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 2020transportation 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.

Performance Measure	***FAST Act Target***
% 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

Performance Measure	*FAST Act Target*
% 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.

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	

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.

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.

F*igure 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

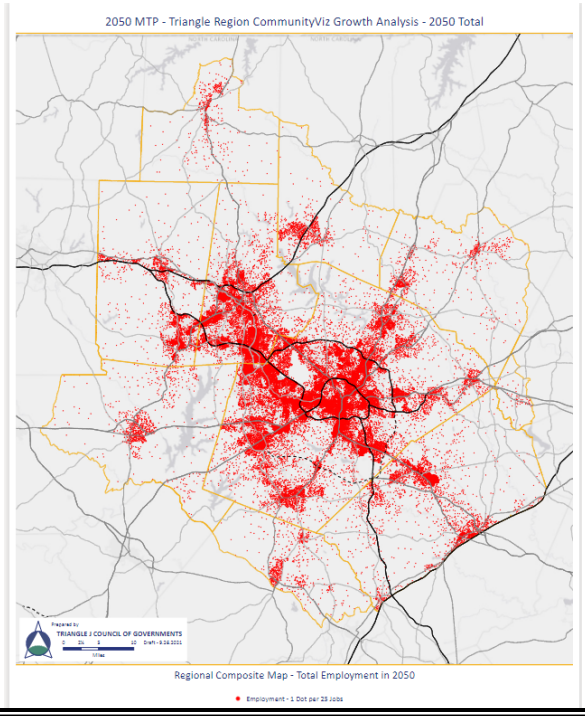
The financial plan used pie and bar charts to present data. Examples: see MPOs' Web sites for draft reports and presentations throughout the planning process.

Others

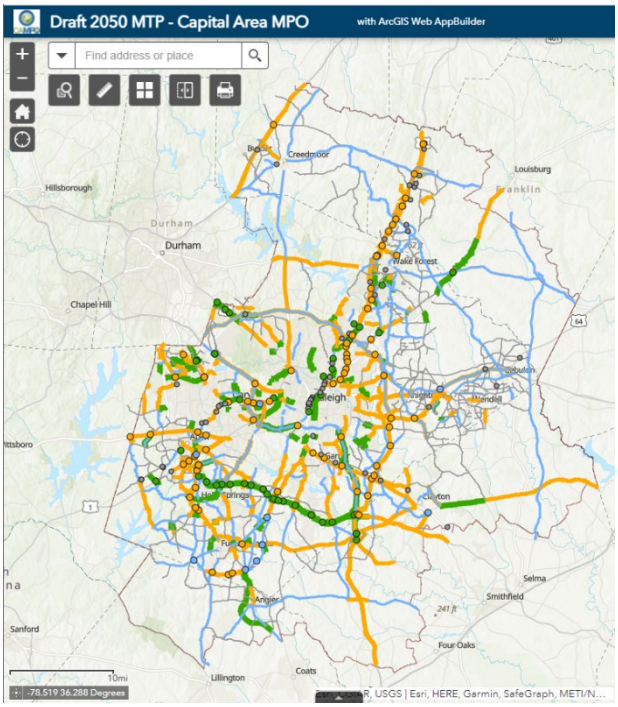
The presentations throughout the 2050 MTP planning process and this final report have dozens of maps and graphics to depict everything from the status of the planning process to the relationship of the MTP, CTP and TIP.

Figure 5.2.2 -- Examples of Visualization Techniques

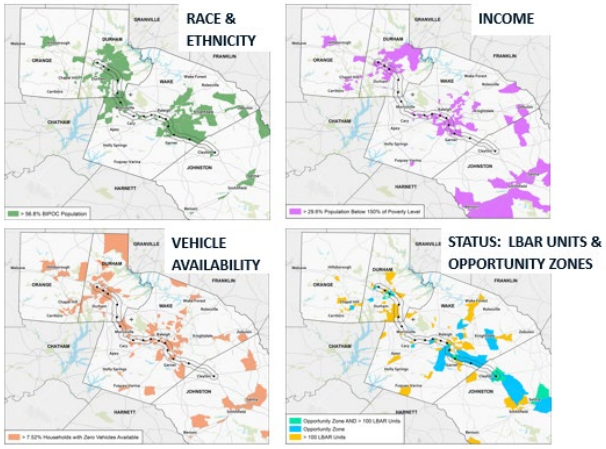
Dot-Density Growth Maps



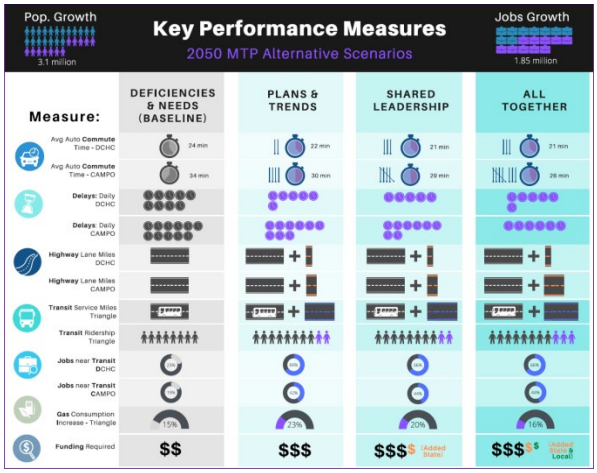
On-Line Project Maps



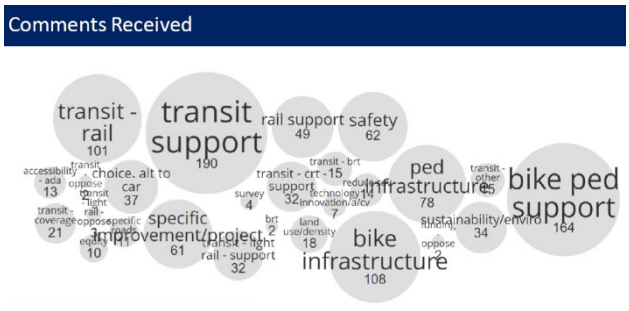
Communities of Concern Maps



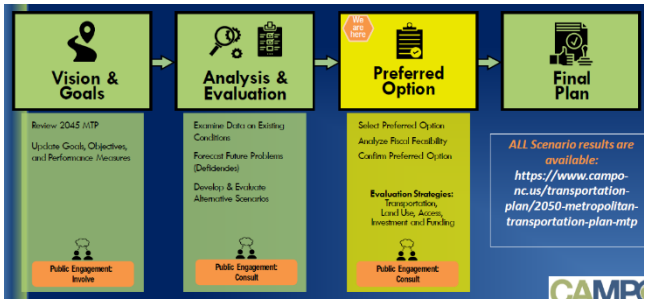
Scenario Impact Infographics



Engagement Survey Infographics



Process Diagrams



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, ncluding 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	*CORE Bicycle & Pedestrian Plan*. 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	*Triangle Region Long Range Transportation Demand Management Plan*. 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	*Congestion Management Plan (CMP*). 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 System Status Report and Mobility Report Card. The Capital Area MPO has a Congestion Management Process (CMP) and System Status Report.	Functional Plan
4	*Triangle Regional Freight Plan*. 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	*RDU Vision 2040*. 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	*ITS Strategic Deployment Plan Update*. Plan includes a snapshot of best practices, list of projects, regional ITS architecture, and guidelines for maintaining the Plan.	Functional Plan
7	*NC 98 Corridor Study*. 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	*Triangle Strategic Tolling Study*. 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	*Bus on Shoulder Study*. 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	*Wake County Transit Plan* – 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	*US 1 Phases I & II Corridor Studies.* 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	*NC 50 Corridor Study.* 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	*NC 54 and More Study.* 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	*Southwest Area Study Update*. 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	*Northeast Area Study Update*. 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	*Southeast Area Study.* 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	*Raleigh-Cary Rail Crossing Study.* 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	*NC 56 Corridor Study.* 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	*CAMPO-FAMPO Rail Corridor Study Phase 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	*Triangle Bikeway Implementation Study.* 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	*US 401 Corridor Study.* 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	*RED Lanes Study.* 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	*Commuting Corridors Study* 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	*Western Wake Signal Integration Study.* 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: • *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: • *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: • *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.