involved reducing incident clearance time, increasing responder safety, reducing secondary incidents, and education of the public. The accomplishments included the following:

Incident Management Activities

Starting in 2013, various service agencies have been involved in creating a coordinated traffic incident management program. Studies indicate that 70 percent of all drivers do not know the state has fender bender and move over laws; therefore an effort is being made to make the public aware of those laws.

Establishment of the Incident Management Subcommittee

An Incident Management Subcommittee was created to develop a MOU for CAMPO and to develop a public education campaign for motorists. The MOU has been endorsed by the emergency response agencies throughout the region. It is a non-binding statement of principles but all agree that the

MOU is important. Roles at incident scenes have been agreed upon by various responder agencies. This was taken to local police and fire associations with agreement from both groups.

Media Buys using Radio/TV, Online, Billboards

NCDOT worked in cooperation with the MPOs to purchase billboards to advertise a “Move Over and Fender Bender Laws Ad Campaign”. NCDOT staff also worked to host a news conference that included the Secretary of NCDOT; as well as the leaders of the Incident Management Subcommittee to address the Move Over and Fender Bender Public Service Announcements (PSAs). Furthermore, NCDOT’s Dynamic Messaging Signs (DMS) have been used to display the Move Over and Fender Bender PSAs; along with radio ads for a brief period of time. Finally, the NCDOT Communications staff has used social media to broadcast information concerning the laws.

Traffic Incident Management Memorandum of Understanding

The final draft of the MOU was presented and endorsed by both the Incident Management Subcommittee Meeting and the Congestion Management Process (CMP) Stakeholders Group meeting. The MOU was circulated throughout the region for review and adoption by local government boards.

- Safety Audits. Both MPOs receive Traffic Engineering Accident Analysis (TEAAS) data from NCDOT’s Transportation Mobility & Safety Division. The aforementioned division uses the data for Road Safety Audits for state maintained roads. Both MPOs will continue to work with NCDOT’s Transportation Mobility & Safety Division to utilize data from future road safety audits to prioritize and fund future road projects.
- Safety Countermeasures. Additional safety countermeasures that are utilized by both state and local agencies within both MPOs include:
 - buffers or planting strips,
 - marked crosswalks,
 - “road diets” (narrowing or eliminating travel lanes on roadways)
 - traffic calming/traffic control devices
 - Roundabouts and 4-way stop control intersections

Both MPOs will support safety countermeasures on roads, and at signalized and unsignalized intersections where needed to ensure safety for the travelling public.

- ITS safety. Both MPOs were a part of the most recent Triangle Regional ITS Strategic Deployment Plan Update that was finalized in 2020. The MPOs have created a joint ITS working group to prioritize and implement recommendations from the Plan. One of the goals of the ITS Strategic Deployment Plan is to “*Advance safe and efficient movement of people and goods throughout the region*”. The three objectives associated with the goal include:
 - *Clear 90% of incidents in 60 minutes or less on the principle arterial network,*
 - *Reduce the number of crashes per 100 million vehicle miles by 10% over a three-year floating average on the principle arterial network, and*
 - *Decrease secondary incidents by 10% on the principle arterial network*

9.5 The Fixing America's Surface Transportation (FAST) Act and the 2050 Metropolitan Transportation Plan

The FAST Act initiated new planning rules in *23 CFR 450* that are relevant to the MPOs' transportation plans. The new rules (paraphrased in italics) and a discussion of how the MPOs have responded are presented below.

1. *New Planning Factors –306 (b)(9)(10)*

A. *Improve resiliency and reliability of the transportation system and reduce or mitigate storm water impacts of surface transportation*

The resiliency and reliability of the transportation system has improved under the 2050 MTP because the investment in highway maintenance has substantially increased. In the 2040 MTP, highway maintenance expenditures were 30% of the total non-transit budget. That figure is approaching 50 percent for both MPOs in the 2050 MTP.

In terms of storm water impacts, the local planning departments and NCDOT and the many resource agencies have taken an aggressive approach in implementing the state and federal regulations to limit the impacts from private structures and surface transportation. NCDOT continues to use the Merger process, which is supported by USACE, NCDENR, FHWA, stakeholder agencies and local units of government, to effectively implement Section 404 of the Clean Water Act during the NEPA/SEPA decision-making phase of transportation projects.

B. *Enhance travel and tourism*

The Triangle is not considered a travel or tourism destination. Nonetheless, the location of major universities draws travel to the area for university related special events, and some roadways such as I-40 serve as principal travel corridors for those traveling to the mountains or beaches. The 2050 MTP has a substantial investment in the roadways and public transportation that provide access to the major universities because the land use and travel modeling processes identify those areas as employment and education centers. Those centers and the subsequent forecasted congestion attract needed roadway improvements and transit services. For example, fixed guideway transit such as commuter rail or bus rapid transit provides access to all of the four major universities in the Triangle. Major roadway improvements are planned for those campuses, as well. In terms of tourism travel that passes through the Triangle, those travel corridors such as I-40 and the future I-87 will receive major capacity improvements.

2. *The MPO shall set performance targets no later than 180 days after the State or Public Transportation Provider establishes performance targets – 306 (d)(3)*

The CAMPO and DCHC MPO have approved performance targets as required, and continue to update them on required schedules.

3. *The MPO and public transportation providers shall jointly agree upon and develop specific written provisions for developing and sharing information related to the following -- 314(h):*

- a. *Transportation performance data*
- b. *The selection of performance targets*
- c. *The reporting of performance targets*
- d. *The reporting of performance data to be used in tracking progress toward attainment of critical outcomes*
- e. *The collection of data for the State asset management plan for the NHS*

The MPOs and transit providers developed the agreements. CAMPO adopted an agreement on May 16, 2018 and the DCHC MPO incorporated written commitments into a TIP amendment on May 9, 2018.

4. *Documented Participation Plan shall include – 316(a):*
 - a. *Public ports* – There are not any ports in the MPO’s planning area.
 - b. *Private providers of intercity bus operators* – Local transit systems coordinate and share facilities with the private, intercity bus operations. For example, the Durham Central Transit Station, which provides access to local fixed-route and regional transit systems, also has access to Greyhound and Mega Bus services. The MPO Technical Committees (TC) have designated a member from these private providers but they do not attend the TC meetings. The MPOs will continue to coordinate with private providers by sending them participation information through public input processes.
 - c. *Employer based commuting programs* – The Triangle J Council of Governments (TJCOG) coordinates the Triangle TDM program for the entire Triangle Region. Chapter 7 of this report summarizes the TDM program. The following TDM Web page has program details that demonstrate the breadth and effectiveness of the program:
<http://www.tjcog.org/triangle-transportation-demand-management-program.aspx>
 - d. *Vanpool programs* – These programs are an integral and successful part of the Triangle TDM program. See subpart “c” above.
 - e. *Transit benefit programs* – These programs are an integral and successful part of the Triangle TDM program. See subpart “c” above.
 - f. *Parking cash-out programs* – Local government, transit agency and downtown organization planners have promoted parking cash-out programs to large residential developments, employment centers and universities. For example, local planners discuss unbundling “free” parking spaces from apartment rental fees with developers and property management firms. However, the MPOs are not aware of any bona fide parking cash-out programs in the region.
 - g. *Shuttle or telework programs* -- These programs are an integral and successful part of the Triangle TDM program. See subpart “c” above.
5. *The MPO shall consult with agencies and officials responsible for other planning activities within the MPA when developing the MTP and TIP MPO – 316(b)*
 - a. *Tourism* – The MPOs include the relevant Convention & Visitors Bureaus by providing participation information (both general efforts like the MTPs and TIPs and project-specific efforts like corridor studies and small area plans).
 - b. *Natural disaster risk reduction* – The MPOs participate in hazard mitigation plan updates and special studies like the 2018 Triangle Regional Resilience Assessment.
6. *MPO has option to conduct and include PEL process – 318(e)*

The MPOs have begun to be engaged by NCDOT in their Integrated Project Delivery initiative. This is envisioned by NCDOT to be NC’s collective approach to the PEL process.
7. *MPO shall have Congestion Management Process – 322*
 - a. *An MPO serving a TMA may develop a congestion management plan*

The MPOs have approved Congestion Management Process plans and have implemented the plans through completion of System Status Reports and other reports such as a Mobility Report Card.

b. Consider employer-based travel demand reduction strategies: intercity bus, employer-based programs, carpool, vanpool, transit benefits, parking cash-out, telework, job access projects. The Triangle TDM program, which is summarized in chapter 7 of this report, makes use of these strategies. The following TDM Web page identifies the strategies and evaluates their effectiveness: <http://www.tjcog.org/triangle-transportation-demand-management-program.aspx>

8. MPO shall include the consideration of intercity bus service – 324 (f)(2)

See the response to #4-c above.

9. MPO shall have performance targets – 324(f)(3)(4)

- a. MTP shall include a description of the performance measures and targets used in assessing the performance of the transportation system
- b. A system performance report evaluating the condition and performance of the transportation system with respect to the performance targets including progress achieved by the MPO to reach performance targets

The response in item number 2, addresses the CAMPO and DCHC MPO timeline for addressing the federal performance measures. In addition, as detailed in chapter 4 of this report, the MPOs have established a set of both MTP performance measures/ targets and federal performance measures that are aligned with the MPOs goals and objectives.

Related Performance Based Plans

There are several other plans maintained by transportation agencies that feed into performance management or include aspects of performance management. It is important that the goals and objectives of those plans are incorporated into the MPOs overall performance based planning efforts. The following plans contain applicable performance management components.

- NCDOT Strategic Highway Safety Plan (SHSP)
- Transportation Asset Management Plan (*for the National Highway System*)
- Congestion Management Process (CMP)
- Transit Asset Management (TAM) Plan
- Public Transportation Agency Safety Plan

10. MPO may voluntarily elect to conduct scenario planning – 324(f)(4) (ii)

As detailed in the land use plans and policies and Alternatives Analysis sections of chapter 5 of this report, the MPOs have made extensive use of scenario planning. Different land use plans are matched with different sets of transportation investments (e.g., large highway investments, large fixed-guideway investments) to create modeled outputs.

11. TIP shall include to the maximum extent practicable – 326(d)

- a. Description of the anticipated effect of the TIP toward achieving the performance targets identified in the MTP
- b. Link investment priorities in the TIP to achievement of performance targets in the plans

The MPOs will provide written text and analysis as the performance measures take effect and as the Transportation Improvement Programs (TIP) under the 2050 MTP are updated and implemented.

10. Post-2050 Vision: Comprehensive Transportation Plan Projects

Many worthy projects that would help ease congestion, improve access and provide travel choices are not able to be funded within the constraints of existing and reasonably anticipated revenue sources, and therefore are not included in the fiscally constrained 2050 Metropolitan Transportation Plan. These projects are typically included in each MPO's Comprehensive Transportation Plan (CTP). These unfunded projects are listed in the appendices with an implementation year beyond 2050.

The [Durham-Chapel Hill-Carrboro CTP](#) was adopted in May 2017 and was last amended in December 2020.

The Comprehensive Transportation Plan for CAMPO is a combination of the proposed projects that were not funded in the Metropolitan Transportation Plan (MTP) in Wake County, and adoption of the CAMPO portion of county-wide CTPs in Franklin, Granville, Harnett, and Johnston Counties. The CTPs for each county are an important input during the development of each MTP. CAMPO works to ensure the projects identified in the MTP and local CTPs match. The current status of Capital Area MPO CTP components can be viewed at:

<http://www.campo-nc.us/transportation-plan/comprehensive-transportation-plan>