RESEARCH & DEVELOPMENT

Rural Freight Transport Needs

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16. Abstract

The transportation needs of rural North Carolina are very different from the urban areas. To understand rural needs, a literature review, a socio-economic study, an economic analysis, and two major workshops, one held in Sylva, NC in the southwestern corner of the state (July 30, 2019) and another in Hertford, NC in the northeast (October 23, 2019) were conducted. The workshops were undertaken to solicit input from two rural communities, which could be used to better understand the rural transportation needs. These workshops ultimately became case studies, aimed to help NCDOT understand how to couple infrastructure investments with economic development for rural areas.

The effort built on two prior studies. One was the "Way Forward" report prepared by the Global Research Institute (GRI). It focused on the socio-political-economic trends and the role played by educational institutions in facilitating economic growth. The other was the Seven Portals Study (and implicitly, its antecedent, the Statewide Logistics Plan). This second study identified ways that regional economic growth could be aided by infrastructure investments; and many of its rural recommendations were implemented.

The primary deliverables for the project are contained in this report as appendices, specifically, they are:

- Appendix A - Socioeconomic Attributes of Northeastern & Southwestern North Carolina
- Appendix B – Southwestern North Carolina Workshop Summary
- Appendix C – Northeastern North Carolina Workshop Summary
- Appendix D – Literature Review

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Table of Contents

Executive Summary

The research team completed a comprehensive literature review, socioeconomic study, and held two workshops in the NE and SW. The literature review reinforced the connectivity of regional economics to infrastructure investment and strategy. The regions in question both face challenging socioeconomic conditions including poverty and lower incomes. During the study, a key element of the research was direct engagement with community stakeholders including local leaders, community planners, business and industry leaders, and economic developers. These sessions provided great insight into the dynamics specific to each region and allows for more applicable and relevant strategic recommendations.

Ideas from the Southwestern Rural Freight Workshop coalesced into four primary focus areas to guide economic development in the southwest region, including: (1) System Resiliency and Competitiveness, (2) Demographic Opportunities, (3) Regional Identity, and (4) Regional Industries. Workshop attendees also identified actions that could be taken to support each of these focus areas as well as input from the research team to identify potentially "game-changing" investments that could generate substantial economic activity in the region. The Southwestern North Carolina workshop helped lead to key-takeaways, which are summarized below:

- Due to the terrain and hydrology in the region, the resiliency and reliability of the state's transportation system is critical. Even more important than building new capacity, is ensuring the functionality of existing highway, rail, and aviation assets.
- The region does not act as one unit, but instead as a collection of many microeconomies that transcend county and state boundaries. Actions should be taken to strengthen the cross-pollination of business activities between North Carolina and its neighboring states.
- In years past, Advantage West operated to enhance the economic well-being and long-term prosperity of North Carolina's southwestern region with state-support. Currently, the MountainWest Partnership operates to advance economic development priorities of the region; however, it does so without state-support. Issuing renewed support to the MountainWest Partnership, which can serve as an important catalyst for new business and as a critical resource for existing businesses, would greatly benefit the region.
- North Carolina's southwestern counties are experiencing a flatlining population of 20-45 year-olds. IT and internet advances, such as the broadband projects being undertaken in Macon County are required to retain a younger workforce. The Southwestern Commission Council of Governments conducted a broadband assessment that can be used to strategically increase broadband access in the region.
- Commercial paddling in the Nantahala and Pisgah National Forest areas is estimated to support 446 full-time jobs and $10 million in employee earnings, annually (Maples and Bradley, 2017). The region can continue to capitalize on its natural scenery and outdoor activities to attract visitors from within the state and beyond.
- State-level policies that strengthen access management in the region (i.e. minimizing or managing the number of conflict points that exist along a corridor) would be invaluable to protect the area's economic stability. A difference in two minutes of travel time greatly influences a driver's decision to travel through southwestern North Carolina, Tennessee, Georgia, or South Carolina (supporting economies in these areas along the way).

- Improving air and rail access to Harrah's Cherokee Casinos could help increase tourism in the region. Western Carolina Regional Airport may need to relocate its runway to enable regular air carrier service, and railroad right-of-way could be purchased or reactivated to promote increased traffic to the casino as well as rail tourism in the region.

Ideas from the Northeastern workshop coalesced into three primary focus areas to guide economic development in the Northeastern region, including: (1) Transportation Upgrades and Redevelopment, (2) Workforce Opportunities, and (3) Regional Identity and Industries. The workshop helped lead to key-takeaways, which are summarized below:

- The Northeastern region is well-positioned to capitalize on economic growth related to Hampton Roads, Virginia. Highway, waterway, and other transportation networks that connect business and population centers in North Carolina to Hampton Roads can facilitate growth in North Carolina.
- The Northeastern region's proximity to deep-water channels and the eastern seaboard provide a comparative advantage for marine industries.
- Military personnel stationed in Hampton Roads, Virginia often seek employment elsewhere after fulfilling their service obligations. Connecting military personnel with civilian occupations offers a potential growth opportunity for the Northeastern region.
- Many industries are poised to benefit from transportation investments. Offshore wind, boat-building, seafood production, barging, and agriculture were potential growth industries discussed during the workshop.
- A state-supported economic development entity can serve as an important catalyst in the Northeast. Additional resources for an organization such as the NC East Alliance could help accelerate business growth in the region.

1. Introduction

This report describes the outcomes of a project that studied the freight transportation needs of rural North Carolina, which are very different from the urban areas. The effort included a literature review, a socio-economic study, an economic input-output analysis, and two major workshops, one held in Sylva, NC in the southwestern corner of the state (July 30, 2019) and another in Hertford, NC in the northeast (October 23, 2019). The objective was to understand the rural transportation needs, using these two areas as case studies, with an aim to help NCDOT understand how to couple infrastructure investments with economic development for rural areas.

The effort built on two prior studies. One was the "Way Forward" report prepared by the Global Research Institute (GRI). It focused on the socio-political-economic trends and the role played by educational institutions in facilitating economic growth. The other was the Seven Portals Study (and implicitly, its antecedent, the Statewide Logistics Plan). This second study identified ways that regional economic growth could be aided by infrastructure investments; and many of its rural recommendations were implemented (e.g., improvements to the Western Carolina Regional airport and highway network improvements in the northeastern region).

The primary deliverables for the project are contained in this report as appendices, specifically, they are:

- Appendix A - Socioeconomic Attributes of Northeastern & Southwestern North Carolina
- Appendix B – Southwestern North Carolina Workshop Summary
- Appendix C – Northeastern North Carolina Workshop Summary
- Appendix D – Literature Review

Arguably, the centerpieces of the current project were the workshops held in the southwest and northeast. They elicited input about infrastructure needs. Follow-up communications and web-meetings ensued. The inputs received served as the backbone for our findings.

Updating perceptions about freight transport needs is important.[1] The state has limited resources for making infrastructure (transportation-related) investments. So, choosing the right investments in the right places and times is critical. Moreover, now that the state has a logistics coordinator in the Office of the Secretary, as recommended by the Statewide Logistics Plan, there is a person/office for whom these need assessments have value. As the Seven Portals study found, infrastructure investments can be a significant catalyst in the state's economic development; acting as supply push, although, to be effective, they must be coordinated with demand pull from the business sector. The "demand pull" is growth of interest to the companies and people that are already located in or might be encouraged to choose these areas. The "supply push" is investment in transportation and possibly other forms of infrastructure (such as IT) to help reduce transport costs, improve accessibility, and enhance those economic activities.

[1] Although it is difficult to project how much climate will change in coming decades, we believe that it would be prudent to take into account the likelihood of climate change on transportation infrastructure going forward, particularly in areas near the coast. Climate change has both long-term implications (beach erosion, rising sea levels, etc.) and short-term effects (increased frequency of extreme weather events) (World Bank, 2017), both of which should be factored into efforts to build, maintain, and expand resilient transportation systems in North Carolina.

2. Literature Review

The project's literature review created an anthology of studies and other research efforts that aimed to address the issue of tying infrastructure investment to economic development. It included a comprehensive review of freight dependent industries, local needs-based assessments, state and regional needs assessments, and national and international perspectives. The full review can be found in Appendix D. Major themes and key take-aways are summarized below.

Freight Dependency. Although a lack of consistency exists in the definition of "freight-intensive" or "freight-dependent" industries (Shin *et al*., 2015), many industries make heavy use of freight transport. Examples include agriculture, manufacturing, retail, forestry, construction, activities related to energy extraction and mining, as well as transportation (WisDOT, n.d.). Many of these industries are prevalent in rural areas. Four economic sectors - services (37%), government (16%), retail and wholesale trade (14%), and manufacturing (11%) - constitute 80% of rural employment (USDOT and USDA 2008). Other rural industries are transport dependent even though they may not be freight-intensive or freight-dependent. One example is the tourist industry, which is heavily dependent upon delivery of supplies. Another is the production of vaccines. It is critically dependent on the availability of transport services with global reach so that medicine can be delivered to critical locations in a timely manner.

Local Needs Assessments. Finding more effective, efficient solutions to rural America's transportation needs is an ongoing process that requires the hard work of researchers, elected and appointed policy makers, business leaders, and non-profit advocacy groups (Kidder 2006). Local needs assessments, such as those undertaken by the NC Rural Center, the Southwestern Commission, and the NC East Alliance, shed light on rural infrastructure priorities and include information about local economic conditions and activities that can be supported by transportation infrastructure. These assessments provide a basis from which solutions can be uniquely tailored to specific localities, involving substantial stakeholder input; however, funding for needs assessments is often limited.

State and Regional Needs Assessments. It is vital to North Carolina's economy to ensure adequate transportation infrastructure is in place that can facilitate the movement of interstate cargo. In 2015, approximately $765 billion of cargo, weighing nearly 430 million tons, was transported using North Carolina highways (Cambridge Systematics, 2017). Rural interstates are major freight corridors, and maintenance of those network links is critical to the overall economic health of the state. There is a nuance here which is important to note. Many state-level "rural transport needs" studies have focused on inter-urban infrastructure investments needed to facilitate transport between urban centers. While important, these studies contain little insight into the transport needs of the rural areas themselves.

National and International Perspectives. Since the Great Recession of 2007-2009, while urban areas have seen strong gains and rebounds, rural areas have continued to decline (Khanna 2016). One of the central issues is a lack of interstate cooperation. Often, states compete with one another, investing in redundant infrastructure projects to the detriment of rural communities (Khanna 2016). The United States has 11 megaregions with economic activities that transcend state lines (Rockefeller Foundation 2008). Being able to organize investments around economic corridors, instead of competing based on state boundaries, would better suit the needs of rural communities.

3. Socioeconomic Attributes of Northeastern and Southwestern North Carolina

A second element of the project was a review of the socio-economic characteristics of rural North Carolina. The objective was to understand the status of these regions, their characteristics, and their business climates. This section overviews the findings. The investigation placed a special emphasis on the northeastern and southwestern portions of the state. As might be expected, we found that these regions are challenged, economically, and they are heavily dependent upon small, private sector businesses. Unemployment is high and earnings are low, relative to averages for the state. Poverty is more common than for the state overall. The statistics cited are mostly from years since 2010. Appendix A contains the detailed report including reference sources for the values cited.

3.1. Northeast Prosperity Zone

The Northeast Prosperity Zone is a largely rural and sparsely populated, 17-county region. As of 2017, an estimated 541,000 people—or five percent of North Carolinians—live here. Once one of the more prosperous areas of the state, today the region contributes modestly to the state's economy. Noteworthy trends include the following:

- *Economically depressed* - On average, 21 percent of the region's population lives in households with incomes below the federal poverty level, 22 percent live in households with incomes no greater than twice that level; and 43 percent are poor or near poor.
- *High unemployment* – From 2013-2107, 9 percent of the area's civilian labor force was unemployed. Thirteen counties had unemployment rates above the statewide rate. The average county civilian unemployment rate ranged from 5 percent in Currituck County to 13 percent in Bertie County.
- *Low earnings* - In the period 2013-17, the typical working person (age 25+) earned $31,500, 10 percent less than the statewide average.
- *Deep Poverty* - An average of 9 percent of the area's residents—some 48,000 individuals in all— live in households with incomes no greater than half the poverty level. The "deep poverty" rate ranges from 4 percent in Currituck County to 14 percent in Washington County.

3.1.1 Businesses

In 2016, the region had some 12,000 private businesses with employees. The region also had 34,000 single person establishments. Noteworthy trends include the following:

- The region's economy is heavily driven by private sector activity. In 2015, out of a regional total of $19.3 billion, private-sector enterprises generated $15.2 billion. That translates to $79 of every $100 of economic output. 90 percent of the private-sector businesses are in the service sector. In 2015, service sector firms generated $10.1 billion in economic output, or two-thirds of the private-sector total. Within the service sector, the largest concentration of businesses was in the retail trade super-sector (2,267), followed by health care and social assistance

(1,341), other services (1,316), accommodation and food services (1,278), and construction (1,111).

- Compared to the overall state, the region has more than the average number of businesses (in descending order) in agriculture; retail trade; transportation and warehousing; accommodation and food service; utilities; and health care and social assistance sectors.
- Compared to the overall state, the region has smaller percentages of businesses (in ascending order) in professional, scientific, and technical services; management of companies; manufacturing; wholesale trade; educational services; and administrative and waste management sectors.
- In 2016, the region was home to an estimated 343 government establishments that have 15,169 payroll positions. Local governments had the most payroll positions (9,604), followed by the state (4,548) and federal (1,017) governments.
- In 2016, the region was home to 33,807 single-person establishments. Such businesses typically are small and unincorporated. They typically have at least $1,000 in annual sales. While modest, such income can be significant for the owners of these establishments.
- In 2012, persons of color owned a total of 10,597 businesses (employer and non-employer), or 25 percent of private businesses in the region. In that same year, statewide, persons of color owned 23 percent of all businesses.
- 75 percent of the minority-owned businesses are owned by persons who identify as Black or African American. This is higher than the statewide figure of 62 percent.
- Minority-owned businesses tended to be smaller than nonminority-owned ones. In Pitt County, for example, nonminority-owned establishments are 7 times more likely to have employees than minority-owned establishments, with annual sales that are 19 times greater. Among businesses, nonminority-owned ones have 12 times as many employees and paid 12 times as much in wages than do their minority-owned peers.

3.1.2 Employment

In 2013-17, the region was home to, on average, 5 percent of the state's civilian labor force. 253,316 people participated in the region's labor force. After subtracting the 1,578 people in the armed services, a total of 251,738 persons were in the civilian labor force. Compared to the state, workers residing in the in region were more apt to be unemployed. Noteworthy trends include the following:

- The largest concentration of employees is in the health care and social assistance super-sector (30,934), followed by the retail trade (25,577), accommodation and food services (21,358), and manufacturing (16,977) super-sectors.
- An average of 58 percent of people of working age (ages 16+) participated in the labor force from 2013-17; in contrast, the statewide rate averaged 63 percent. Compared to the state, a smaller percentage of early-career workers (ages 25-34) participated in the labor force, on average, from 2013-17; across the region, 80 percent of such workers were in the labor force versus 83 percent of such workers statewide.

- On average, prime-age workers (ages 25-64) accounted for 77 percent of the civilian labor force from 2013-17, as compared to a statewide figure of 81 percent. Compared to the state, older workers (ages 65+) accounted for a somewhat higher share of the labor force.
- The average unemployment rates from 2013-17 were 2.5 times greater for African-American workers than non-Hispanic White workers (15 percent versus 6 percent); the unemployment rate for Hispanic workers was twice that of non-Hispanic White workers (12 percent versus 6 percent).

3.1.3 Incomes

Compared to the overall state, from 2013-17, workers residing in the region earned less than their peers. These lower earnings translated into lower household incomes, which resulted in higher proportions of people living in poverty and near poverty. Noteworthy trends include the following:

- The typical working person (age 25+) residing in the area had, on average, annual labor earnings of $31,500 from 2013-17, an amount 10 percent less than the statewide figure. In 2017, the average weekly wage in the NPZ was $737, an amount 22 percent lower than the statewide figure of $941; average weekly wages in the region were lower than the corresponding statewide figures in every major industrial sector. Across the region, median household income from 2013-17 ranged from $31,300 in Bertie County to $68,300 in Camden County; in all, 10 counties in the region had median household incomes below the regional value of $42,500.
- On average, 21 percent of the region's population lived in households with incomes below the federal poverty level, with another 22 percent living in households with incomes no greater than twice that threshold; in all, 43 percent of all residents were poor or near poor.
- Poverty rates were higher for African- Americans (32 percent), Hispanics (32 percent), and non-Hispanic Whites (13 percent) than was typical in North Carolina. Moreover, for 2013-17, at least one-third of all African-American residents in eight counties lived in households with incomes less than the federal poverty level: Beaufort, Chowan, Halifax, Northampton, Perquimans, Pitt, Tyrrell, and Washington.
- Goods-producing sectors paid more consistent wages. The average weekly wage paid in 2017 to positions in the broad service sector totaled $701 in the region versus $915 statewide; the gap was smaller in the broad goods-producing sector ($932/week versus $1,071/week).

3.2 Western Prosperity Zone

The Western Prosperity Zone is another one of the eight statewide planning regions established by the N.C. General Assembly. People of European descent migrated into this 13-county region throughout the 19th century. In 2017, an estimated 727,000 people—or seven of every 100 North Carolinians—lived here. The region has historically had an economy dominated by small farmers and merchants. The current economic trends of the region are characterized as follows:

- The region's output in 2015 was $23 billion. This means the region generated $5 of every $100 in statewide economic activity.
- In 2016, the region had some 18,000 private businesses with employees. Those firms accounted for 8 percent of the state's businesses. The region also had 64,000 single-person establishments.
- Of all the businesses, 8 percent were owned by persons of color in 2012. In contrast, persons of color accounted for 15 percent of the population.
- The region was home to, on average, 7 percent of the state's civilian labor force from 2013-17; of those people, 5 percent, on average, were unemployed.
- The typical working person (age 25+) residing in the area had, on average, annual labor earnings of $30,700 from 2013-17, an amount 12 percent less than the statewide figure.
- On average, 15 percent of the region's population lived in a household with an income below the federal poverty level, with another 22 percent had an income no greater than twice that level. In all, 37 percent of all residents were poor or near poor.

3.2.1Businesses

In 2015, the value of goods and services produced by businesses based in the region equaled $23.2 billion. In 2016, the region had some 18,400 private businesses with employees, the last year with complete data. This is 8 percent of the state's private businesses. The region also contained 64,100 single-person establishments. Noteworthy trends include the following:

- In 2015, the region's private-sector enterprises generated $19.9 billion in economic activity, out of a regional total of $23.2 billion. That translates to $86 of every $100. Some 84 percent of these private-sector businesses were in the broad service sector. These businesses had a total of 231,000 employees in 2016.
- In 2016, the region was also home to an estimated 266 government establishments that had 17,100 payroll positions. Local governments had the most payroll positions (12,500), followed by the state (3,700) and federal (938) governments.
- Size-wise, 58 of every 100 private businesses had no more than four employees in 2016, a share greater than the statewide one. Eighty-eight of every 100 businesses had no more than 19 employees. The region had about the same share of large businesses, meaning those with 100 or more employees, as did the state. Approximately 2 percent of the region's establishments were categorized as "large" in 2016, the same as the statewide figure.
- Single-person businesses in the region accounted for 9 percent of all such establishments in the state. Such businesses typically are small and unincorporated, operated by one person. They have (usually) at least $1,000 in annual sales. These businesses generated $2.6 billion in annual receipts in 2016.
- The largest concentration of private businesses is in the retail trade super-sector (3,000), followed by the construction (2,200), other services (2,000), health care and social assistance (1,900), and accommodation and food services (1,900) super-sectors.
- Compared to the state, the region has higher than average percentages of businesses (in descending order) in the broad construction; arts, entertainment, and recreation; utilities;

educational services; accommodation and food services; real estate and rental and leasing; and retail trade sectors.

- Compared to the state, the region has lower than average percentages of businesses (in ascending order) in the broad professional, scientific, and technical services; management of companies; transportation and warehousing; wholesale trade; finance; and information sectors.
- Persons of color owned in 2012 a total of 5,300 businesses (employer and non-employer), or 8 percent of all establishments in the region. Statewide, persons of color owned 23 percent of all businesses.
- When compared to other businesses, those owned by persons of color were more apt to be non-businesses. Even among businesses, minority-owned establishments typically had fewer employees, smaller payrolls, and lower sales.

3.2.2. Employment

The region was home to, on average, 7 percent of the state's civilian labor force in 2013-17. Compared to the whole state, the region's labor force is older. Noteworthy trends include the following:

- Some 83 percent of regional employees work in the broad service sector. The largest concentration of employees is in the health care and social assistance super-sector (47,000), followed by the retail trade (39,000), accommodation and food services (37,000), and manufacturing (27,000) super-sectors.
- Compared to the whole state, the region has higher than expected employment (in descending order) in food service; health care and social assistance; retail trade; other services; arts, entertainment, and recreation; and construction.
- Compared to the whole state, the region has lower than expected employment (in ascending order) in the broad management of companies; administrative and waste management; finance and insurance; utilities; professional, scientific, and technical services; transportation and warehousing; wholesale trade; agriculture; and information.
- From 2013-17, on average, 328,800 people participated in the region's labor force. After subtracting the 400 people in the armed services, a total of 328,400 persons were in the civilian labor force. In short, 7 percent of the state's civilian labor force lived in the area.
- Across the region, an average of 56 percent of people of working age (ages 16+) participated in the labor force from 2013-17; in contrast, the statewide rate averaged 63 percent.
- Compared to the state, about the same percentage of early-career workers (ages 25-34) participated in the labor force, on average, from 2013-17; across the region, 82 percent of such workers were in the labor force, as were 83 percent of such workers statewide.
- On average, prime-age workers (ages 25-64) accounted for 80 percent of the civilian labor force from 2013-17, as compared to a statewide figure of 81 percent. Compared to the state, older workers (ages 65+) accounted for a higher share of the civilian labor force.
- On average of 5 percent of the region's civilian workforce was unemployed from 2013-17, compared to a statewide rate of 7 percent.

- In the region, average unemployment rates from 2013-17 were 1.9 times greater for African-American workers than non-Hispanic White workers (10 percent versus 5 percent); the unemployment rate for Native American workers was 1.8 times greater that of non-Hispanic White workers (9 percent versus 5 percent).
- Among prime-age civilian workers (ages 25-64) residing in the region, on average, 34 percent possessed at least a bachelor's degree from 2013-2017, as did 35 percent of all such workers in North Carolina.
- For employed civilians across the entire region, one of every five, on average, worked in professional occupations from 2013-17.

3.2.3 Income

Compared to the whole state, workers residing in the region earned less than did their peers from 2013-17. Lower earnings translate into lower household incomes, which results in higher proportions of people living in poverty and near poverty. Noteworthy trends include the following:

- The typical working person (age 25+) residing in the area had, on average, annual labor earnings of $30,700 from 2013-17, an amount 12 percent less than the statewide figure.
- From 2013-17, the typical household in the region had, on average, an annual income of $45,300.
- On average, 15 percent of the region's population lived in households with incomes below the federal poverty level, with another 22 percent living in households with incomes no greater than twice that threshold; in all, 37 percent of all residents were poor or near poor. Poverty rates were higher for non-Hispanic White (13 percent), African-American (27 percent), and Hispanic (32 percent) persons than was typical in North Carolina. One-fifth of the Native American persons lived in poverty.
- In 2017, the average weekly wage in the region was $744, an amount 21 percent lower than the statewide figure of $941; average weekly wages in the region were lower than the corresponding statewide figures in every major industrial sector except for leisure and hospitality services.
- An average of 6 percent of all residents—some 41,000 individuals in all— lived in households with incomes no greater than half the poverty level. The "deep poverty" rate ranged from 4 percent in Henderson County to 11 percent in Swain County.
- The typical non-Hispanic White household had a household income of $47,100, as compared to $30,800 for the typical African-American household and $28,700 for the typical Hispanic household. These incomes are lower than comparable households in North Carolina.
- An estimated 13 percent of all residents, on average, lacked health insurance coverage from 2013-17; the share of uninsured individuals ranged from 11 percent in Madison County to 21 percent in Swain County.
- Persons ages 25-34 were the most likely regional residents to lack insurance (27 percent) followed by those ages 18-24 (25 percent) and ages 35-64 (17 percent).

4. Workshops

To help develop rural transport policies and investments that are on-target, workshops were held in both the southwestern and northeastern regions of the state. The workshops convened economic development specialists, transportation planners, civil engineers, academic researchers, and other key stakeholder in their respective areas. Workshop attendees engaged in discussion and produced thoughtful ideas about the best ways in which the North Carolina Department of Transportation (NCDOT) could help foster economic growth in their region. The southwestern workshop was held on July 30, 2019 at the offices of the Southwestern Commission. A follow-up debriefing workshop was held at the same location on November 4, 2019. The northeastern workshop was held at the Perquimans County Library in Hertford, NC on October 23, 2019; and a follow-up debriefing virtual workshop was held on May 2, 2020These ideas shared by the workshop participants helped shape the suggestions for infrastructure investments presented here.

4.1 Southwestern Region

The Appalachian Mountains cover North Carolina's southwestern region, offering an intricate network of springs, streams, waterfalls, rivers, and points of high elevation. Certain areas of the Blue Ridge or the Great Smoky Mountains receive up to 90 inches per year of rainfall, outpaced only by the Pacific Northwest (Dykeman et al., 2019). In this region, sudden rainfall brings rapid rises in stream water, which often result in destructive floods and debris flows (Dykeman et al., 2019). Storms in the region that trigger hundreds of debris flows occur about every nine years and those that generate thousands occur about every 25 years (Wooten et al., 2016). In February 2019, for example, landslides closed four of the major arteries in North Carolina's southwestern region, including I-40 in both directions (Marusak and Price, 2019). Additionally, in August 2019, more than 7,600 tons of soil, rock, and tree debris, caused the US Forest Service to close the Nantahala River and the North Carolina Department of Transportation to shut down U.S. 19/74 near Bryson City.

Figure 1. Rockslide on Interstate I-40

Source: *NCDOT*

Due to the terrain in the region, the resiliency, reliability, and robustness of the transportation system is critical. The system is tested during times of landslides and construction, when multi-hour detours may result from service disruptions, particularly for freight trucks which may not be able to travel on the same routes that passenger vehicles can. According to one participant observation, there may only be one grocery store in the community, with only one convenient route for access. Any disruption in this primary route can lead to substantial delay for product delivery due to a long truck detour.

Figure 2. Southwestern North Carolina County Employment Linkages

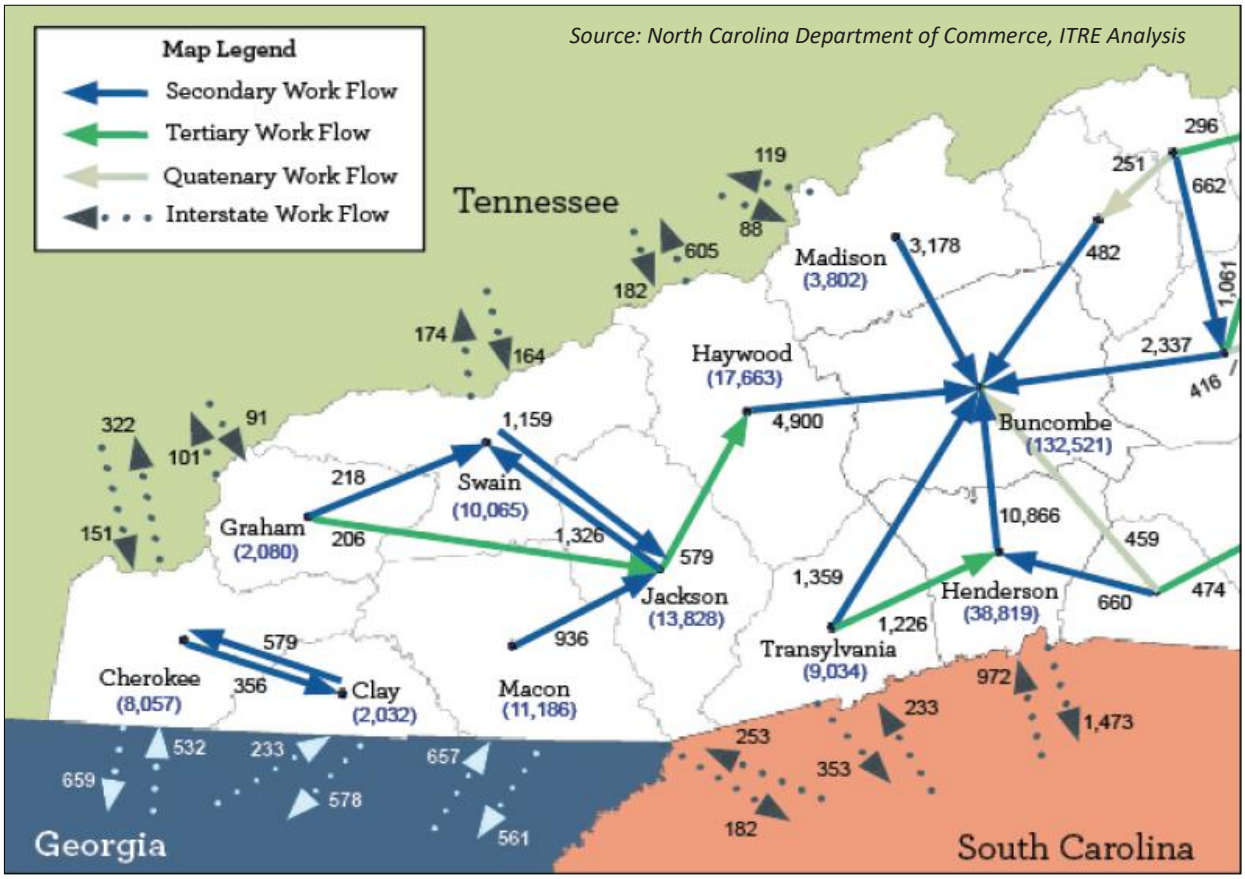


Image Caption: *This map shows workforce linkages in southwestern North Carolina. Blue arrows indicate a "secondary workflow" or the highest level of workforce commuting for residents of a given county (second only to commuting within the county itself). Tertiary and quaternary workflows indicate the third and fourth highest levels of workforce commuting for residents of a given county. The numbers inside parentheses indicate total county employment. The other numbers indicate the number of workers who are employed in another county.*

Over the course of the workshop, the concept of regional identity was discussed. Workshop attendees were quick to demonstrate that the region does not act as one unit, but instead as a collection of many micro-economies. However, when needed and mutually beneficial, these counties can and do coordinate to improve conditions, increase quality of life, and enhance economic opportunities. For instance, Graham and Swain counties have a mutual aid agreement in which they share resources to assist one another in natural or man-made disasters, including traffic crashes that occur in one county but are served by the other. Attendees discussed how highway networks influence their commuting patterns. They explained that highway connections between states enabled those living in the region to reach employment locations in other states as well as connecting out-of-state residents to employment centers in North Carolina.

In addition to their similarities, workshop attendees helped demonstrate unique business characteristics found within counties in the region. "In Cherokee County, heavy industry is a key employer, whereas healthcare and services are a focal point in Jackson County," an attendee stated. In Cherokee County,

Figure 3. Plans for the New Conference Center and Hotel Tower at the Harrah's in Cherokee County

***Photo Caption**: The $250 million construction project for the new conference center and hotel tower at Harrah's Cherokee Casino Resort in Cherokee County is scheduled to open in 2021. The casino is a major attractor for the region, drawing a total of 1.2 million guests in 2018.*

Sioux Tools Inc, Team Industries, loi Enterprises, MGM Brakes, and C R Brown Enterprises are manufacturers that support 550-1,000 jobs, collectively; in Jackson County, Dlp Partner Medwest LLC, Meridian Behavioral Health Services, Mountain Trace Rehabilitation, and Disability Partners, are health services providers that employ 1,200-2,200 jobs, collectively.

The region also supports several niche businesses that are unique to specific counties. For example, Macon County is home to Drake Enterprises Ltd, a tax preparation software provider, which is the second largest employer in the county. Graham County's third largest employer is Phillips & Jordan Inc, operating in the construction industry. Meanwhile, Western Carolina University is the largest employer in Jackson County. For more information on top employers in the county, see Appendix D, which contains the Top 25 Employers for eight counties in North Carolina's southwestern region (Cherokee, Clay, Graham, Haywood, Jackson, Macon, Swain, and Transylvania counties).

Additionally, Harrah's Cherokee Valley River Casino was widely discussed as an economic engine for the region. "Human freight is our biggest market," one workshop attendee quipped. "We bus people in from all over to visit the casino." Harrah's Cherokee Casinos received approximately 5.6 million guests in 2018 with 4.4 million guests at Harrah's Cherokee Casino Resort in Jackson County and 1.2 million guests in Harrah's Cherokee Valley River Casino & Hotel in Murphy County.

In addition to Harrah's, several eco-tourism attractors exist in the region including: the Appalachian Mountains, the Nantahala River, Great Smoky Mountain National Park, Pisgah National Forest, among others. Broadband internet access was also discussed during the workshop. With the rise of shared workspaces, short-term transient office rentals, and telecommuting, improved internet access could potentially benefit all industries in the region.

During the workshop, attendees discussed business opportunities that could benefit the region, citing retirement, tourism, and other industries. “People from Atlanta are moving here to Graham, Clay, and other counties to retire. We have to be ready for that,” an attendee stated. Many of the counties in southwestern NC have increasing population rates for individuals in their retirement years (60+) and preparing for that could provide an economic opportunity.

Attendees also discussed the importance of securing the region’s existing transportation network, rather than focusing on new capacity. They emphasized NCDOT’s role in highway maintenance, citing landslides and other events. Attendees also discussed the importance of viewing the individual roads in that region as part of a collective system that needed to be preserved. In other words, a roadway alteration in one community could impact the entire regional network (for better or worse).

Due to the terrain in the region, the resiliency, reliability, and robustness of the transportation system is critical. The transportation system is also tested with the addition of new traffic signals. Though new signals may benefit a local community, they can create travel time slow-downs that negatively impact the region. Notice in Figure 4 that the travel times from Asheville to Atlanta are very close. Signal delays could flip the preferred route away from passing through Franklin, which would make the southwestern region less likely to benefit from pass-through traffic.

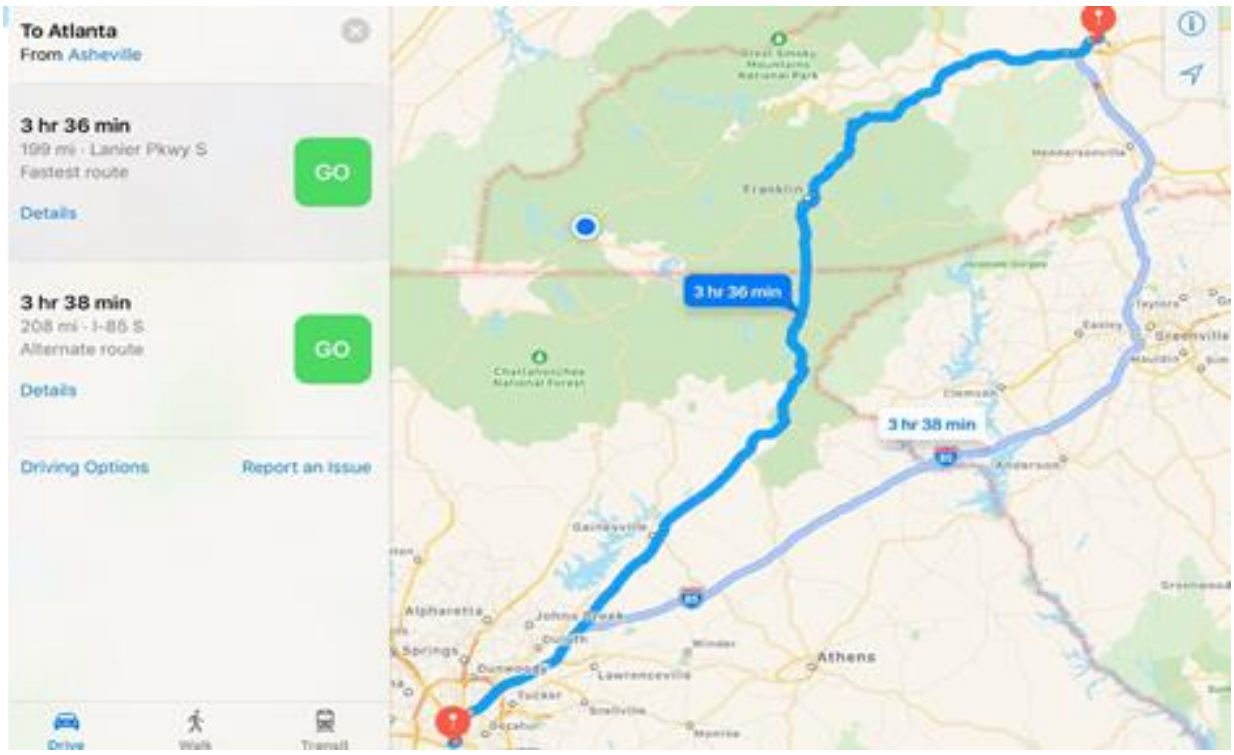
Workshop attendees voiced a shared concern about maintaining reasonable travel times. They specifically discussed corridor conflict points in the context of traffic signals. According to those in attendance, there are currently no effective regional measures that can be taken to consider and evaluate the regional impact of traffic signal installations or other access management concerns. Attendees explained the special importance of land use decisions in the mountain due to severe topographic constraints to accessibility and transportation choice. Attendees explained that implementing state-level policies to strengthen access management in the region (i.e. minimizing or managing the number of conflict points that exist along a corridor) would be invaluable to protecting the area’s economic stability.

Reliable travel times are important to community members in the region who travel to neighboring counties for work, school, and healthcare. Additionally, changes in expected travel times may attract or deter travelers to the region. One attendee demonstrated how small changes in travel times affect the region’s prosperity. She used a google maps trip suggestion to show how a hypothetical driver traveling from Asheville to Atlanta may select a route either through South Carolina or southwestern North Carolina (see Figure 4). A difference in two minutes of travel likely impacts a driver’s decision to travel through southwestern North Carolina, Tennessee, Georgia, or South Carolina.

Maintaining a lower travel time through the corridor could potentially give hundreds or thousands of drivers an incentive to pass through the region, thus supporting businesses in the area’s economy.

For example, as individuals travel through, they may make planned or unplanned stops to purchase fuel, meals, or lodging at locations in the region. Maintaining these economic benefits would require strong state leadership to enforce policies that would benefit the region overall. Attendees acknowledged that locally elected officials are beholden to their communities and therefore have a stronger incentive to put their locality’s needs first, even if it comes at the detriment of the region.

Figure 4. Suggested Travel Options from Asheville to Atlanta



Source: Google Maps

Attendees reiterated that without an access management policy intervention, the region's economic livelihood is at risk. Inland ports located in Greer, South Carolina and Gainesville, Georgia affect businesses in North Carolina's southwestern region. The inland ports shorten the supply chain for many manufacturers, processors and distributors in the region.

The current growth of the retirement-age population is one of the most significant demographic trends in the history of the United States. This demographic has increased steadily since the 1960s; but is projected to more than double from 46 million today to more than 98 million by 2060 (Mather et al., 2015). North Carolina's southwestern counties are experiencing this trend as well. According to U.S. Census data, southwestern county residents above age 60 have increased from 50,000 to 70,000 from 2000 to 2017. In addition to the national trend of an aging population, North Carolina's southwestern counties are experiencing a flatlining population of people 20-45 years old. Workshop attendees noted that above and beyond national trends of aging, the southwestern region of North Carolina is attracting retirees from out of state to stay and live. Migration rates, the inflow and outflow of individuals residing in North Carolina's southwestern counties, are shown in Figure 2. One attendee suggested that the slower pace of life, the lower cost of living, and the mountainous scenery were all factors that were drawing people from Atlanta, and other locations inside and outside of North Carolina's borders, to settle in the region during retirement. Workshop attendees also mentioned the need to retain a younger workforce through IT, internet advances, and broadband projects.

Ideas from the Rural Freight Workshop coalesced into four primary focus areas to guide economic development in the southwest region, including: (1) System Resiliency and Competitiveness, (2)

Demographic Opportunities, (3) Regional Identity, and (4) Regional Industries. Workshop attendees also identified actions that could be taken to support each of these focus areas as well as input from the research team to identify potentially "game-changing" investments that could generate substantial economic activity in the region.

Roadway improvements were high on the list, relating to freight and the general and aging population in the region. This includes widening shoulders and straightening curves to meet safety standards, as well as improving the design and load-bearing capacities of weight-restricted bridges. One participant also discussed safety considerations central to an aging population. He suggested to install raised pavement markers on the roads to help those with night vision issues while driving.

The workshop helped lead to key-takeaways, which are summarized below:

- Due to the terrain and hydrology in the region, the resiliency and reliability of the state's transportation system is critical. Even more important than building new capacity, is ensuring the functionality of existing highway, rail, and aviation assets.
- The region does not act as one unit, but instead as a collection of many micro- economies that transcend county and state boundaries. Actions should be taken to strengthen the cross-pollination of business activities between North Carolina and its neighboring states.
- In years past, Advantage West operated to enhance the economic well-being and long- term prosperity of North Carolina's southwestern region with state-support. Currently, the MountainWest Partnership operates to advance economic development priorities of the region; however, it does so without state-support. Issuing renewed support to the MountainWest Partnership, which can serve as an important catalyst for new business and as a critical resource for existing businesses, would greatly benefit the region.
- North Carolina's southwestern counties are experiencing a flatlining population of people 20-45 years old. IT and internet advances, such as the broadband projects being undertaken in Macon County are required to retain a younger workforce.
- The Southwestern Commission Council of Governments conducted a broadband assessment that can be used to strategically increase broadband access in the region.
- Commercial paddling in the Nantahala and Pisgah National Forest areas is estimated to support 446 full-time jobs and $10 million in employee earnings, annually (Maples and Bradley, 2017). The region can continue to capitalize on its natural scenery and outdoor activities to attract visitors from within the state and beyond.
- State-level policies that strengthen access management in the region (i.e. minimizing or managing the number of conflict points that exist along a corridor) would be invaluable to protecting the area's economic stability. A difference in two minutes of travel time greatly influences a driver's decision to travel through southwestern North Carolina, Tennessee, Georgia, or South Carolina (supporting economies in these areas along the way).
- Improving air and rail access to Harrah's Cherokee Casinos could help increase tourism in the region. Western Carolina Regional Airport may need to relocate its runway to enable regular air carrier service, and railroad right-of-way could be purchased or reactivated to promote increased traffic to the casino as well as rail tourism in the region.

Northeastern Region

Economic development opportunities in northeastern North Carolina are intricately linked to Hampton Roads, Virginia. The Hampton Roads harbor area in southern Virginia has the largest concentration of military bases and government facilities of any metropolitan area in the world, yielding a gross domestic product of $94.86 billion in 2018 (CEAP, 2017). Hampton Roads comprises a collection of cities, counties, and towns on the Virginia Peninsula and an extended combined statistical area (CSA) that includes the Elizabeth City, NC micropolitan statistical area and Kill Devil Hills, NC micropolitan statistical area. The harbor at Hampton Roads is essential to its growth and two deep water channels branch out from the harbor, the southern of which is linked with the coastal inlets of North Carolina through the Atlantic Intracoastal Waterway (Tikkanen et al., N.D.). These water connections are key enablers for marine freight. Additionally, the harbor area exists within the Foreign Trade Zone 20 Service Area which offers special procedures to encourage business activities by reducing, eliminating, or delaying duties (Tikkanen et al., N.D.).

Figure 5. Foreign Trade Zone 20

Image Caption: *Companies locating in FTZ 20 (90 miles within the Customs Port of Entry in Norfolk, VA) can benefit from advanced distribution networks; easy and reliable access to shipping channels, highways, railways, and airways.*

During the workshop participants spoke about Hampton Roads' success and strategies that could be implemented to harness the area's economic activity for growth in North Carolina. One participant explained, "Hampton Roads is one of our primary economic development assets. They keep expanding the ports and have nowhere to move but South." For example, a barge builder recently relocated from Hampton Roads to the Perquimans County Commerce Center. Another participant said economic development opportunities are originating in Hampton Roads, "coming across the border, landing in Currituck County and expanding across North Carolina." To meet these opportunities,
Larry Lombardi, Currituck County Economic Development Director, spoke about the increasing importance of improved highway infrastructure in the region. According to Lombardi, Currituck County is experiencing a clustering of housing and development occurring along US-168. The participant voiced the need for Future I-87 and limited access highways connecting US- 168 to the future interstate to serve the needs of new residents and businesses looking to locate in Currituck County. He also discussed the possibility of altering the alignment of I-87 to better meet the growth needs of the region.

Echoing these sentiments, another participant spoke about the role of the Virginia ports. This person saw the ports as an economic driver that helped support businesses in Pasquotank and other counties

in the region. She spoke about the importance of connecting North Carolina businesses to the ports via Future I-87. Other participants built upon the discussion regarding the importance of Virginia's ports and future I-87, mentioning the value of having an interstate in the region for business recruitment purposes. "An interstate designation is a primary site selection criterion [for recruiting businesses]," an attendee explained. "I wish we could just get someone from the state level to step in and make something happen. This is too important to us and we've had this need for 10 years."

During the workshop, attendees discussed specific strategies that could be implemented to promote industry in the region. This included plans for being an international leader in offshore wind, bolstering boat-building and marine industries, improving seafood production through aquaculture, advancing freight movement through barging, and continuing to be a leader in agriculture including implementing and expanding value- added opportunities. In addition to topics discussed during the workshop, insights from the Seven Portals Study highlight opportunities for industries in the region.

The workshop attendees discussed offshore wind manufacturing, supply chain component distribution, and energy production as an invaluable growth industry in northeast North Carolina. The region's navigable waterways, Foreign Trade Zone (FTZ) locations, and proximity to the Atlantic Ocean offer a comparative advantage for offshore wind manufacturing, distribution, and other marine industries. Additionally, the coast of North Carolina features wind corridors that are favorable for offshore wind energy production (Stearns et al., 2015). Heavy and oversized components are requisite for the offshore wind supply chain. Only a limited number of heavy-lift boats and other vessels are currently equipped to handle the weight and height requirements to install wind turbines and even fewer vessels can install state-of-the-art turbines in transitional depths of 30 to 60 meters (USDOE, 2016). Barges are used for pile-driving at the site as well as transporting parts (USDOE, 2016). The parts can be transported in pieces or put together from the manufacturing site depending on the part size (USDOE, 2016).

Workshop attendees discussed multiple opportunities the region has with the offshore wind industry. Attendees explained that the offshore wind supply chain would enable the region to strategically advance boat-building, barging, and manufacturing activities to meet the needs of the offshore wind market. They spoke specifically about lucrative manufacturing opportunities.

Figure 6. NCDOT Ferry Vessel Maintenance

Image Caption: *A boat welder works on a steel hull plate for an NCDOT ferry vessel.*

Expanding marine industries in the region was discussed. The participants identified barging, boat-building, and coastal industries as primary opportunities for growth. One participant discussed Stevens Towing as an example of a successful barging company that currently exists in Edenton and could be readily integrated into the supply chain of offshore wind or other industries in the region. Stevens Towing's Riverbulk Terminal is located 125 miles south of

Norfolk, Virginia by Intracoastal barge and 185 miles north of Morehead City. Participants also spoke about economic opportunities related to boat-building.

According to Department of Agriculture statistics, North Carolina ranks first nationally in the production of sweet potatoes, and second in hogs, pigs, and turkeys (NC East Alliance, N.D.). The state ranks third overall for cucumbers sold for pickles, trout sold, and poultry and egg products (NC East Alliance, N.D.).

Outside of its livestock and agricultural strength, N.C.'s northeastern region also has assets that serve to support and grow agricultural output. The state has the facilities to support food processing, ample municipal services support, a variety of logistical support features, such as access to trucking companies, large refrigeration facilities and easy access to market through an extensive four-lane highway network (Cambridge Systematics, 2019).

Much of the state's production in hogs, turkeys, and other poultry is centered in and around the region. There are more than 160 facilities involved in food manufacturing. Total employment in North Carolina's food industry sector exceeds 20,000 people, or 5 percent of the total workforce (NC East Alliance, N.D.). Major food processing employers in the Region include many nationally and internationally recognized companies such as Mt. Olive Pickles, Carolina Turkeys, The Cheesecake Factory Bakery, and Sara Lee Bakeries (NC East Alliance, N.D.). As the demand for seafood has increased, technology has made it possible to grow food in coastal marine waters and the open ocean. Aquaculture is a method used to produce food and other commercial products, restore habitat and replenish wild stocks, and rebuild populations of threatened and endangered species. It is breeding, raising, and harvesting fish, shellfish, and aquatic plants. U.S. aquaculture is an environmentally responsible source of food and commercial products that helps to create healthier habitats and is used to rebuild stocks of threatened or endangered species.

During the workshop, participants discussed the importance of value-added agriculture and saw an increasing role for value- added agriculture in the region. According to the U.S. Department of Agriculture, value-added agricultural products can be described as using raw agricultural outputs to create a distinct product or intentionally altering the production of a good to enhance its value. Examples of the former include a change in the physical state or form of the product, such as milling wheat into flour or making strawberries into jam. Examples of the latter may include the production of a product in a manner that enhances its value, such as production of organic agriculture.

Participants also discussed ways to improve existing transportation networks in North Carolina's northeastern region including highway, rail, air, ferry, barge, and pipeline, to provide increased access with the ports at Hampton Roads. Discussion centered around measures that could be undertaken to capitalize on growth that extends across the Virginia- North Carolina border. The need for full implementation of the Future I-87 corridor, which improves connectivity to Hampton Roads, was also discussed. As plans currently stand, the corridor would span from Raleigh to Hampton Roads via Rocky Mount, Edenton, and Elizabeth City. Future I-87 would supersede existing US-64 and US-17 (Regional Transportation Alliance, 2019). Participants also mentioned the need for limited access highways to tie into Future I-87, so that industries in northeastern North Carolina could fully access the ports as well as provide housing opportunities for individuals working in the Hampton Roads greater region.

Figure 37. Terrestrial and Marine Highway Assets Discussed by Participants During the Workshop

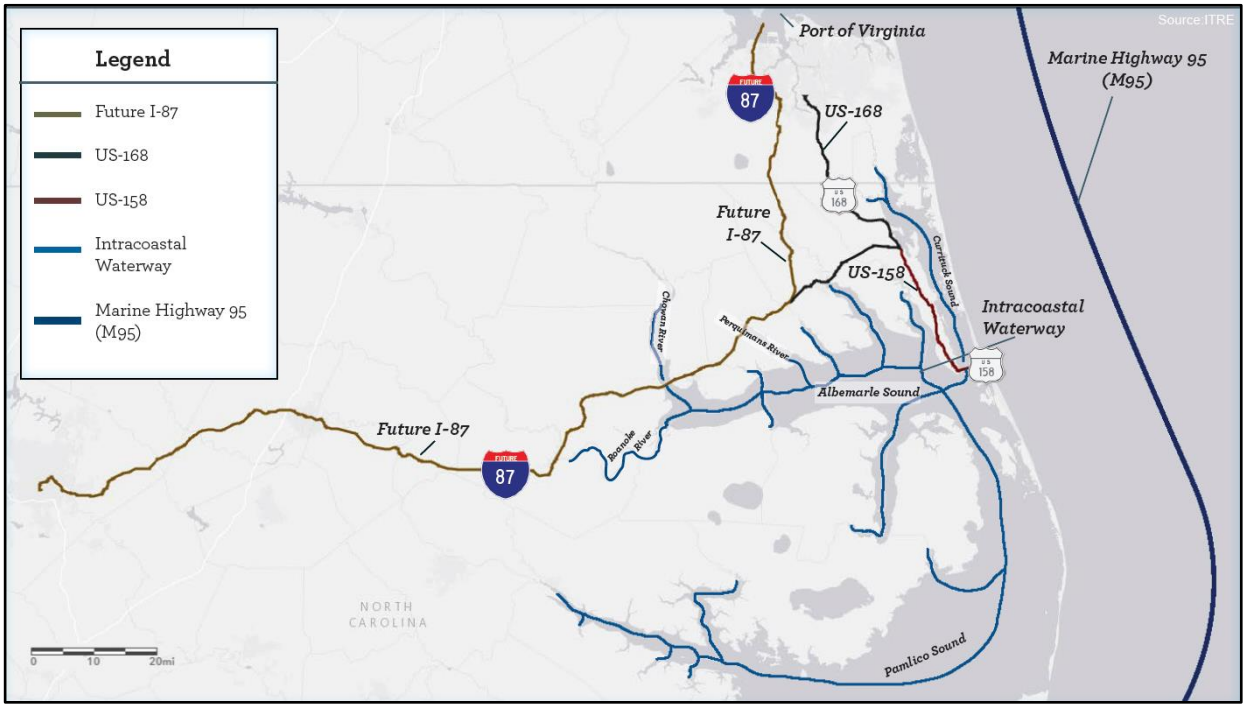


Image Caption: *This map shows the Future I-87 corridor, the existing US-158 and US-168 corridors, as well as the numerous waterways that are invaluable to the region's economic competitiveness.*

In addition to highway improvements, workshop participants also spoke about opportunities to bolster transportation via the region's waterways. The waterways in northeastern North Carolina have historically served as transportation corridors. They continue to be utilized daily for recreational and commercial transport. Workshop attendees recommended prioritizing funding to help expand upon marine highways in the region. For example, Washington County's Comprehensive Transportation Plan discusses the role of the Roanoke River and the Albemarle Sound (NCDOT, 2015).

- Roanoke River: Begins in Roanoke, Virginia and flows 400 miles to its ending point in the Albemarle Sound, near the town of Plymouth. This deep-water river can accommodate barge traffic.
- Albemarle Sound: Protected from the Atlantic Ocean by the Outer Banks, the sound extends east from Washington County for about 50 miles. A vital link in the Intracoastal Waterway, the Albemarle Sound connects with the Chesapeake Bay via canals. Barge traffic travels this route all the way to the Atlantic Ocean.

Workshop participants specifically discussed the importance of barge transportation investment during the workshop. They spoke about a need to update barge infrastructure for transporting freight containers and oversized supply chain components. Barge investments have been made elsewhere in the United States. For example, the US Department of Transportation's Maritime Administration (MARAD) recently awarded $1.8 million to the James River Barge Lines for the construction of an

Figure 8. U.S. Marine Highway Corridors

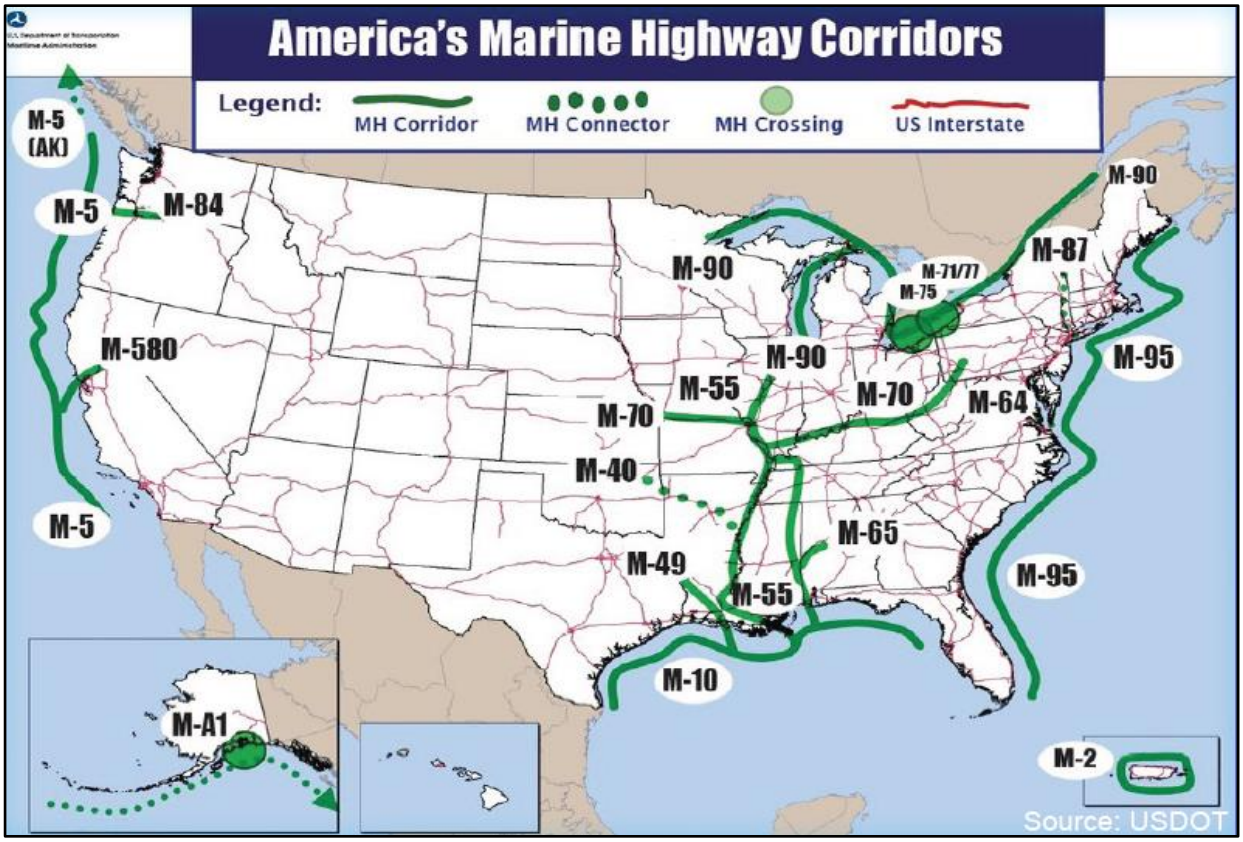


Image Caption: *The Marine Highway system currently includes 25 "Marine Highway routes" that serve as extensions of the surface transportation system. Each all-water route offers relief to landside corridors experiencing traffic congestion, excessive air emissions or other environmental challenges.*

additional barge to expand service from Hampton Roads to the Port of Richmond. The barge is expected to carry approximately 170 containers per trip (Cambridge Systematics, 2019).

Workshop participants also spoke about the general importance of using North Carolina's marine highways to allow increased access to its two deep-water ports and four river ports and continue the development of maritime-dependent industries. The Port of Wilmington is served by CSXT and Wilmington Terminal Railroad (WTRY), handles containers, bulk and break-bulk cargo, and features refrigerated storage capabilities (Morley, 2019). The Port of Morehead City is served by Norfolk Southern (NS) (on the North Carolina Railroad) and Coastal Carolina Railway (CLNA), has nine berths with approximately 5,500 feet of wharf and handles both breakbulk and bulk cargo at its existing facilities (Morley, 2019). Radio Island, which is part of the Port of Morehead City, is located across the Newport River from the port and includes approximately 150 acres of land suitable for port industrial development (Morley, 2019).

The Aurora river port is in Beaufort County along the Pamlico River. The port is owned by the Nutrien company which uses the facility to transport phosphate from the nearby mine to the Port of Morehead City (6). Cofield, located in Hertford County along the Chowan River handles scrap metal for the Nucor steel plant, accessible by rail via the North Carolina Virginia Railroad and by highway via SR 1400 (6).

Edenton is on the Chowan River and handles fertilizers, forest products (i.e., lumber, logs, and wood chips), slag, primary iron and steel products, primary non-ferrous metal products, fabricated metal products, and waste/scrap (Morley, 2019). The Knobbs Creek Deepwater Barge Port is in Elizabeth City (6). The port has a water depth of 30 feet with direct access to shipping traffic lanes through the Albemarle Sound into the Atlantic Ocean (Morley, 2019).

Participants also spoke about the importance of shallow draft channels and inlets for keeping North Carolina's seafood industry alive as well as keeping the ferry channels open. In North Carolina, the U.S. Army Corps of Engineers maintains shallow draft projects with dredging depths of less than 20 feet. This includes 10 inlets and 14 inland water ways that are a part of the Atlantic Intracoastal Waterway. Of these channels there are three that directly impact the successful operation of ferry routes, Hatteras Inlet/Rollinson Channel, Silver Lake/Big Foot Slough, and Stumpy Point Bay.

Workshop participants shared a common view that the waterways and marine infrastructure in the region were a tremendous asset for commerce. Though many attendants felt the resources were being underutilized.

These ideas coalesced into three primary focus areas to guide economic development in the Northeastern region, including: (1) Transportation Upgrades and Redevelopment, (2) Workforce Opportunities, and (3) Regional Identity and Industries.

The workshop helped lead to key takeaways, which are summarized below:

- The region is well-positioned to capitalize on economic growth related to Hampton Roads, Virginia. Highway, waterway, and other transportation networks that connect business and population centers in North Carolina to Hampton Roads can facilitate growth in North Carolina.
- The region's proximity to deep-water channels and the eastern seaboard provide a comparative advantage for marine industries.
- Military personnel stationed in Hampton Roads, Virginia often seek employment elsewhere after fulfilling their service obligations. Connecting military personnel with civilian occupations offers a potential growth opportunity for the region.
- Several industries are poised to benefit from transportation investments. Offshore wind, boat-building, seafood production, barging, and agriculture were potential growth industries discussed during the workshop.
- A state-supported economic development entity can serve as an important catalyst in the Northeast. Additional resources for an organization such as the NC East Alliance could help accelerate business growth in the region.
- Waterways are not currently designated as transportation infrastructure, which makes acquiring grants for dredging, channeling, or other marine transportation network improvements difficult. If the region's waterways were able to receive this infrastructure designation, it would help for economic development grants and programs.

5. Summary and Recommendations

For many planners and economic developers, freight growth is seen as the physical manifestation of a strong economy (American Planning Association, 2016).

Ideas from the Southwestern Rural Freight Workshop coalesced into four primary focus areas to guide economic development in the southwest region, including: (1) System Resiliency and Competitiveness, (2) Demographic Opportunities, (3) Regional Identity, and (4) Regional Industries. Workshop attendees also identified actions that could be taken to support each of these focus areas as well as input from the research team to identify potentially "game-changing" investments that could generate substantial economic activity in the region. The Southwestern North Carolina workshop helped lead to key-takeaways, which are summarized below:

- Due to the terrain and hydrology in the region, the resiliency and reliability of the state's transportation system is critical. Even more important than building new capacity, is ensuring the functionality of existing highway, rail, and aviation assets.
- The region does not act as one unit, but instead as a collection of many microeconomies that transcend county and state boundaries. Actions should be taken to strengthen the cross-pollination of business activities between North Carolina and its neighboring states.
- In years past, Advantage West operated to enhance the economic well-being and long-term prosperity of North Carolina's southwestern region with state-support. Currently, the MountainWest Partnership operates to advance economic development priorities of the region; however, it does so without state-support. Issuing renewed support to the MountainWest Partnership, which can serve as an important catalyst for new business and as a critical resource for existing businesses, would greatly benefit the region.
- North Carolina's southwestern counties are experiencing a flatlining population of 20-45 year-olds. IT and internet advances, such as the broadband projects being undertaken in Macon County are required to retain a younger workforce. The Southwestern Commission Council of Governments conducted a broadband assessment that can be used to strategically increase broadband access in the region.
- Commercial paddling in the Nantahala and Pisgah National Forest areas is estimated to support 446 full-time jobs and $10 million in employee earnings, annually (Maples and Bradley, 2017). The region can continue to capitalize on its natural scenery and outdoor activities to attract visitors from within the state and beyond.
- State-level policies that strengthen access management in the region (i.e. minimizing or managing the number of conflict points that exist along a corridor) would be invaluable to protect the area's economic stability. A difference in two minutes of travel time greatly influences a driver's decision to travel through southwestern North Carolina, Tennessee, Georgia, or South Carolina (supporting economies in these areas along the way).
- Improving air and rail access to Harrah's Cherokee Casinos could help increase tourism in the region. Western Carolina Regional Airport may need to relocate its runway to enable regular air carrier service, and railroad right-of-way could be purchased or reactivated to promote increased traffic to the casino as well as rail tourism in the region.

Ideas from the Northeastern workshop coalesced into three primary focus areas to guide economic development in the Northeastern region, including: (1) Transportation Upgrades and Redevelopment, (2) Workforce Opportunities, and (3) Regional Identity and Industries. The workshop helped lead to key-takeaways, which are summarized below:

- The Northeastern region is well-positioned to capitalize on economic growth related to Hampton Roads, Virginia. Highway, waterway, and other transportation networks that connect business and population centers in North Carolina to Hampton Roads can facilitate growth in North Carolina.
- The Northeastern region's proximity to deep-water channels and the eastern seaboard provide a comparative advantage for marine industries.
- Military personnel stationed in Hampton Roads, Virginia often seek employment elsewhere after fulfilling their service obligations. Connecting military personnel with civilian occupations offers a potential growth opportunity for the Northeastern region.
- Many industries are poised to benefit from transportation investments. Offshore wind, boat-building, seafood production, barging, and agriculture were potential growth industries discussed during the workshop.
- A state-supported economic development entity can serve as an important catalyst in the Northeast. Additional resources for an organization such as the NC East Alliance could help accelerate business growth in the region.

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Appendix B: Southwestern Workshop Summary

Appendix C: Northeastern Workshop Summary

Appendix D: Literature Review

D.1 Introduction

The literature review provided an updated anthology of studies and other research efforts that have endeavored to address the issue of tying infrastructure investment to economic development. Consistent with the project's purpose, we sought efforts that endeavored to link demand pull" with "supply push".

The literature review document is organized in the style of an annotated bibliography. Individual reports, journal papers, or other documents are identified via a heading and then a brief description of the contents of that document follows. Table 1 categorizes some of the primary sources by year, report type, whether the report supported the idea of building infrastructure in response to economic development (rather than vice versa), and whether the reference mentioned the importance of making investments in freight corridors.

Table 1. Survey of primary documents referenced in the literature review.

Report	Year	Economic development -driven?	Freight corridor investments	Report Type
NC Statewide Logistics Plan	2007	Yes	Yes	Technical
Rural Counts NC	2015	Yes	n/a	Other
America 2050 "Megaregions"	2016	Yes	n/a	Other
SC Freight Plan	2017	Yes	Yes	Technical
NC Statewide Freight Plan	2017	Yes	Yes	Technical
Seven Portals Study	2011	Yes	Yes	Technical
A Way Forward….	2014	Yes	No	Academic
GA Freight Plan	2017	Yes	Yes	Technical
TN Freight Plan	2016	Yes	Yes	Technical
2050 Vision	n.d.	Yes	Yes	Other
NC Maritime study	2012	Yes	n/a	Technical
VA Freight Plan	2013	Yes	Yes	Technical
NC Economic Development Guide	2018	Yes	Yes	Technical

To help readers navigate through the review, a categorization scheme was employed. Section 2 sets the stage by positing ideas about the freight dependency of various industries. Section 3 reviews documents that are antecedents of the current effort. Section 4 describes documents that focus on local (as opposed to state, regional, or national needs) but where the impetus is clearly to make infrastructure investments that address local needs. Section 5 reviews documents that are broader in scope, such as state freight plans. These documents are needs-based, but they do not necessarily drill down to the local level in identifying specific needs except for large-scale industries (e.g., a port, a major manufacturer, etc.). Section 6 extends this scope further by examining national and global trends in economic activity, with an eye toward identifying the geo-political challenges that arise when urbanized areas and economic enterprises cross state or national boundaries. Section 7 provides a brief description of IMPLAN, a tool commonly used to assess the economic dependencies among areas and the potential impacts of new economic activities. Section 8 summarizes the literature and shows how this material, in a holistic sense, relates to the current project.

D.2 Freight Dependency

In thinking about infrastructure's ability to cause change, it is useful to identify industries that are dependent upon freight. Although a lack of consistency exists in the definitions for freight-intensive or freight-dependent industries (Shin et al., 2015), specific industries are agreed upon as freight-intensive. For context, the definition of freight refers to "*goods transported in bulk by truck, train, ship, or aircraft, a freight train*" (Oxford dictionaries, 2018), whereas goods are shipped in large quantities, typically at a reduced unit price. Examples of freight-dependent industries include agriculture, manufacturing, retail, forestry, construction, activities related to energy extraction and mining, as well as transportation (WisDOT, n.d.).

Other industries may not necessarily be freight-intensive or freight-dependent, but their productivity, if not feasibility, may be transport-related or transport-dependent. For example, the production of vaccines may not be either freight-intensive or freight-dependent the way those terms are commonly used, but it is critically dependent on the availability of transport services with global reach so that the right medicine can be delivered to critical locations in a timely manner.

In a report completed for the Maryland Department of Transportation on the economic impact of the freight industry, the authors instead adopt the term *goods dependent industry*, which is defined in the Maryland Statewide Freight Plan as "*business(es) relying on transportation to receive raw supplies and manufactured goods and to send their refined/finished product(s) to market*" (Cambridge Systematics, 2009). This definition of freight-dependent industries includes the following industries, which may be similar to the industries of focus for North Carolina: (1) agriculture, (2) forestry, (3) fishing and hunting, (4) mining, (5) utilities, (6) construction, (7) manufacturing, (8) wholesale trade, (9) retail trade, and (10) transportation and warehousing. Yet another definition of the freight industry set forth in a 2011 study by Cambridge Systematics and Marlin Engineering is as follows: "*the transportation (and related services) of goods from point of production or import through delivery at retail locations or ports for exports*." To avoid double-counting industries, Shin et al. (2015) restricted their definition of industries as freight-dependent based on the North American Industry Classification System (NAICS) codes # 48 and 49 (transportation and warehousing).

Whether freight is transported via semi-trucks, aircraft, rail, or boat is dependent on several factors, including the trip length, type of commodity being transported, time sensitivity and the need for "door-to-door service" (NJTPA, n.d.). Regarding trip length, rail and air are typically more competitive for longer-distance trips. For commodity type, rail and boat are typically more desirable for heavy materials. For deliveries that are time sensitive, semi-trucks and aircraft are more favorable. Finally, trucks are also preferred if door-to-door delivery is required (NJTPA, n.d.).

The North American Industry Classification System (NAICS) codes distinguish industries based on the type of production involved. See Table 2.

For purposes of this research, NAICS codes 11-49 are considered related to freight. Specifically, we consider freight-dependent industries to involve transporting raw materials to a different location where processing takes place; this includes codes 11-45 (see Table 1). Codes 48 and 49 are considered *freight-intensive*. Alternatively, NAICS codes 51-92 are considered "non-freight," meaning that they are industries largely unrelated to freight (e.g. service industries).

Table 2. NAICS codes corresponding to industries grouped by production type.

Classification	NAICS Code	Industry
Freight-dependent	11	Agriculture, Forestry, Fishing and Hunting

Freight-dependent	21	Mining, Quarrying, and Oil and Gas Extraction
Freight-dependent	22	Utilities
Freight-dependent	23	Construction
Freight-dependent	31-33	Manufacturing
Freight-dependent	42	Wholesale Trade
Freight-dependent	44-45	Retail Trade
Freight-intensive	48-49	Transportation and Warehousing
Non-freight	51	Information
Non-freight	52	Finance and Insurance
Non-freight	53	Real Estate and Rental and Leasing
Non-freight	54	Professional, Scientific, and Technical Services
Non-freight	55	Management of Companies and Enterprises
Non-freight	56	Administrative and Support and Waste Management and Remediation Services
Non-freight	61	Educational Services
Non-freight	62	Health Care and Social Assistance
Non-freight	71	Arts, Entertainment, and Recreation
Non-freight	72	Accommodation and Food Services
Non-freight	81	Other Services (except Public Administration)
Non-freight	92	Public Administration

D.3 Antecedent Studies

The documents reviewed in this section were prior studies. They may differ in purpose or scope from the focus of the current project, but they set the stage for the present effort.

A Way Forward: Building a Globally Competitive South

This book chronicles the historical economic activity in the Southeastern United States, showing the intersection of politics, technological advancement, economic conditions and activity, demographic changes and the growing disparity between the new South's rapidly growing urban regions, exemplified by North Carolina's Research Triangle Park, and the Charlotte region, which has evolved into one of the largest banking centers in the United States and globally, but also continued reliance and existence of rural centers.

Regarding the Rural South's future, the authors note that manufacturing facilities are now available with similar technologies in places like Thailand for Malaysia, where labor costs are still cheaper, though continuing to grow there as well. Given cheaper labor costs, the authors document that among other factors, it is still difficult to plot with uncertainty how rural regions in this part of the country will navigate the new economy of the 21st century. Coclanis and Gitterman note that places like Hilton Head, South Carolina, St. Simons, Georgia and parts of western North Carolina such as Watauga and Moore Counties have seen less wealthy residents forced out by the arrival of wealthier residents. The authors note that strong universities in the east and west will need continued public investment and demographic changes, such as an influx of immigrants, such as those from Mexico and the greater Latin America will continue to sustain industries in tourism, recreation and retirement, agribusiness and even manufacturing.

NC Statewide Logistics Plan (2008)

In 2008, a report was commissioned by the North Carolina General Assembly and the Office of State Budget and Management via H.B. 1005, Session Law 2007-551, in order to get a picture of North Carolina's "*long-term economic, mobility, and infrastructure needs*," referred to as the *2008 Statewide Logistics Study*. To accomplish this goal, the research team first identified pressing commerce needs, then found gaps within existing transportation infrastructure investments that can be improved to meet North Carolina's commerce needs, and a timetable for implementing the changes. In this report, the importance of a strategy coordinating infrastructure investments with economic development patterns is stressed, citing other states that operate under this approach (including CA, FL, NJ and VA). California goes even further, focusing on a holistic, quality-of-life approach including in its coordination "*financial services, transportation, affordable housing, real estate, managed health care plans and public safety*."

The seven guiding principles recommended in the NC Statewide Logistics Plan follow from the importance of creating a task force to coordinate transportation and economic development planning, and include the following:

1. Embolden the knowledge-based economy
2. Support existing industries
3. Transform NCDOT into an operations-based agency
4. Facilitate pass-through traffic
5. Support import/export activity
6. Partner with military investments
7. Support innovations in transportation infrastructure

A follow-up report was completed in 2009, in which the NC Governor created a Logistics Task Force based on Executive Order 32. Following from a recommendation in the NC Statewide Logistics Plan, the purpose of the Governor's Logistics Task Force was to find ways to coordinate and meet the logistics- and transportation-related industry needs that are considered promising in North Carolina, and into the future. The Task Force provided outreach within each of the seven established economic development regions, and recommended commissioning two further reports - *The Seven Portals Study* and the *North Carolina Maritime Strategy*.

NC Seven Portals Study, Northeast Report

In 2011, the Seven Portals Study focused on ways to assist economic growth through economic development. Using a "demand-pull / supply push" paradigm, the study asserted that infrastructure investments would help if they were closely tied to desired economic development. The seven regions were those shown in Figure 1.

Figure 9. The seven economic regions employed in the Seven Portals Study (Source: Seven Portals Study)

The Northeastern Chapter of the Seven Portals Study focuses on the infrastructure needs of 16 counties shown in light purple in Figure 9. The authors of the report present blueprints for potential logistics villages to catalyze economic development in the region, using the region's historic strengths and already-existing industry clusters as a base for further investment and development. The report lists the following industries as ones that have made sizable investments in the region:

- Automotive Industry
- Aviation
- Boatbuilding/Marine Trades
- Heritage Tourism
- Inner Coastal Development
- Life Sciences and Biotechnology

In addition, the report examines four sites that could be used for development of a "Logistics Village." The four (4) locations investigated were: Ahoskie (including Tri-County Airport); Edenton (including Northeastern Regional Airport); Elizabeth City (including Elizabeth City/Coast Guard Air Station Airport) and Williamston (including Martin County Airport). The report also made the case that a fifth location, based on discussions with public officials and private investors in Virginia, could be used to create an "import-export village."

The logistical villages as recommended by the authors would capitalize on strong presence in Homeland Security and national defense. While the bulk of the military bases in the state are based in the Eastern part of the state, if not the Northeast specifically, the region has a long-established relationship with the United States Coast Guard. Due to the location and human capital dependent on continued funding, the state could make continued and larger investments into industries and businesses that support and are supported by this cornerstone.

The report also made the case that the state should continue to grow and recruit firms in the renewable energy industry. Since 2011, this sector has only continued to grow as the price of renewable energy technologies have fallen drastically.

NC Seven Portals Study, Southwest Report

In the 2011 Seven Portal Report, one chapter focused on the infrastructure needs of 23 counties in the western region of the state. As shown in Figure 2, it divided the area into three distinct regions: the southwestern Sub-Region, the Midwestern Sub-Region and the Northwestern-Sub region.

Figure 10. Three subregions in the western part of North Carolina (Source: Seven Portals Study)

The authors recommended the development of potential logistics villages in the 3 sub regions. With respect to Southwestern North Carolina, the authors noted that Cherokee County, and three nearby counties, Clay Graham, and Swain are all Tier 1 counties with high unemployment rates that have not significantly improved since the completion of this report. Cherokee County had attracted manufacturers including Indian Head Industries, IOI Enterprises, Moog Components group and Sioux Tools. The report documented the county's strong tourism industry, reliant on natural and cultural resources. The Village would be in proximity to a potential gaming facility pursued by the Eastern Band of Cherokee Indians, thus necessitating additional transportation infrastructure investments in the region.

Network Appalachia: Access to Global Opportunity

In the 2010 report, *Network Appalachia: Access to Global Opportunity,* the Appalachian Regional Commission made some of the following recommendations for Western North Carolina. The state was urged to do the following, in no specific order:

- Build a new inland port, trans-load and consolidation center to enhance rail and truck access to both domestic and international markets for western North Carolina.
- Restore the abandoned rail link near Murphy, NC to reconnect western North Carolina, northern Georgia, and eastern Tennessee rail corridors, enhancing rail access for western North Carolina, northern Georgia, and eastern Tennessee.
- In cooperation with the Norfolk Southern Crescent Corridor project, develop new intermodal container transfer facility to enhance access to both domestic and international markets for east Tennessee, southwest Virginia, and western North Carolina.
- Complete construction of the Corridor K highway (US 19/74) corridor linking eastern Tennessee with western North Carolina.
- Restore rail freight service along the Asheville, NC and Spartanburg, SC route to enhance western North Carolina access to both the Crescent Corridor and to the Port of Charleston, SC

NC Maritime Study

Predominant foreign areas for water-based trade in North Carolina are Europe, Latin America, China, and other parts of Asia. Economic analysis illustrates that foreign economy expansion will strongly surpass the domestic economy in the next few decades. To survive in the future world markets, in 2012, the North Carolina Statewide Maritime Strategy was developed to evaluate the geographical location, challenges, and opportunities of the state's ports for worldwide maritime commerce. To accomplish this, the research team first investigates how state ports support its economy, then identify strategies to leverage port investments and associated transportation infrastructure. These strategies introduce potential market opportunities and associated infrastructure investments which support state industries. The recommended markets were either built on the existing state's profile or introduced to serve potential port services not offered in nearby ports. The guiding principles recommended in the NC maritime strategies follow from the importance of building trust with the community, maintaining truck mobility, and improving rail access to support industries and healthy economy in NC. Maritime strategy focused deliberately on highway projects for freight transportation system investments as a result of the "state's producers report" and NC maritime analysis. Since, more than 50 percent of total overseas delivery costs is associated to landside costs. A recommendation to maintain truck mobility was articulated as follows:

- Prioritize or accelerate funded STIP projects (e.g. various capacity improvements, bypasses and connectors, as well as upgrades of US or state highways to interstate standards) that improve freight mobility along the key routes for waterborne truck freight within NC (e.g. I-40, I-85, I-95, I-26, I-73/74, I-77, US 17, US 70, US 74/76, and NC 24). For example, since US 70 provides primary access to the Port of Morehead City and eastern NC, completion of projects such as the US 70 Kinston Bypass, upgrades in the vicinity of James City, and the North Carteret bypass would enhance access for freight movement to Morehead City.

To address inadequate freight rail service to both Wilmington and Morehead City, maritime strategy identifies the following recommendation, as stated:

- Improvements to port rail access
- New or improved port terminal connections that would enhance rail transport of various commodities to and from the state's port facilities
- Development of inland rail ramps at targeted industrial sites. This allows for more cost-efficient transfer of heavy or oversized manufactured goods destined for export
- Development of a new intermodal container facility east of Charlotte, to replace the undersized and poorly-located CSX terminal in west Charlotte
- Implementation of shared rail service to lower quotes for rail transport to the state's port facilities and attract ocean carriers willing to exclusive agreements with a single US rail carrier for point-to-point transportation service to shippers

Maritime strategies also include a recommendation to support future transformational and incremental maritime opportunities in NC. The overview of the recommendations are as follows, as stated:

- Expansion and modernization of the existing Port of Wilmington container terminal. This requires further deepening of the 26-mile Cape Fear Channel
- Construction of a new greenfield container port at either Radio Island in Morehead City or at River Road or Southport in Brunswick County (e.g. investment in landside road and rail access in Radio Island)
- Deeper and wider channel than offered by the existing 42 ft-deep Cape Fear River (e.g. depths of up to 51 feet would be required to accommodate larger "Post Panamax" or "Neo Panamax" ships expected to call on the US east coast in the future)

- Highway and rail investments to improve the efficiency of container movement between the port and North Carolina's inland terminals and distribution centers (e.g. a new intermodal terminal east of Charlotte would meet future capacity demands and move container operations out of the congested urban center)
- Investment in refrigerated cargo
- In-state roll-on/roll-off as well as lift-on/lift-off facilities to handle oversize cargo. This would support local manufacturing of heavy construction and mining equipment, for which there is strong demand overseas (e.g. a new Ro/Ro and Lo/Lo terminal is proposed at either Radio Island or the Port of Wilmington north property)
- Direct rail connection from manufacturing sites to port to facilitate export of oversize cargo
- Support for Military Cargo
- Support for Chemicals and Phosphates. Additional investments in privately developed and operated bulk storage facilities at Morehead City will support this commodity

D.4 Local Needs-Based Assessments

This section reviews documents that have focused on eliciting information about local economic activities, existing or proposed; and, then extending that information into an identification of the transport infrastructure needed to support those activities. The Statewide Logistics Plan and the Seven Portals Study, reviewed above, are examples of these. They are not reviewed again. What appears here are additional documents that have the same purpose and focus.

NC Rural Center Counts

The NC Rural Center is an organization that provides ongoing community outreach and dialogue with rural stakeholders, as well as advocacy on their behalf. Based on these outreach efforts, the NC Rural Center produced a collaborative report entitled *10 Strategies for Rural North Carolina's Future*, which lays out a multi-faceted approach to addressing economic grievances of North Carolinians living in rural areas. In addition, the report includes background information of North Carolina as it relates to each of the ten strategies. The ten strategies to reinvigorate economically depressed, rural communities include specific ways that each strategy can be accomplished, verbatim from the report as follows:

1. Vigorously advocate for innovation in education and workforce development
    - Support expansion of rural educational and training innovation
    - Reclaim rural work resiliency
    - Support rural schools and teachers
    - Enhance choice through career pathways
    - Advocate for increased effectiveness of rural education and workforce institutions
    - Encourage exploration of new models to make community college accessible and affordable
    - Encourage institutional collaboration
2. Stabilize and transform rural health
    - Facilitate the rural transition to accountable care communities
    - Strengthen local, state and federal efforts to reduce opioid and methamphetamine drug addiction
    - Stabilize rural health system revenue
    - Support the establishment of the NC Rural Health Leadership Alliance as the new state chapter of the National Rural Health Association
3. Expand accessible and affordable high-speed fiber broadband
    - Raise the speed standard for federal investments in rural broadband

- Leverage federal investments to expand rural fiber
- Continue to prioritize the connection of anchor institutions to higher-speed broadband, particularly our public libraries

4. Accelerate modernization of essential rural and wastewater infrastructure
    - Clearly define the state's role in funding rural water infrastructure
    - Make the water infrastructure allocation from the Connect NC Bond count
    - Create regional economies of scale that will benefit everyone
    - Plan for the future
    - Promote and expand best practices
    - Leverage federal and state resources to create greater impacts
5. Expand and upgrade transportation and natural gas infrastructure
    - Build a world-class highway system
    - Strengthen freight-rail infrastructure and multimodal hubs
    - Expand natural gas infrastructure to maximize competitive advantage
6. Invest in stronger entrepreneurship and small business development systems
    - Better integrate entrepreneurship training as a core element of workforce training
    - Advocate for increased state and federal small business and entrepreneurship development assistance
    - Adopt a statewide small business development framework based on economic clusters, supply and value chains
    - Assess and inventory best practices to support and grow small businesses through local and regional economic and community development organizations
    - Examine strategic opportunities for focusing rural entrepreneurship efforts
    - Improve the regulatory/business environment
    - Fill gaps in the capital access markets to meet the needs of rural business owners and entrepreneurs
7. Strengthen homegrown manufacturing
    - Highlight the importance of homegrown manufacturing
    - Advance innovation in rural manufacturing
    - Build a stronger rural manufacturing workforce
8. Develop opportunities for agriculture and natural resources, including biotechnology and value-added food processing
    - Help farmers get more income for what they grow and raise
    - Support food-manufacturing business opportunities
    - Increase biotechnology opportunities for rural businesses
    - Increase the entry of youth and young adults into farming and other natural-resource businesses
9. Enhance regional collaboration and partnerships
    - Advocate for federal and state program support of collaborative regional development efforts
    - Support research on rural/urban economic connections
    - Convene regional rural/urban roundtables
    - Provide region-focused leadership development
10. Stabilize and leverage rural development funding, capacity building and technical assistance
    - Target solutions for rural North Carolina's most economically distressed regions
    - Accelerate rural community philanthropy to supplement rural development priorities
    - Assure adequate, reliable and transparent funding of rural development programs
    - Increase region-based technical assistance to build capacity
    - Shared responsibility and partnerships
    - Building capacity for the most distressed rural areas

- Increase homegrown philanthropy recruitment efforts
- Stabilize state funding for rural development

The Challenges of Rural Transportation

Kidder (2006) prepared an assessment of the challenges associated with supporting rural transportation. The document addresses the challenges of making rural transport investments, the influence of those decisions on rural economies, ways to make transport more accessible, mechanisms for making the investment decisions, and options for funding. It identifies unique features of the rural environment such as economic structure and population that affect these issues. It examines highways, freight rail, and airports. It concludes that answers to these questions vary widely because of the diverse nature of the rural settings across the country. Perhaps, most pertinent to the current study, it asserts that "*Finding more effective, efficient solutions to rural American's transportation needs is an ongoing process that will require the hard work of researchers, elected and appointed policy makers, business leaders, non-profit advocacy groups*…"

Rural Transportation Issues

The US Secretaries of Agriculture and Transportation were remanded by Section 6206 of the Food, Conservation and Energy Act of 2008 (PL 110-246) to conduct an assessment of rural transportation issues. A multi-chapter document presents the findings. Chapter 3 focuses on "How Freight Transportation Supports Rural America." It concludes, not surprisingly, that transportation is needed to support a vibrant rural economy; but, it also admonishes that it cannot stand alone in doing that. It is one of several enabling elements. It indicates that four economic sectors - services (37%), government (16%), retail and wholesale trade (14%), and manufacturing (11%) - constitute 80% of rural employment. The fact that manufacturing is the fourth largest employment category is noteworthy, because it is strikingly different from the nominal perception that agriculture is dominant. However, even though agriculture is not particularly labor intensive (6%), it has a substantial multiplier effect on local prosperity; so, its contribution to rural economic vitality cannot be overlooked. The report also identifies the fact that rural America is not homogeneous, the transport needs vary, and are locally specific (as is the assertion in this project effort). The report continues by identifying the fact that freight transport requirements vary from one manufacturer to another; so, the investments needed in one rural area may be substantially different from those in another. It continues by indicating that "a rural community will do better by integrating its consideration of freight transportation into the larger picture, thinking about how freight transportation, in conjunction with other aspects of the community, can best support the community's overall strategic plan.' The scenic transport interests of tourists may not be the same as the economic efficiency focus of the trucking industry. The report concludes with two comments that are important here. The first is that "transportation does not stand alone but is one of several key elements that contribute to a strong rural economy; [and] many other elements work with transportation to support a high quality of life in rural communities." The second is that "rural communities are unique and different from one another, and their needs for freight transportation vary. An efficient transportation system is defined by the needs of each community."

Transportation in Rural America: Challenges and Opportunities

Lockwood (2004) prepared an assessment for the Oberstar Forum of the transportation challenges and opportunities that face rural America. Seeing the deregulation of the 1980s from a negative perspective, he asserts that rural America faces the challenges of "unstable trucking, abandoned rail lines, and essential air service. Intercity motor coach service is provided by hundreds of small companies, with many of the larger ones operating under the franchise of the two large national consolidators. Rural public transportation consists of a patchwork of thousands of small carriers, heavily subsidized by federal and state transportation and social service agencies." This not-so-glowing-picture, including an assertion of "rural sprawl" leads to admonishments that the rural communities are facing major challenges in meeting their transport needs. He asserts that

"transportation is not the most essential ingredient in the success of such transitions, but it can play an important contributory role." Further, "while older economic bases require new efficiency, new industries—such as recreation and information technology—may require special transportation support and new capacity or connections supporting growth, access, and integration. In some cases, improved ground transportation can improve the "scale economies" of certain industries by providing closer connections in time or distance to regional hubs and metropolitan areas. In addition, retaining the work forces—such as the educated worker required by the IT industry—require access to urban-type amenities that may imply significant transportation improvements." The latter comment is profound because it asserts that the mix of enabling technologies needed by the rural communities may be very similar to those that are important to more urban settings. The overarching conclusions are that distinctive challenges exist in the rural freight market and that governmental policy and actions need to be sensitized to those challenges.

Idaho Rural Economic Development and Integrated Freight Transportation Grant Program (REDIFiT)

This solicitation was particularly interesting in the context of the current project. The State of Idaho (2014) elected to seek proposals to "assist businesses and industries to develop and expand options for shipping freight and products to market." Among the objectives was "increasing economic development opportunities, increasing domestic and international trade, [and] creating and preserving jobs." Award of funding was contingent upon private sector partnerships and cooperation from state and local government agencies. The solicitation indicates that "The goal of the Idaho State Department of Agriculture (ISDA) in administering this grant is to fund ***one high priority project*** [emphasis added] annually in a manner that fits the legislative purpose of the grant. While the amount to be awarded was paltry at $100,000, nonetheless, this represents an interesting idea upon which North Carolina could build. It would ensure that the projects funded would be consistent with local needs and desires; or put alternately, that they would have a high probability of leading to economic growth and job creation.

D.5 State and Regional Needs Assessments

This section presents reports that demonstrate a needs-based assessment of infrastructure investments at the scale of a state or a multi-state region (e.g., the Appalachian corridor or the I-95 corridor). These studies are needs-based in that input has been solicited from freight industry stakeholders who would like to see transport infrastructure investments made. However, those inputs are more general in nature (e.g., more capacity on I-95). They do not necessarily focus on the needs of specific areas (e.g., rural counties) or industries, and they may not extrapolate beyond current, existing industries to consider what investments might be needed or appropriate if new "game-changing" industries were to be added to the existing economic activity.

NC Statewide Multimodal Freight Plan

In 2017, the North Carolina Statewide Multimodal Freight Plan developed the following overarching goals (with specific objectives corresponding to each one):

1. **Economic competitiveness** - Enhance economic development opportunities and competitiveness
2. **Mobility & reliability** - Improve freight system efficiency, reliability and resiliency
3. **Safety & security** - Enhance freight transportation safety and security
4. **Innovative technology** - Support adoption and deployment of new freight technologies
5. **Asset management** - Improve freight infrastructure conditions and preservation
6. **Environmental sustainability & livability** - Protect and enhance the natural environment
7. **Collaboration & partnership** - Foster public-private partnerships and collaboration with freight stakeholders

8. **Sustainable funding** - Ensure good fiscal management and sustainable funding for the state's freight network

In 2015, approximately $765 billion of cargoes weighing nearly 430 million tons was transported using North Carolina highways (Cambridge Systematics, 2017). To give an idea of the significance of freight-dependent industries in North Carolina, an estimated 236,586 jobs, $11.3 billion in labor income, and $33.1 billion in the Gross State Product were gained as a direct result of freight industries; these numbers are even greater when considering indirect and induced impacts (Cambridge Systematics, 2017). As such, it is vital to the state's economy to ensure adequate transportation infrastructure is in place to facilitate the movement of cargo across the state.

As a part of the 2017 North Carolina Statewide Multimodal Freight Plan, the following three commodities, by tonnage, were the most commonly transported via highway systems: (a) gravel, (b) nonmetallic minerals, (c) wood products; the top three commodities by value transported via highways include (a) mixed freight, (b) pharmaceuticals, (c) machinery.

By train, the following commodities were the most commonly transported by carload, by tonnage: (a) coal, (b) hazardous materials, (c) chemicals; the top intermodal commodities transported by rail, by tonnage, include (a) freight-all-kinds, (b) apparel, (c) food products (Cambridge Systematics, 2017).

By boat, the top commodities transported in Morehead City, by tonnage, includes (a) fertilizers, (b) ores and minerals, (c) rubber; the top commodities transported by marine vehicle in Wilmington, by tonnage, include (a) forest products, (b) chemicals, (c) fertilizers (Cambridge Systematics, 2017).

By aircraft, the top commodities by tonnage, include (a) electronics, (b) machinery, (c) textiles and leather; by value, the top commodities transported by aircraft include (a) electronics, (b) pharmaceuticals, (c) machinery (Cambridge Systematics, 2017). Although information on commodities transferred by pipeline was included in the study, it is omitted from this report because this is something over which NCDOT does not have jurisdiction.

2050 Vision Plan: NC Moves

NCDOT is conducting a two-year, multi-phased study involving a thorough examination of North Carolina's transportation system, including data collection and information dissemination about its current and historical performance as it prepares to engage the public by measuring potential and definite challenges the state will undoubtedly face as its urban areas continue to grow. According to the State Dept. of Transportation, a million more residents will relocate to the state each decade through 2050, two-thirds of whom we can expect to create emerging metropolitan areas along I-85 between Charlotte and Durham. Growth trends will thus increase congestion along this corridor and expectedly increase travel time for highway commuters, necessitating that North Carolina increase options for multimodal travel options. Demographic trends suggest that rural North Carolina regions, including those in the Southwest and Northeastern regions of the state, will continue to shrink in population.

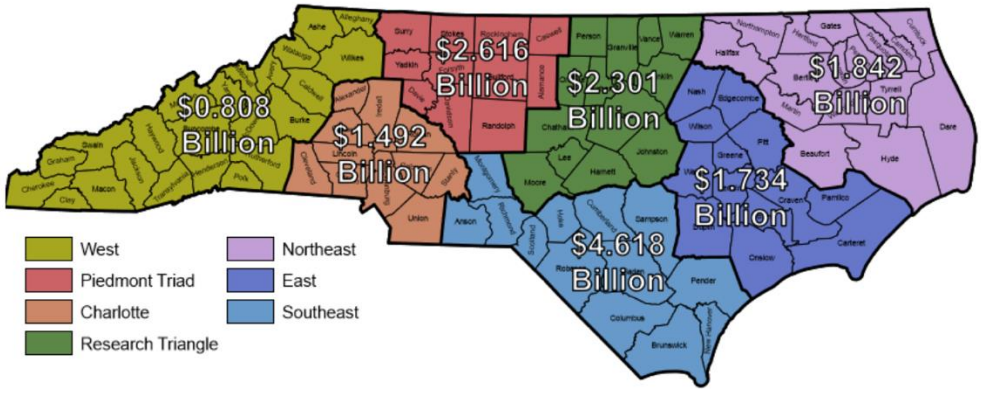
NC Port Study

Researchers at ITRE used IMPLAN, a common input-output matrix software for economic contribution studies to examine the economic impacts of the state's ports. They found that the ports, which are publicly-owned by the state, contribute approximately $15.4 billion annually to the state's economy. The 2018 North Carolina Ports Report examines the economic contribution of the state's two ports in Morehead City and Wilmington between July 1, 2017 and June 31, 2018.

Of that $15.4 billion, $12.9 billion can be attributed to the Port of Wilmington and $2.5 billion through the port of Morehead City. Researchers also attribute the number of jobs related or dependent on the two ports to number 87,700.

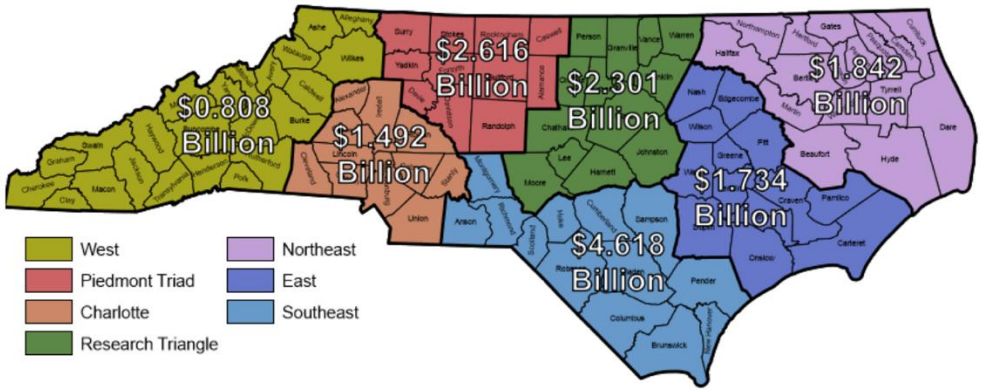
Figure 11 presents a map showing how port revenue is dispersed throughout the state by region.

Figure 11: Distribution of revenues associated with the North Carolina ports



And, also shown is a map showing how the number of jobs supported by the ports are dispersed throughout the state. See Figure 12. Both maps were published directly in the Ports study.

Figure 12: Distribution of jobs supported by the North Carolina ports



The study concludes that the North Carolina ports are much smaller than neighboring ports in Georgia and South Carolina as shown in Table 3.

Table 1. Trade activity at NC ports compared to Georgia and South Carolina (Source: NC Ports Study)

Port	2018 Total Trade (metric tons)	2018 Container Traffic (TEUs)
North Carolina (Port of Wilmington and Port of Morehead City)	6,600,000	322,391
Georgia	36,430,000	4,770,000
South Carolina	22,718,000	2,140,000

Source: Census 2018a, Census 2018b & Respective State's Port Authority's Websites

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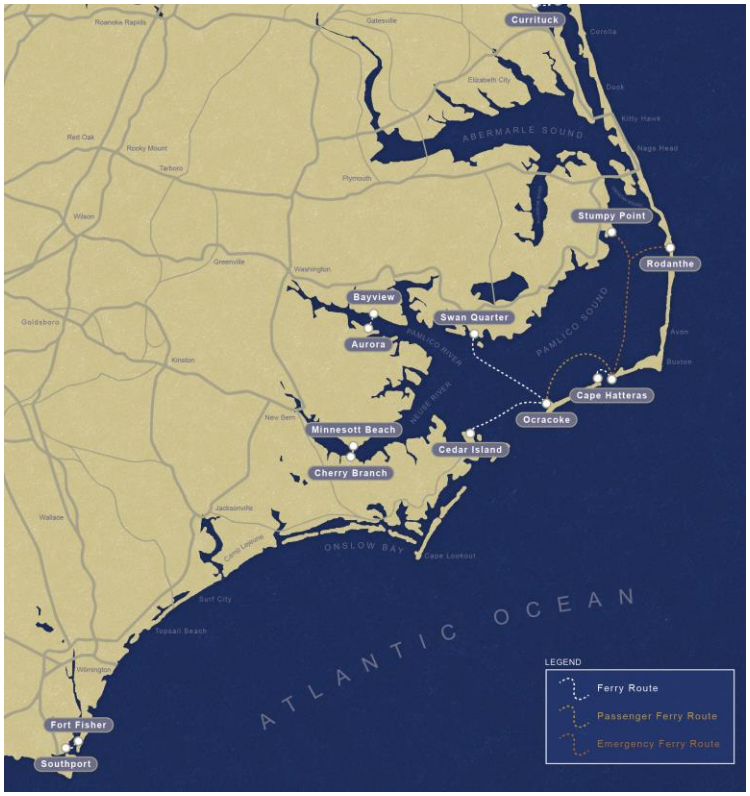
The noted difference between North Carolina compared with its neighboring states can be understood as a deficit in infrastructure investments. Compared to Georgia and South Carolina, NC ports range from one-fifth to one-half in employment contributions of neighboring states' ports. Ports, like other connectivity dependent hubs, benefit from improvements in highway and rail investments. The authors recommend larger investments in rail and highway investments for North Carolina to better compete with neighboring states.

Improvements in inland connectivity to the Wilmington and Morehead City hubs would better increase North Carolina's chances to attract cargo shipments and likely would see increases in employment, output income and tax collections that would outweigh the costs of those investments.

NC Ferry Study

Researchers at ITRE conducted an economic contribution analysis of the North Carolina Ferry System, published in 2019. The NC Ferry Division operates 21 vessels on seven routes on the eastern coast of the state as shown in Figure 5. The ferries transport more than 800,000 vehicles and about two million passengers annually, making the State-operated ferry system the second largest of its kind in the United States.

Figure 13. Ferry routes in North Carolina (source N.C. Ferry Study)



Methodologically, the researchers collected 3,770 surveys during four economic quarters to measure the economic contribution of the NC DOT Ferry system. The report finds value-added benefits in travel time, safety, and travel costs to be significant economic drivers for the region.

Table 4 summarizes information about the routes.

Table 4. Information about the ferry routes in North Carolina

NCDOT Route	Year Created	Fare Type	Distance (Miles)	Crossing Time (Minutes)
Hatteras – Ocracoke	1953	Free	8.5	60
Cedar Island – Ocracoke	1961	Toll	23	135
Knott's Island – Currituck	1962	Free	5	45
Southpoint – Fort Fisher	1965	Toll	3.5	35
Aurora - Bayview	1966	Free	3.5	30
Cherry Branch – Minnesott Beach	1973	Free	2.5	20
Swan Quarter – Ocracoke	1977	Toll	27	160

Source: NCDOT Ferry Division

According to report, the ferry system supports 5,860 jobs, more than $217 million in wages, $32.5 million in tax revenue and $735.2 million in business output.

Historically, the ferry routes helped connect the inner banks with the outer banks and was used as a means for navigating the state's many rivers and streams. Due to the demand of settlers and farmers, the state's earliest ferry systems were built to support and transport livestock, agricultural goods and people. The system helped

link North Carolina's agricultural-based and coastal economies together. Today the ferry system helps support work commutes, school commutes, dining, shopping as well as the region's vital tourism economy.

SC Freight Plan

For comparison purposes, the SC Freight Plan was reviewed as well. The mission statement of the freight plan is to ensure "*safe, reliable surface transportation and infrastructure that effectively supports a healthy economy for South Carolina*," with sub-goals pertaining to (1) improving mobility and system reliability, (2) system safety, (3) infrastructure condition, (4) economic and community vitality, (5) environmental sustainability, and (6) equity. Similar to other reports, stakeholder outreach throughout the state was completed, and their input gathered as it relates to the needs of the freight industry, including interviews, meetings, webinars, listening sessions, and online surveys. As stated, the recommendations in the report correspond to each of the sub-goals:

1. Mobility and System Reliability Strategies
    - Reduce the number of system miles at unacceptable congestion levels
    - Utilize the existing transportation system to facilitate modal options for a growing population and economy
    - Improve the average speed on congested corridors
    - Improve travel time reliability (on priority corridors or congested corridors)
    - Reduce congestion on the freight transportation system
2. Safety
    - Improving the safety, security, and resilience of the freight transportation system
    - Improve substandard roadways and bridges
3. Infrastructure Condition
    - Maintain or improve the current state of good repair for the [National Highway System intermodal connectors]
    - Reduce the percentage of remaining state highway miles (non-interstate/strategic) moving from a "fair" to a "very poor" rating while maintaining or increasing the percent of miles of pavement condition considered to be "good"
    - Improve the condition of the state highway system bridges
4. Economic and Community Vitality
    - Improve access and interconnectivity of the state highway system to major intermodal facilities (road, rail, marine, and air)
    - Utilize the existing transportation system to facilitate enhanced freight movement to support a growing economy
    - Maintain, or improve upon, current truck travel speed and/or travel time reliability performance
5. Environmental
    - Develop a post-process tool to quantify freight system investment's effect on the environment in the South Carolina Travel Demand Model, both in terms of statewide benefits, and localized impacts
    - Work with agency partners to expedite the environmental permitting process while maintaining a focus on minimizing environmental impacts
6. Equity
    - Identify a Strategic Statewide Freight Network that supports all modes (road, rail, ship, air) and all users (owners, operators, users)
    - Incorporate valuation of economic impact into project prioritization

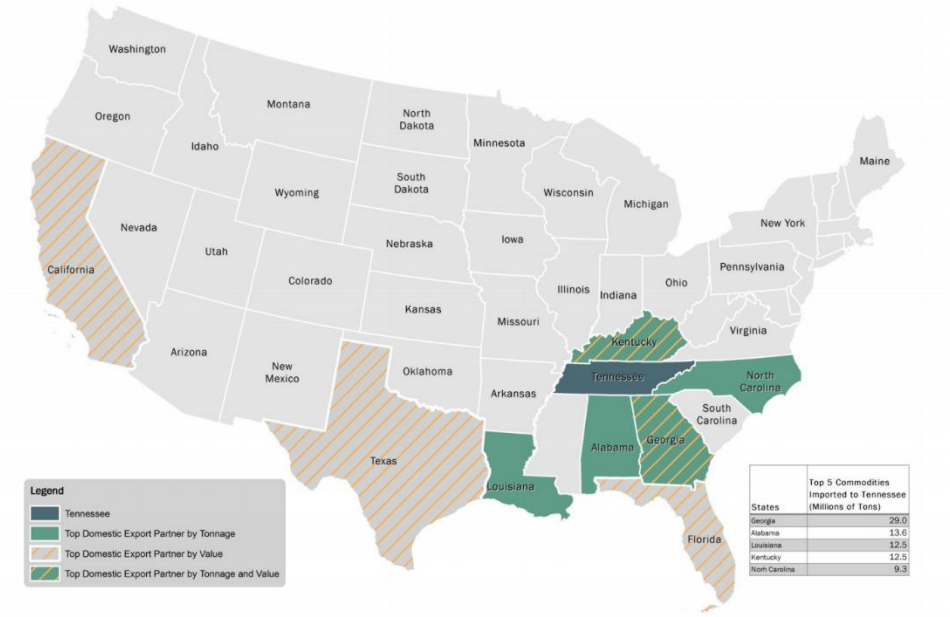
Tennessee Freight Plan

The Tennessee DOT released a long-range-planning document in 2018 on multimodal freight transport to continue supporting and growing the state's economy. The goals of that plan are similar to other states in the

region, and include improving connectivity between urban and rural corridors, supporting multi-state corridor planning and regional administration, reducing adverse environmental impacts and increasing reliability, efficiency, safety and security for all parties involved and affected.

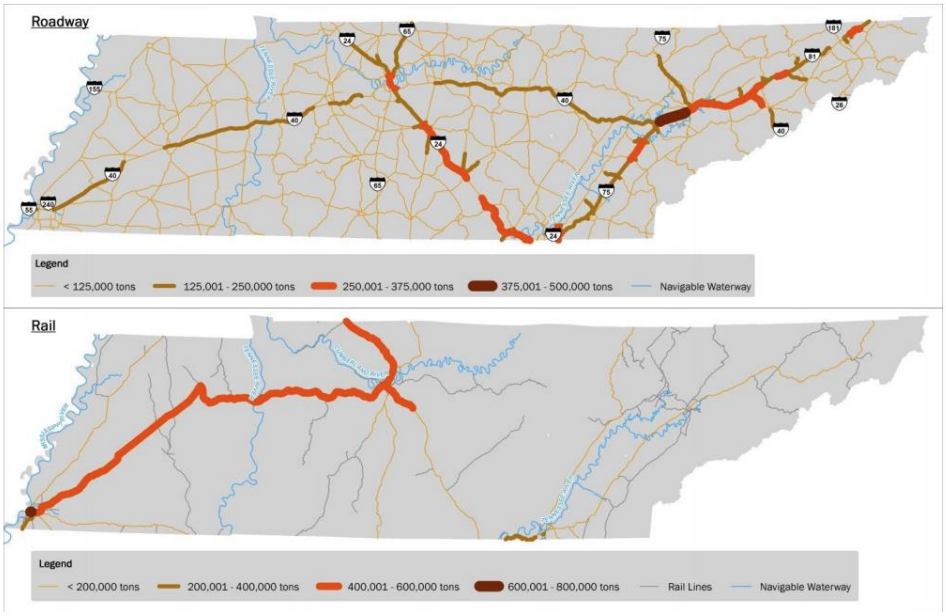
Tennessee has a large automotive manufacturing sector. Its connection to the rest of the country is depicted in Figure 14.

Figure 14. Trading partners with Tennessee (source: Tennessee Freight Plan)



Tennessee is home to three major automobile manufacturers: Nissan, Volkswagen and General Motors. The industry cluster of these firms has led to the development of supporting industries, such as parts manufacturers, which are brought in predominantly by truck. There is a heavy dependence on I-40 in the western part of the state as well as I-24, I-65 and I-75. This supportive highway and rail networks are depicted in Figure 7.

Figure 15. Supportive highway and rail networks for auto manufacturing in Tennessee



Source: Tennessee Transearch Data, IHS Inc., 2012

Georgia Freight Plan

Georgia's Department of Transportation has set a goal to plan for the needs of the state with respect to transportation investments to accommodate freight growth and logistics needs" statewide by 2050. The department, similar to its counterparts in the region has identified freight and logistics demand as a critical piece in driving Georgia's economic growth. And, like other states in the region that have developed formal guidelines and plans to improve freight, plans in the state center on improving reliability, efficiency, and safety.

In the Governor's Task Force on Freight & Logistics Report, the logistics industry is cited as making up 18 percent of the state's gross product. There are more than 5,000 firms that provide logistics and freight services, employing more than 110,000 Georgia residents and generating more than $50 billion in annual sales. There are more than 30,000 firms that have been identified as relying on the logistics industry to distribute goods and services through supply chains. These firms employ more than 700,000 people in the state and bring the state more than half a trillion dollars in revenue.

The Report finds that:

- In March 2015, the Port of Savannah handled **27.8 percent** more container cargo than in the same month in the previous year. The **333,058** Twenty-Foot-Equivalent Units moved is the most ever in a single month for the port. (source GPA)
- Automobile imports and exports by the Georgia Ports Authority, led by the Port of Brunswick, have set a new record for each of the past **three years**. The **700,702** units moved in FY 2014 represented a **10 percent** increase over the previous year. (source GPA)
- In 2014, CSX handled **1.8 million** carloads of freight on Georgia's rail network. In 2015, Norfolk Southern expanded its "Railroad University" in McDonough, Georgia, which will be capable of

training up to **900 employees** working as conductors, engineers, and track and signal workers. (sources CSX and Norfolk Southern)

- In 2014, Georgia experienced its **fifth straight** year of record-setting increases in international imports and exports. Georgia is now the **eleventh largest** exporting state and **seventh largest** importing state in the country. (source Georgia Center of Innovation for Logistics)

Figure 16. Smaller Urban and Rural Freight Corridors in Georgia

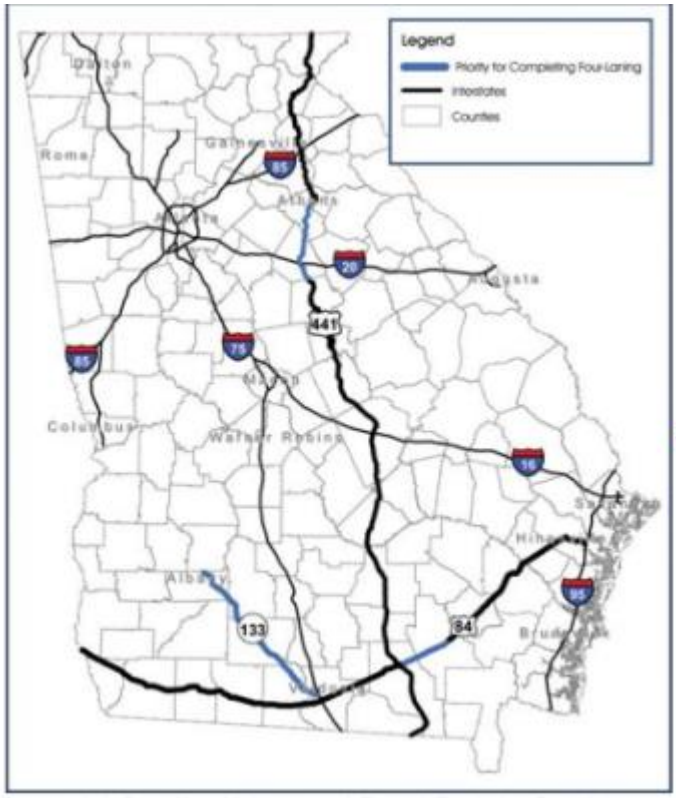
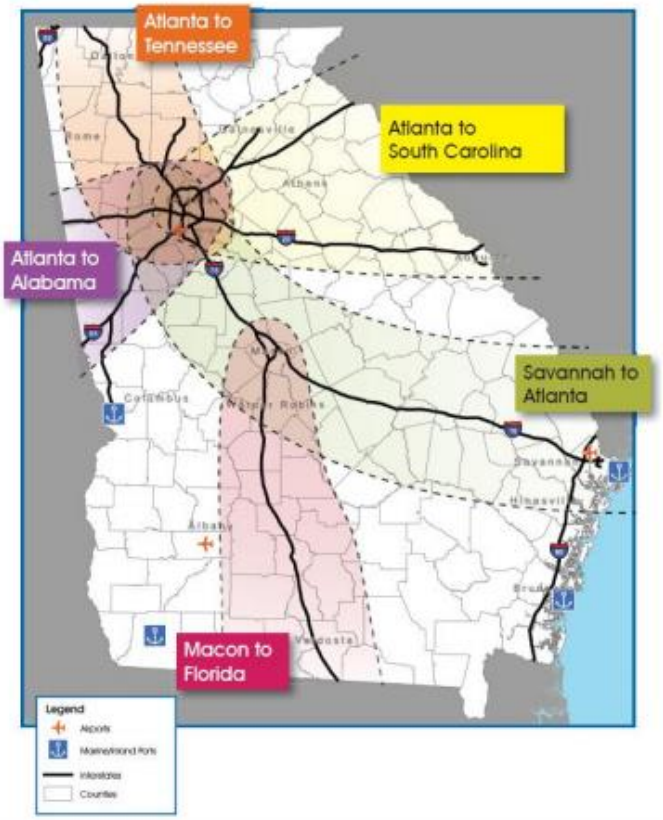


Figure 17. Significant highway corridors in Georgia



To improve the state's economic prospects, the state legislature started the Governor's Road Improvement Program ("GRIP") in 1989, including 3,273 miles of roadway, typically outside large urbanized areas The review of the GRIP network and analysis of key corridors undertaken as part of this Plan indicated three GRIP corridor improvements are high-priority freight projects: US 84, State Route 133, and US 441.

Virginia Freight Plan

The Virginia Freight Element (VFE) is part of "*Virginia's multimodal long-range transportation plan*" (VTrans2040) and corresponds to the state's freight plan. The main focus of the VFE is to ensure an "efficient, reliable, and accessible transportation systems that enhance goods movement on Virginia's multimodal transportation network" with goals pertaining to (1) economic competitiveness and prosperity, (2) accessible and connected places, (3) safety for all users, (4) proactive system management, and (5) healthy communities and sustainable transportation communities. To accomplish these goals, the research team first identified freight needs and challenges, then propose freight improvement strategies well-suited for businesses and residents. Stakeholder outreach including interviews, "regional forum" meetings, and online surveys were

completed throughout the state, and employed as input to develop strategies. The strategies in the report are arranged by "*policies, programs, technologies, and infrastructure*" and include the following as stated:

1. Policy strategies
    - Include freight representation and participation in the state planning process
    - Support multi-state coordination of freight infrastructure improvements
    - Update freight modal systems plans on a regular basis
    - Support opportunities for intermodal terminal development and multimodal diversity
    - Develop first/last mile urban freight policies and recommended practices
    - Support the strategies and initiatives of the Virginia Economic Development Partnership and collaborate with relevant stakeholders to identify and implement transportation investments that support economic development
    - Support industry efforts to enhance workforce recruitment and retention in the transportation and logistics industries
    - Seek more opportunities to improve rail freight as a practical modal alternative to help relieve freight congestion on Virginia's highways
    - Collect origin/destination data on a regular basis to understand truck movements from and to large intermodal facilities
    - Measure and report infrastructure condition, safety, and congestion performance for the Primary Highway Freight Network, the Multimodal Freight Network, and the Critical Urban/Rural Corridors separately from other statewide performance measures
    - Protect high capacity freight corridors and facilities from inappropriate adjacent development
    - Facilitate the sharing of information, best practices, and training among public and private transportation operators, including local emergency response agencies, to improve Traffic Incident Management
2. Program strategies
    - Maintain and improve the designated Virginia Freight Network to ensure the freight system continues to move toward achieving the transportation goals identified in VTrans2040
    - Seek out and implement rapidly - evolving freight data tools to improve freight-related performance metrics
    - Hire a freight expert to coordinate public agency freight planning
    - Promote, advance, and implement the Atlantic Gateway as a unified, coordinated, and comprehensive program for all transportation modes
    - Develop an Industrial Development Area (IDA) Grant Program to improve the economic potential and intermodal opportunities for freight within areas of industrial development
    - Prioritize economic and transportation studies across the Commonwealth in the Urban Crescent
    - Prioritize project selection criteria that support funding first/last mile connectors in locations with regional, statewide, and national significance
    - Leverage Public-Private-Partnerships for funding freight transportation improvements
    - Increase the amount of funding available to the DRPT Rail Enhancement Fund to increase rail investment
    - Address safety and security issues with at-grade rail crossings through accelerated investments and increased collaboration between the public- and private-sector
3. Technology strategies
    - Develop and expand partnerships with public- and private-sector stakeholders to implement proven freight-focused technology solutions and invest in emerging transportation technologies
    - Continue to invest in the development of sophisticated real-time information systems and increase the dissemination of dynamic travel information to improve freight movement mobility and reliability

- Partner with local, state, and federal agencies to expand programs that support fuel efficiency and alternative fuel options in the transportation industry

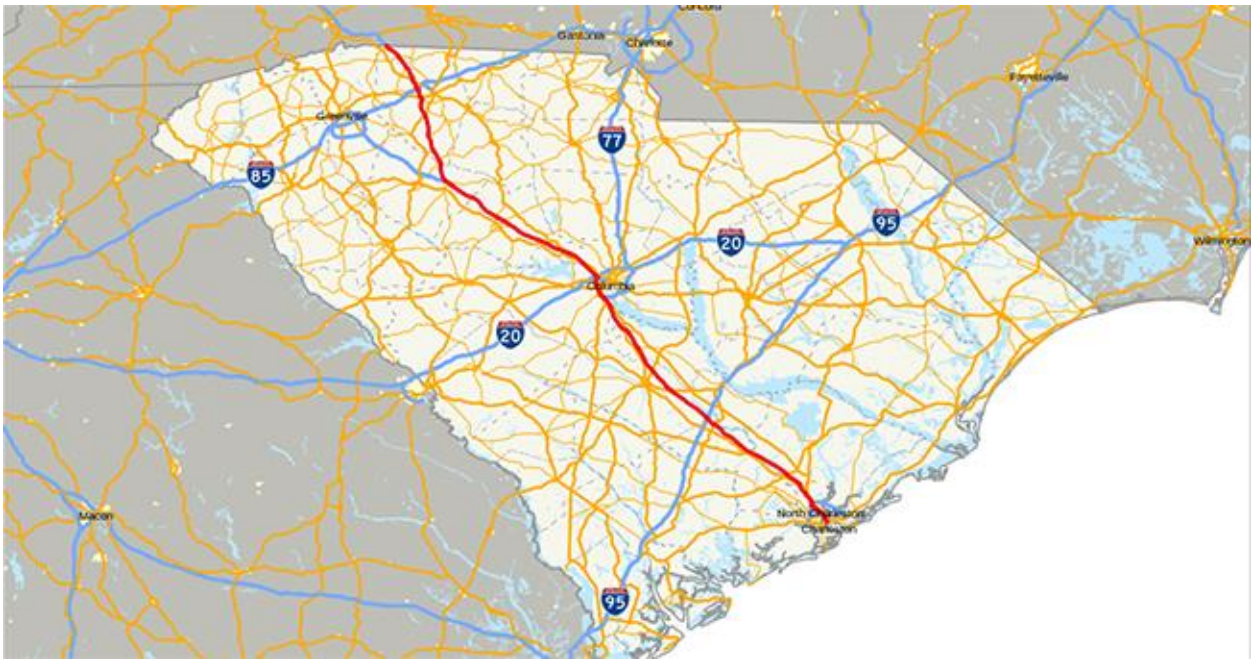
4. Infrastructure- related strategies
    - Increase the supply of truck parking in the Interstate system
    - Prioritize improvement or replacement of functionally obsolete and structurally deficient bridges on the Commonwealth's Strategic Freight Network. Repair deficient pavement on the most significant freight corridors to ensure safe and efficient goods movement
    - Invest in addressing the highest freight value tunnel and bridge bottlenecks in the Hampton Roads region to increase capacity/velocity for freight to/from the Port
    - Implement multimodal corridor improvements to improve freight movement along key freight corridors (e.g. I-81, I-95, I-64 and US-58)
    - Consider a new Interstate route between Hampton Roads and North Carolina (I-87)
    - Invest in improvements to facilities at the Port of Virginia to accommodate anticipated growth
    - Complete the widening of I-64 from Richmond to Hampton Roads
    - Improve I-81 along the Crescent Corridor (Primary freight network) and provide dedicated truck lanes, bypass interchanges, and truck climbing lanes along I-81
    - Permit I-81 hard shoulder running
    - Improve the section of I-81/I-77 overlap
    - Complete the I-95 Express Toll Lanes
    - Add an extra lane in each direction to SR-164 between VIG and I-664
    - Improve US 58 in Hampton Roads. Upgrade US 58 to "limited access" and evaluate a potential bypass on abandoned rail ROW. Prioritize through movements on US 58, from HR region to I-95. Double-track railway through Suffolk to eliminate bottlenecks

This report also provides some recommendations for air cargo, freight rail, and port infrastructure investments. For air cargo, the recommendation, as stated, is to "*Invest in local and regional access improvements to support growth of air cargo at the Washington Dulles International Airport.*" For port and freight rail, respectively, *"Improve landside access by truck and rail to the Port of Virginia to accommodate anticipated growth*" and "*Increase investment in railroad system modernization to preserve rail network quality and access to shipper* and *complete construction of the fourth main-line track from the south bank of the Potomac River to Alexandria.*"

South Carolina Investments in Rural Interstates

A news article highlighted a decision by South Carolina DOT to make investments in rural portions of its interstate highway system. Similar to the I-95 issue that exists in North Carolina, some rural interstates are major freight corridors, and maintenance of those network links is critical to the overall economic health of the state. The article focuses on farm-to-market investments, which are anticipated to enhance the state's economy vitality.

Figure 18. Interstate map of South Carolina



Source: AASHTO Journal. October 26, 2018. "*SCDOT expands program to widen rural interstates for freight needs*."

D. 6 National and International Perspectives

This section reviews economic development considerations associate with geopolitical boundaries. In many instances, individuals living in the northeastern and southwestern regions of North Carolina are employed across state lines. Northeastern North Carolina has a natural affinity to Norfolk (in Virginia) and southwestern North Carolina similarly relates strongly to Chattanooga TN or Atlanta, GA.

Connectography: A new Map of the United States

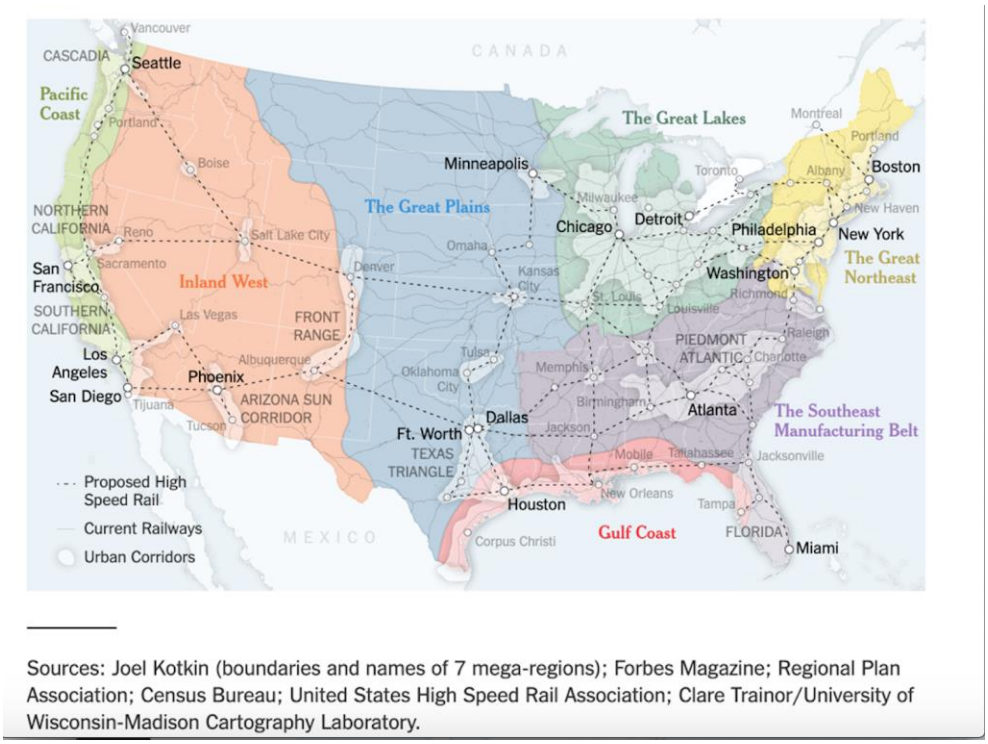
Parag Khanna, Senior Fellow at the Lee Kuan Yew School of Public Policy in Singapore makes an argument in an April 2016 Op-ed in The New York Times that while Western Europe and Asia have reoriented their respective governing states around urban clusters based on high-tech industries and advanced manufacturing, the United States has yet to do so. The politics of governance outside the federal system in the United States and local municipalities remains tied to 50 states. After the Great Recession, while urban areas have seen strong gains and rebounds, rural areas have continued to decline. Thus, smaller cities and regions have become more disconnected to the United States. Khanna argues that while Congress once thought holistically about large infrastructure projects on a continental scale, such as the Louisiana Purchase, the Pacific Railroad Act, the Tennessee Valley Authority and the U.S. Interstate Highway system, it has since backed off of national regional planning.

Khanna argues that states must organize not around drawn state borders, but the already existing and newly planned infrastructure rail and highway corridors, rail lines and telecommunications. Often times, states compete with one another with redundant infrastructure projects such as ports, when fewer would suffice and serve the national interest better so that the U.S. would globally be more competitive. This is true in how states have conducted a "race-to-the-bottom" to attract high-tech firms and automotive manufacturers. Khanna opines, "*For example, instead of waging a 1980s Asian-style race to the bottom to attract low-wage auto jobs at Nissan, Honda or Toyota plants, Tennessee and Kentucky should join forces to become an advanced manufacturing hub for the global auto industry, with better cross-border infrastructure. They may end up with*

fewer plants, but they would be more competitive ones, especially if they could coordinate research and development through the states' public and private universities. Where possible, such planning should even jump over international borders. While Detroit's population has fallen below a million, the Detroit-Windsor region is the largest United States-Canada cross-border area, with nearly six million people (and one of the largest border populations in the world). Both sides are deeply interdependent because of their automobile and steel industries and would benefit from scaling together rather than bickering over who pays for a new bridge between them. Detroit's destiny seems almost obvious if we are brave enough to build it: a midpoint of the Chicago-Toronto corridor in an emerging North American Union."

Khanna argues that this national planning would also strongly benefit poorer, rural areas and not exclude them as they have been from the quickly growing-urban trends. Below is a map based on his recommendations.

Figure 19: A new map of the United States showing megaregions

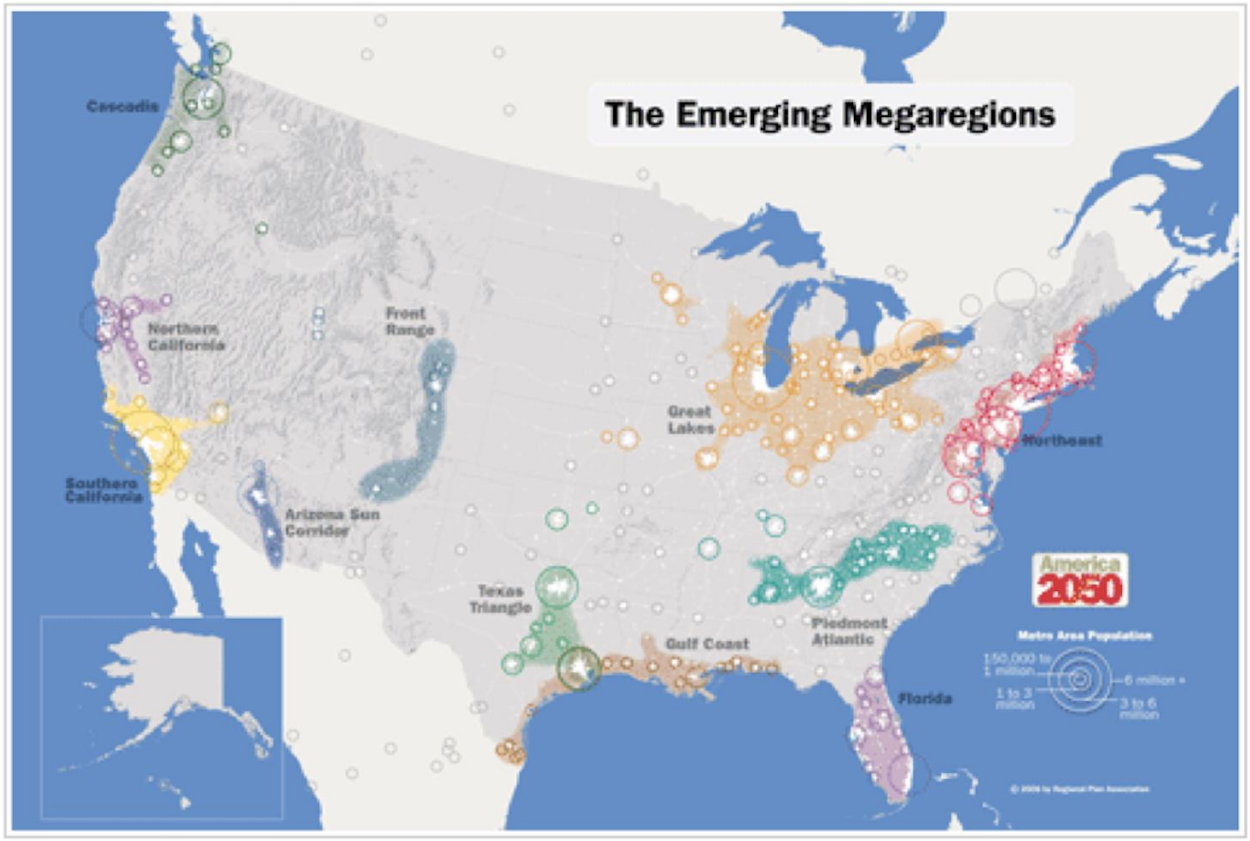


Source: New York Times

America 2050 Megaregions

America 2050 proposes 11 megaregions within the United States (see below map) that will require a collaborative approach to planning and investment. Why? Because, many challenges are best solved by working across regions, and because growing urban areas are increasingly linked by their economies, settling/commuting patterns and land use, ecological systems and topography, shared social networks/culture/history, and infrastructure. Not only could planning across regions help to link the economy and transportation systems, but environmental protections could be improved upon, based on the knowledge that migratory species require connected ecological landscapes (as opposed to the fragmentation that occurs when separate locales make decisions within their jurisdictions).

Figure 12: Map showing the Emerging Megaregions



Source: America 2050

D.7 Economic Impact Analysis Tools

The most common and widely accepted methodology for measuring the economic impacts of cooperatives, enterprises, or transportation facilities is input-output (I-O) analysis, a subset of a family of methods called social accounting models (Shaffer, et al. 2004; Hewings 1985). Input-output models attempt to describe an array of economic transactions between various sectors in a defined economy for a given period, typically a year. These models provide researchers not only with estimates of the scalar multipliers but also support a detailed decomposition of the multipliers.

IMPLAN © (also known as IMpact Analysis for PLanning) is an input-output model, which has gained prominence in transportation economics over the past few decades. The hallmark of IMPLAN is the specificity of its economic datasets. The database includes information for 546 different industries (generally at the four- or five-digit North American Industrial Classification level), and more than 20 different economic variables. Along with these data files, national input-output structural matrices detail the interrelationships between and among these sectors. The database also contains a full schedule of Social Accounting Matrix (SAM) data. All of this data is available at the national, state, and county level. For this study the research team used IMPLAN to conduct its input-output analysis.

IMPLAN offers a "snapshot" of the economy, detailing the sales and purchases of goods and services between all sectors of the economy for a given period of time within a conceptual framework derived from economic theory. The activities of all economic agents (industry, government, households) are divided into production sectors. The transactions between the sectors are measured in terms of dollars and segmented into two broad categories: non-basic, which includes transactions between local industries, households and other institutions, and basic, which includes transactions between industries, households, and other institutions outside the economy being modeled (i.e., imports and exports).

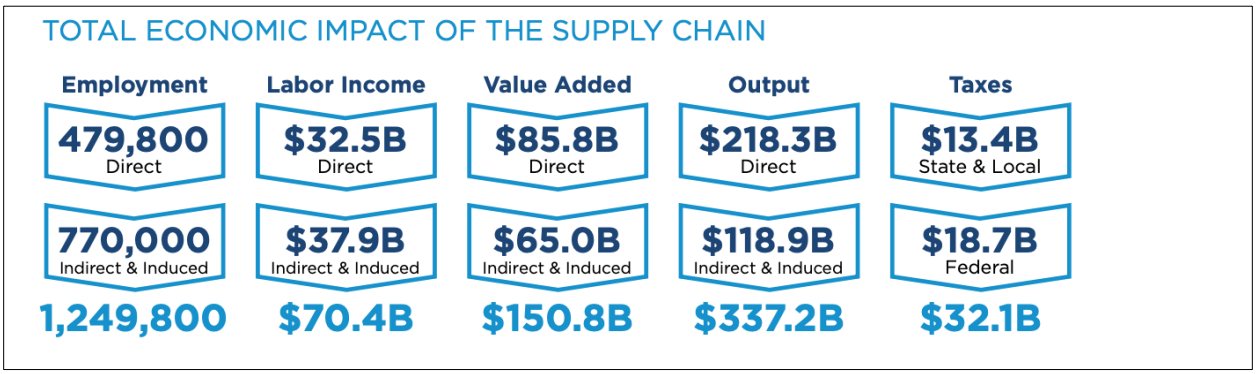
One can think of IMPLAN model as a large "spreadsheet" of the economy where columns represent buying agents in the economy. These agents include industries within the economy buying inputs into their production processes, households and governments purchasing goods and services, as well as industries, households, and governments that are located outside the region of analysis. The latter group represents imports into the economy. Economic agents can import goods and services into the regional economy for two reasons. First, the good or service might not be available and must be imported. Second, local firms might produce or supply the imported good or service, but the local prices or specifications might not meet the needs of the purchasing economic agents. The columns represent economic demand. The rows of the "spreadsheet" represent selling agents in the economy or supply. These agents include industries selling goods and services to other industries, households, governments, and consumers outside the region of analysis. The latter group represents exports out of the economy. Households that sell labor to firms are also included as sellers in the economy.

Supply Chain Analysis

The 2016 report *North Carolina's Supply Chain: Conduit for Commerce & Economic Development* provides an economic impact analysis of the state's current supply chain conditions. The report structure is a long-form analysis on 14 sectors considered to be part of the larger supply chain supporting the state. The report uses as input-output methodology to provide information on economic multipliers using academic research, demographic and economic data sources, combined with IMPLAN.

The report discusses the economic impact of 14 supply chain sectors by employment, labor income, output, value-added (GDP) and taxes. North Carolina's supply chain leading sectors are classified in the following sectors: transportation, distribution & logistics, pharmaceuticals, industrial machinery and equipment, and tobacco and other agricultural products.

Figure 21. Total Economic Impact of the Supply Chain



Source: North Carolina State University

North Carolina's supply chain faces some of the following challenges and trends: rapid need for future infrastructure, growing foreign markets, a strong U.S. dollar, consolidation in corporate arena with regard to economies of scale, and a more highly-skilled work force.

Impact Assessments

Economic impact assessments are often conducted using "before-after" studies where "local" real estate values or tax revenues are compared "before" and "after" the infrastructure investment takes place. Assessments attempt to determine the magnitude for which infrastructure (e.g., highway) investments impact the local economy. As with clinical studies, a control group must be identified that was not "subjected" or "affected" by the "treatment", (e.g. no investment took place). The changes in real estate values or tax revenues for that control group are then compared with the changes projected to take place in the area.

D.8 Summary and Conclusions

Following a review of the literature, several key themes emerge. First, urban areas are continuing to grow and are becoming increasingly connected. Scholars have recommended implementing strategies to collaborate, plan, and make investments that span across regions. Mega-regions were thoroughly discussed in the literature. These large areas have similarities, such as residential/commuting patterns and connectivity, environmental and economic linkages, and common infrastructure. Rural freight industries face unique challenges within megaregions (Lockwood,2004). Transportation investments are potentially costly in rural and require a strategic assessment of priorities. Local needs assessments may shed light on rural infrastructure priorities and include information about local economic conditions and activities that can be supported by transportation infrastructure. Local needs assessments can provide a basis from which solutions can be uniquely tailored to specific localities, involving substantial stakeholder input; however, funding needs assessments are often limited. In contrast, statewide freight plans may be associated with greater funding, but more limited input from stakeholders, since a much larger geographic area is included in statewide and regional freight plans. While local needs assessments may recommend specific projects or project types, state freight plans are more likely to include guiding principles for future freight investments.

To expand on this, the freight plans reviewed generally included a picture of the state's freight industry and an accounting of the state's assets related to transportation infrastructure, followed by goals and corresponding objectives, and a description of the stakeholder outreach that informed the reports. Goals commonly mentioned in state freight plans include investment in infrastructure, mobility, sustainability and environmental concerns, safety, economic competitiveness, regional/intra-regional collaboration, and equity (although this one is less common). While many governmental and academic reports tended to focus on economic and infrastructure considerations, the NC Rural Counts Center (a policy advocacy organization that conducts extensive outreach with business leaders in rural, economically depressed areas) provided more holistic and multi-faceted recommendations, including factors that form the base of a healthy economy (e.g. improved health care, education, expand access to broadband, modernization of rural water/wastewater/natural gas infrastructure, workforce training programs, etc.). This may suggest a disconnect between local stakeholders and governmental decision makers. To address this discrepancy, the current research project seeks to bridge the gap between local stakeholder knowledge and state-level decision makers by working closely with local stakeholders, using NC Rural Counts as a valuable reference, in order to come up with more comprehensive and innovative approaches to reinvigorating economically depressed areas. The findings of this research should create a pathway for several approaches to investing in poverty-stricken rural areas within North Carolina.