



# Piedmont Triad Scenario Planning Peer Exchange

*A TPCB Peer Exchange Event*

**Location:** Greensboro, North Carolina  
**Date:** May 3 – May 4, 2023  
**Host Agency:** Piedmont Authority for Regional Transportation (PART)  
**Peer Agencies:** Dale Stith, Hampton Roads Transportation Planning Organization (HRTPO)  
Martin Rivarola, Mid-America Regional Council (MARC)  
**Sponsoring Agency:** Federal Highway Administration (FHWA)



U.S. Department of Transportation  
**Federal Highway Administration**

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13. ABSTRACT (Maximum 200 words) This report summarizes noteworthy practices and key recommendations shared during a scenario planning peer exchange, hosted by the Piedmont Authority for Regional Transportation, on May 3-4, 2023, in Greensboro, North Carolina. The Federal Highway Administration (FHWA) sponsored this event as part of its Transportation Planning Capacity Building Program jointly run by FHWA and the Federal Transit Administration.				
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# Peer Exchange Overview

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This report summarizes a 1.5-day scenario planning peer exchange held May 3-4, 2023, in Greensboro, North Carolina, and hosted by the Piedmont Authority for Regional Transportation (PART). The event was co-sponsored by the Federal Highway Administration (FHWA) through its Transportation Planning Capacity Building (TPCB) program, led jointly with the Federal Transit Administration (FTA). The event brought together peers, subject matter experts, and regional stakeholders to introduce the concept and application of scenario planning to develop future land use estimates, build awareness of scenario planning among local planning agencies in the Piedmont Triad, and highlight best practices among peer transportation planning agencies.

PART is a regional transportation agency operating in the Piedmont Triad. Among other programs and services, PART manages the regional travel demand model for four Metropolitan Planning Organizations (MPOs) in the Triad, including the Burlington-Graham MPO, Greensboro Urban Area MPO, Winston-Salem Urban Area MPO, and High Point Urban Area MPO. A total of 43 participants attended the in-person event, including representatives from cities, counties, and MPOs in the Piedmont Triad; the North Carolina Department of Transportation (NC DOT); the FHWA North Carolina Division; the FHWA Office of Planning; and the U.S. DOT Volpe Center.

The peer exchange featured presentations from:

- Jeremy Raw, Community Planner, FHWA Office of Planning
- Mark E. Kirstner, Director of Planning, PART
- Dale Stith, Principal Transportation Planner, Hampton Roads Transportation Planning Organization (HRTPO)
- Martin Rivarola, Assistant Director of Transportation and Land Use, Mid-America Regional Council (MARC)
- Todd Litman, Founder and Executive Director, Victoria Transport Policy Institute (VTPI)

Key takeaways from the peer exchange included:

- Scenario planning can benefit long-range transportation plans by considering “what if?” to explore possible futures, clarify regional goals, and prioritize projects.
- There are three distinct styles of scenario planning – Predictive, Normative, and Exploratory – which consider what future is most likely to happen (predictive), what community members want and desire to happen (normative), and what could happen based on unknown risks and disruptions (exploratory). These approaches may be used individually, or in combination with one another.
- Although advanced modeling tools are not required to do scenario planning, they can help by eliminating guesswork and allowing for more precision in growth allocations and projections.
- Public engagement is a critical component of scenario planning. Developing “drivers” of change and/or creating scenario narratives can be a productive way to initiate conversations with internal and external stakeholders on scenario planning.

The appendices in this report include:

- Appendix A: Event Participants
- Appendix B: Peer Exchange Agendas
- Appendix C: Additional Resources

## Overview of the Workshop

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### Goals of the Workshop

The Piedmont Authority for Regional Transportation (PART) hosted the peer exchange to introduce the concept and application of scenario planning to develop future land use estimates, build awareness and encourage information-sharing among transportation planning agencies in the Piedmont Triad, highlight scenario planning best practices from peer agencies, and help inform the Triad’s regional modeling program and long-range planning efforts. The event was sponsored by the Federal Highway Administration (FHWA) Transportation Planning Capacity Building Program (TPCB), which is jointly managed by the FHWA and the Federal Transit Administration (FTA).

### Selecting the Peers

Peer agencies were selected based on a variety of factors including their previous experience with scenario planning, similarities to the Piedmont Triad region in terms of size and responsibilities, and previous experience with modeling tools to develop and assess future scenarios. The planning team extended invitations to two peer agencies based on these criteria. These peers were:

- Dale Stith, Principal Transportation Planner, Hampton Roads Transportation Planning Organization (HRTPO) in Hampton Roads, Virginia; and
- Martin Rivarola, Assistant Director of Transportation and Land Use, Mid-America Regional Council (MARC) in Kansas City, Missouri.

In addition, at PART’s request, Todd Litman from the Victoria Transport Policy Institute (VTPI) was invited to present on incorporating land use and smart growth development goals into the transportation planning process. Mr. Litman made his presentation virtually from British Columbia, Canada.

### Format of the Event

PART hosted the 1.5-day peer exchange in Greensboro, North Carolina on May 3-4, 2023. The first day of the peer exchange had 43 participants and included PART and MPO planning staff, peer presenters, FHWA and U.S. DOT Volpe Center staff, and other local partners. The second day of the peer exchange had 21 participants and convened a smaller group of PART and MPO staff, local partners, peer presenters, and FHWA and U.S. DOT Volpe Center staff. A full list of attendees is available in Appendix A of this report.

On Day One of the peer exchange, FHWA provided a brief overview of scenario planning and examples from across the country. PART shared information on its current scenario planning activities and how the peer exchange fits into a larger Scenario Planning and Growth Allocation Project for the region. Live polling was used to gather information on participants’ familiarity with scenario planning and understanding of the key “drivers” of change in their communities. The two peer agencies shared their

experiences with scenario planning through two panel sessions, followed by a question-and-answer discussion. In the afternoon, Todd Litman from VTPI presented virtually on prioritizing accessibility in long-range planning. Day One ended with small breakout group discussions reflecting on the day’s key takeaways and opportunities to apply lessons learned.

On Day Two of the peer exchange, the FHWA facilitated two roundtable discussions, which broadly covered “Next Steps for Advancing Scenario Planning at Your Agency” and “Engaging Stakeholders and Long-Term Considerations for Scenario Planning.”

Agendas for each day of the peer exchange are provided in Appendix B of this report.

## Introduction

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### PART Overview

PART is a regional transportation agency operating in the Piedmont Triad of North Carolina. PART manages multiple programs and services for the area, including the regional travel demand model for four Metropolitan Planning Organizations (MPOs) in the Piedmont Triad, which include the Burlington-Graham MPO (BGMPO), Greensboro Urban Area MPO (GUAMPO), Winston-Salem Urban Area MPO (WSMPO), and High Point Urban Area MPO (HPMPO) (see Figure 1). Outputs from the regional travel demand model are used to develop MPO Metropolitan Transportation Plans (MTPs) as well as other regional studies and plans.

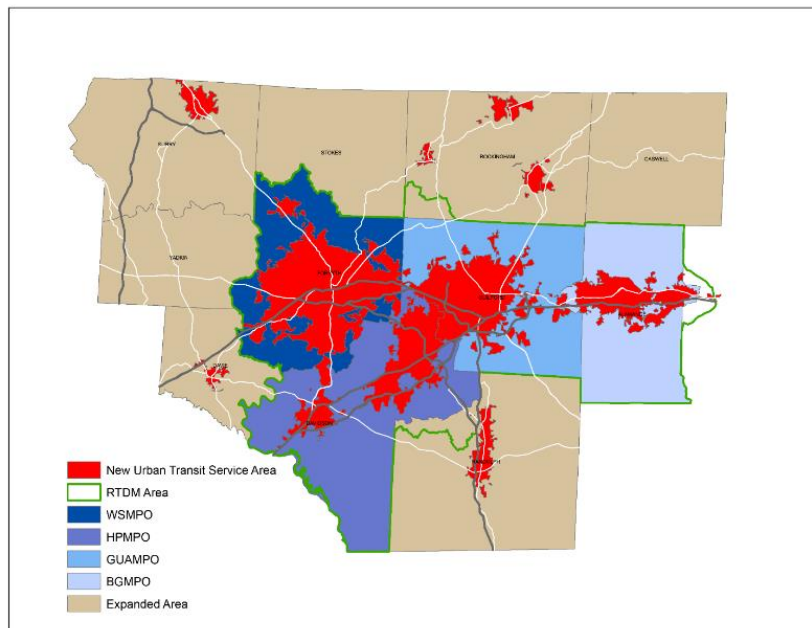


Figure 1: PART’s MPO partners and service area in the Piedmont Triad (Source: PART)

PART's current scenario planning activities emerged out of a U.S. Department of Housing and Urban Development (HUD) grant from 2011 to 2014, which supported the development of the *Piedmont Together* regional sustainability plan. Since then, PART has been working to create a more comprehensive modeling program for the region that incorporates land use, freight, and other components. The HUD grant also introduced PART to CommunityViz<sup>1</sup>, a modeling tool which can be used to generate future scenarios by describing land use types and allocating growth in population, housing, employment, and other areas. Use of scenario planning and the development of socio-economic data using CommunityViz is new to the region, and one of the many elements which will be included in PART's next travel demand update. This update will also include expansion of the model area into the "expanded area" as shown in Figure 1.

PART applied to the TPCB Peer Exchange Program to learn more about how other regional transportation agencies have managed the scenario planning process and used modeling tools such as CommunityViz to support this work, with the goal of integrating scenario planning into the Piedmont Triad's long-term planning processes.

## Presentation and Discussion Highlights

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### Opening Remarks

Representatives from the FHWA Office of Planning (Jeremy Raw), FHWA North Carolina Division (George Hoops), and PART (Mark E. Kirstner) each provided opening remarks and welcomed peers and participants. The opening comments recognized the purpose and benefit of the peer exchange and the larger FHWA-FTA TPCB Program in supporting State, local, regional, and Tribal governments on a range of transportation topics. Jeremy Raw from the FHWA Office of Planning facilitated the event.

### Overview of Scenario Planning

Jeremy Raw from the FHWA Office of Planning introduced the concept of scenario planning, outlined FHWA's guidance and resources available to support scenario planning, and highlighted scenario planning best practices from the Denver Regional Council of Governments (DRCOG) and the Delaware Valley Regional Planning Commission (DVRPC).

The presentation began with an introduction to two FHWA resources on scenario planning: the [Scenario Planning Guidebook](#) (2011) and [Next Generation Scenario Planning: A Transportation Practitioner's Guide](#) (2017). These resources provide a framework for scoping a scenario planning process, describe the benefits of a scenario-based approach, and outline three main approaches to scenario planning, which include:

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<sup>1</sup> For more information on CommunityViz, please visit: <http://placeways.com/communityviz/>. Reference to CommunityViz in this report is intended as descriptive of the tools PART is using and does not constitute an endorsement or recommendation for use of CommunityViz or any particular scenario planning tools. FHWA recognizes that many tools are available to support a scenario planning process and FHWA encourages agencies to find and use the tools that best support their goals.



1. **Predictive** (*probable*) scenario planning envisions the most likely future. Predictive scenario planning typically involves one hypothetical future that is used as a baseline from which to compare and assess projects.
2. **Normative** (*desired*) scenario planning explores what is most important to a community and how to achieve stated goals. Normative scenario planning uses performance-based planning and metrics to establish goals or targets.
3. **Exploratory** (*uncertain*) scenario planning imagines what the future could look like and explores the impact of a range of unknown risks, threats, and disruptions.

All three approaches may be used together in a single scenario planning process. For example, an agency opting to take an exploratory approach may also want to establish goals for their region (normative). Findings can then be applied to develop specific and likely land use forecasts for use in travel demand modeling (predictive). The exploratory aspect is to acknowledge and identify future forces, potential threats, or risks that could be disruptive. Examples of future forces and risks could include local budget constraints, changes to travel behavior, more frequent and extreme weather events, changing market and economic trends, or advances in technology.

Other related scenario planning concepts were introduced including **drivers**, **levers**, and **tipping points**, which may also be used as part of exploratory scenario planning to imagine future risks and uncertainties. “Drivers” are significant outside influences that might alter future outcomes. “Levers” are actions that planning agencies might undertake to respond to “drivers” or to implement specific policies or projects aimed at influencing future outcomes. “Tipping points” describe specific thresholds or timeframes at which certain effects may introduce significant differences in future trends – for example, the point at which connected and automated vehicle fleet penetration passes from being a novelty to a factor that changes the nature of problems that transportation policy and investment are trying to solve (e.g., shifting to consideration of zero-occupant vehicles and new methods of traffic flow management).

Two scenario planning case studies were highlighted from DRCOG and DVRPC. DRCOG’s scenario planning process began by creating a framework to compare scenarios against two key factors: 1) the region’s urban footprint, and 2) transportation investment priorities. The agency created a baseline scenario that was used to compare alternative scenarios with more or less investment in transit versus highways, and with an urban footprint that was more or less compact. The DRCOG exercise produced several scenario outcomes that could be evaluated against regional goals related to land use, transportation, and the environment. DVRPC’s approach to scenario planning involved creating five “future forces” – Enduring Urbanism, Free Agent Economy, Severe Climate, Transportation on Demand, and US Energy Boom – that were used to explore narratives around future scenarios and engage the public to assess scenario alternatives.

## **Scenario Planning in the Piedmont Triad: Setting the Course – Past, Present, and Future**

Mark E. Kirstner from PART gave a presentation providing an overview of the region’s work to date on scenario planning. The presentation included an interactive question-and-answer session with representatives from the four MPOs in the Piedmont Triad to understand what they hoped to learn from the peer exchange. The session concluded with live polling to gather audience input on several topics related to scenario planning.

PART’s work on scenario planning began in 2010 through the HUD-funded *Piedmont Together* regional plan. This planning process introduced the region to CommunityViz and helped to increase buy-in for using modeling tools to support long-range transportation planning. In 2017, PART’s planning and transportation directors began to discuss scenario planning and agreed to investigate the use of scenario planning to generate future growth allocations. Since that time, PART has been working with its local partners to agree on place types, pilot study areas, and develop standards to create a baseline parcel layer and land suitability factors from which scenarios and growth allocations can be developed. The region’s Scenario Planning and Growth Allocation Project will inform other modeling in the region, including the regional travel demand model, and help to create a more comprehensive understanding of local need to support future planning and decision-making (see Figure 2).

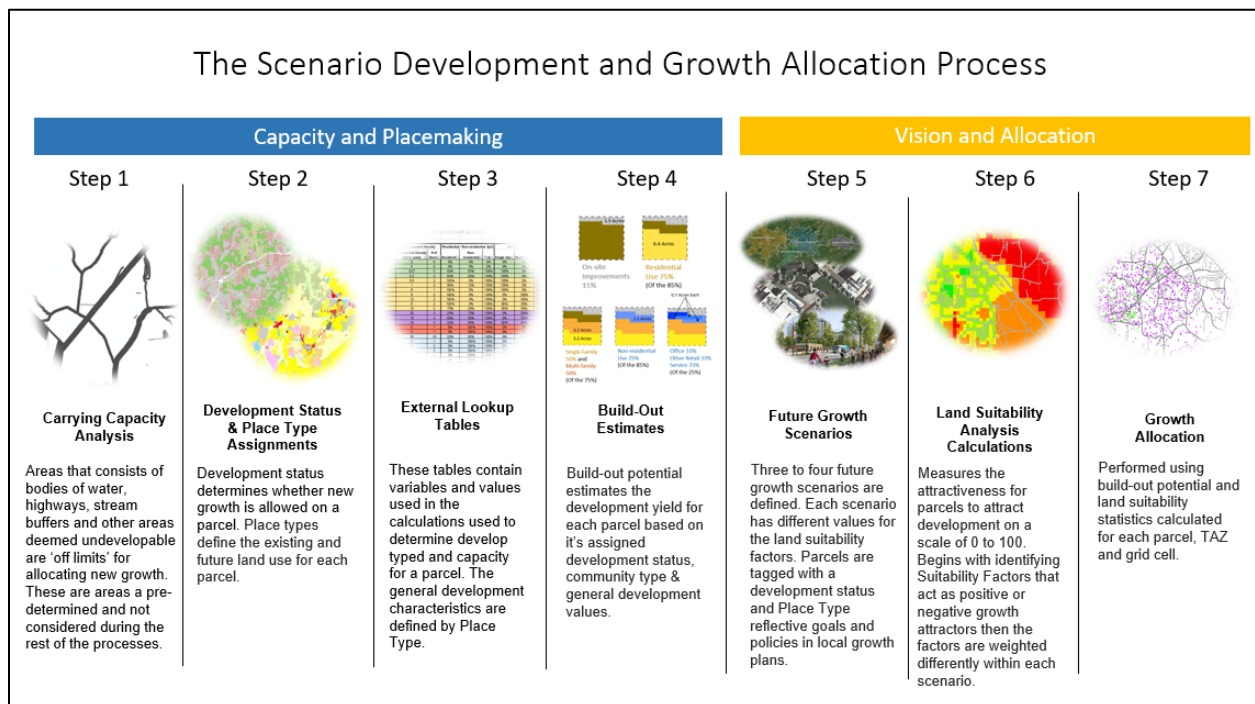


Figure 2: PART’s Scenario Development and Growth Allocation Process (Source: PART)

PART gave an overview of some of the specific features of CommunityViz; for example, the tool includes “land uses” which describe an individual land use rather than zones (e.g., single family dwelling, church) and their development status (e.g., developed, underdeveloped), as well as “place types” which encompass a group of land uses (e.g., walkable neighborhood, health care campus, etc.). PART explained that one of the major benefits of using modeling tools such as CommunityViz is that they allow for more precision in place type and land use assignments, which can produce more accurate growth allocations.

PART developed three pilot scenarios in 2022. These include:

1. **Current Growth Trend** – this baseline scenario allocates growth based on current development patterns, which include less emphasis on density and more emphasis on growth outside of sewer service areas. This scenario does not recognize transit service areas as strong growth attractors.

2. **Activity Centers Growth Scenario** – this scenario emphasizes land suitability to municipal, regional, and urban centers. It also focuses on growth in employment centers, and centers servicing neighborhoods and the region.
3. **Public Transit-Centric Scenario** – this scenario focuses growth along transit corridors. It also utilizes existing utility and street infrastructure and provides multimodal access to activity centers.

PART explained that each of their scenarios incorporates a goal, reflecting a “normative” scenario planning approach, and encouraged MPOs to consider their own targets when developing scenarios. PART also emphasized that accurate parcel tagging, land use, and place type assignments in CommunityViz are essential to translating visions/goals from land use plans into scenario planning and growth allocations. PART explained the CommunityViz methodology which uses land suitability factors to assign growth based on whether the factor has a positive (e.g., urban centers) or a negative (e.g., floodplain) correlation, in addition to other characteristics. A positive correlation means more growth will be modeled to occur in those areas.

PART’s presentation concluded with an interactive audience session. First, PART asked representatives from each of the four MPOs in the Piedmont Triad – BGMPO, GUAMPO, WSMPO, and HPMPO – to respond to the following questions:

1. Related to developing and evaluating scenarios this fall, what are you most apprehensive about?
2. What are you looking forward to the most?
3. What value do you hope scenario planning brings to the transportation planning process?
4. What do you hope to learn from this workshop?

MPO responses are summarized below:

- BGMPO is a small, rural MPO wedged between two large, urban areas. In recent years they have expanded eastward and gained new areas in their jurisdiction. BGMPO’s challenge is finding ways to manage new growth while honoring local wishes to preserve a lower density rural community. BGMPO hoped to learn how peers had engaged elected officials and leadership in the scenario planning process.
- WSMPO was excited to use CommunityViz and scenario planning to inform their transportation plan. WSMPO was most apprehensive about the scenario planning process itself since they are new to scenario planning. They hoped to learn how peer agencies approached scenario planning and how these lessons could be applied to their practice.
- GUAMPO was grateful to PART for bringing regional staff together and adding value to the work MPOs are doing to become more responsive to changing trends. GUAMPO stated they felt there was potential with CommunityViz to understand the impact of future outcomes on the regional transit system, and the impact of future risks and uncertainties. GUAMPO hoped to learn how to develop scenarios and interpret results; they were also interested in learning how to communicate the scenario planning process to the public.
- HPMPO’s biggest concern was learning how to plan for future uncertainty, given recent redevelopment trends in their region. HPMPO hoped to learn more about scenario planning best practices. They felt there was potential for scenario planning to bring more equity to the

transportation planning process and hoped that underserved communities would be a focus of scenarios moving forward.

Following the interactive session with MPOs, PART asked all peer exchange participants to respond to four live polling questions:

1. How familiar are you with Scenario Planning?
2. What are your major concerns heading into this process? (Multiple answers possible)
3. Will you engage the public during the preparation of your scenarios?
4. What do you think will be the top three “drivers” in your community in the future?

Audience responses to the live polling questions are displayed in Figures 3-6.

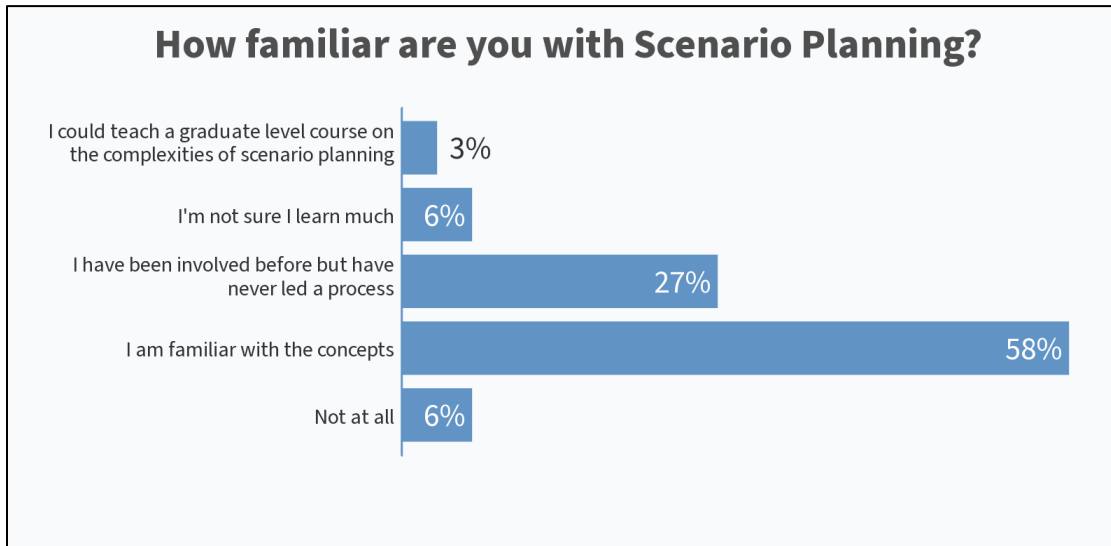


Figure 3: Responses to the poll question, “How familiar are you with Scenario Planning?”

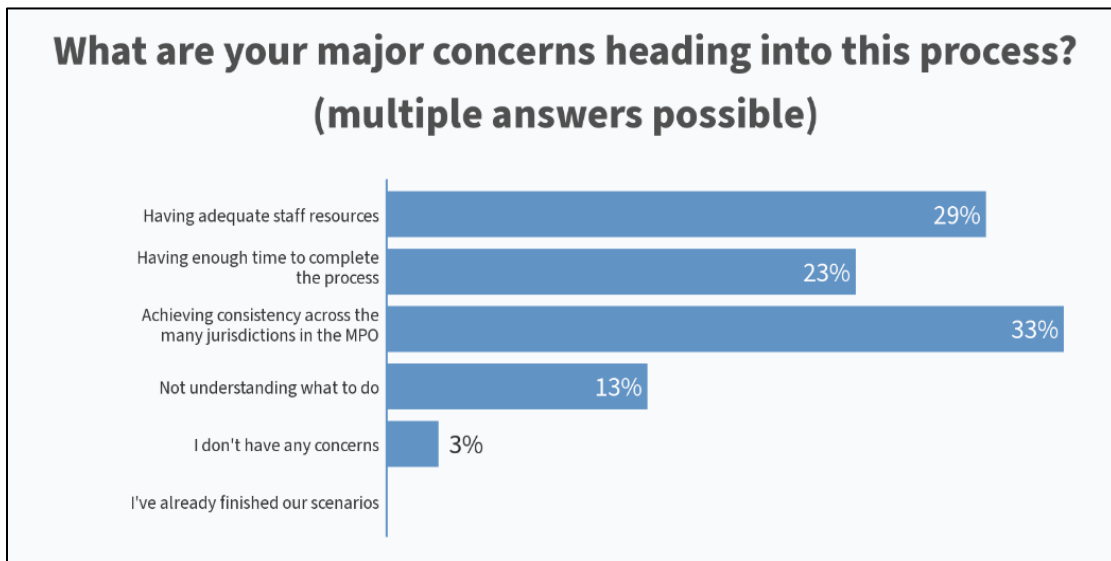


Figure 4: Responses to the poll question, “What are your major concerns heading into this process?”

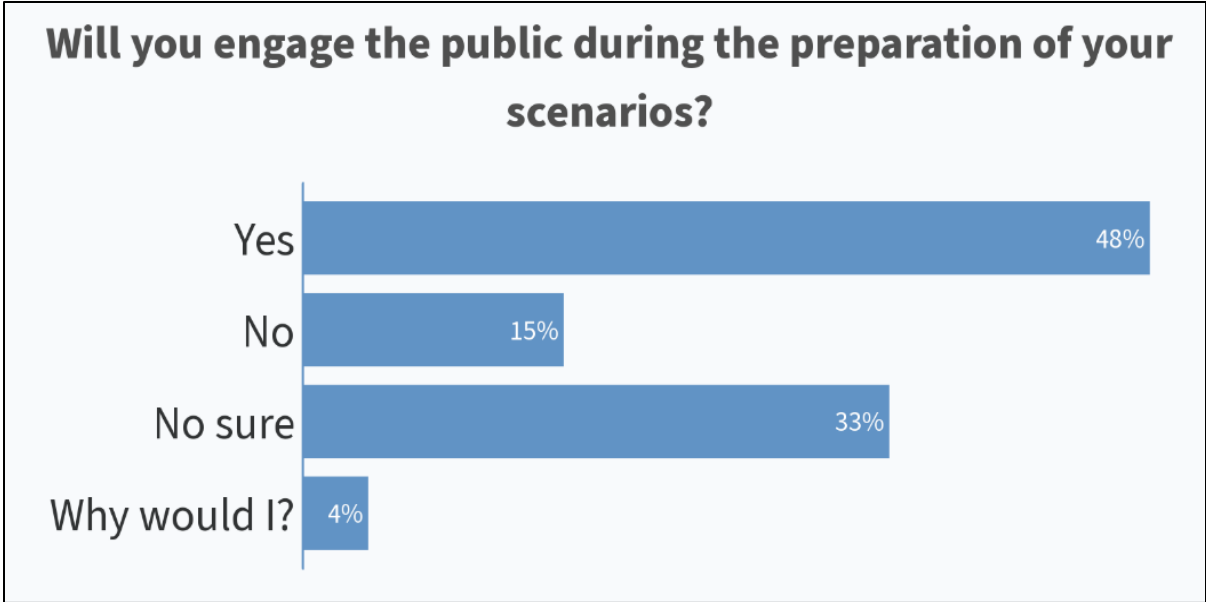


Figure 5: Responses to the question, "Will you engage the public during the preparation of your scenarios?"

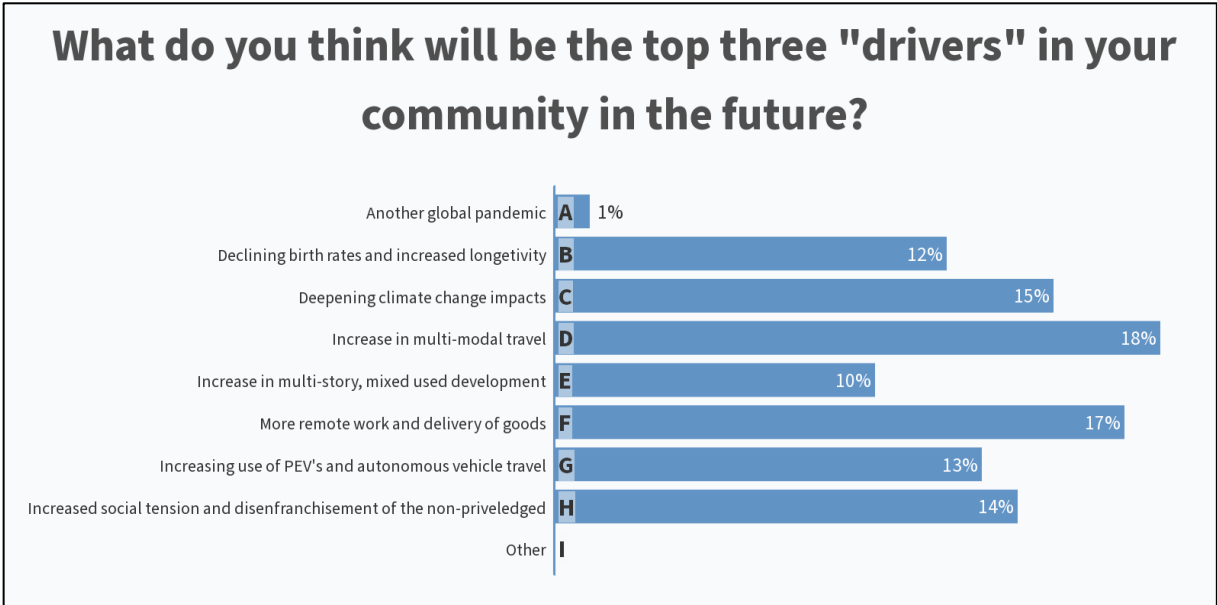


Figure 6: Responses to the poll question, "What do you think will be the top three "drivers" in your community in the future?"

## Peer Approaches to Scenario Planning

Following PART's presentation, representatives from two peer agencies – Hampton Roads Transportation Planning Organization and the Mid-America Regional Council – each shared information on their agency's approach to scenario planning in two peer panel sessions. The topics of the panel sessions were: 1) Using Scenario Planning to Prepare for Uncertainty, and 2) Assessing and Implementing Scenarios. The summary below provides highlights of the themes discussed during these presentations.

### Peer Panel 1: Using Scenario Planning to Prepare for Uncertainty

#### ***Dale Stith, Principal Transportation Planner, Hampton Roads Transportation Planning Organization (HRTPO)***

HRTPO is the transportation planning agency for the Hampton Roads region in southeastern Virginia, representing 1.7 million people, 15 localities, three transit agencies, the Port of Virginia, and is home to the largest Naval base in the world. In addition to locality membership on the HRTPO Board, the Virginia DOT, Port of Virginia, military partners, and four Virginia General Assembly Members also provide important feedback on transportation issues in the region.

In preparation for HRTPO's 2045 Long-Range Transportation Plan (LRTP), the agency hosted a Scenario Planning Workshop through the FHWA-FTA sponsored TPCB Program in November 2017. HRTPO wanted to develop a robust, data-driven scenario planning process to accompany their data-driven project prioritization process. Through a combination of inputs from the TPCB Scenario Planning Workshop, research, partnership with a parallel regional planning effort (Regional Connectors Study), and coordination with regional stakeholders, HRTPO established a Regional Scenario Planning Process, which helped to clarify their preferred approach to scenario planning and their key objectives for the process.

HRTPO took an exploratory approach to scenario planning with four plausible futures: 1) Baseline Scenario, 2) Greater Growth on the Water, 3) Greater Growth in Urban Centers, 4) Greater Suburban /Greenfield Growth. Each scenario was distinct and was used to stress-test their transportation system to identify the most resilient projects. In addition to developing scenarios, HRTPO identified their goals, objectives, and associated performance measures for the region. These included: 1) Economic Vitality, 2) Sustainability: Equity, Community & Environmental, 3) Connectivity & Accessibility, and 4) Safety, Resiliency & Innovation. Finally, HRTPO established a Regional Scenario Planning Framework setting out their methodology for developing scenarios, greater growth control totals, and regional place types, which went to their Board for approval.

As part of their scenario planning process, HRTPO developed scenario drivers and narratives. Drivers helped to identify the elements that could significantly influence the region's development and impact the transportation system. Scenario drivers were organized into four themes (see Figure 7), with input from regional stakeholders, and then used to create scenario narratives. The final component of HRTPO's Regional Scenario Planning Framework was to identify how much growth to add to each of the scenarios to stress test the transportation system. HRTPO decided on a 16% increase, which doubled the forecasted baseline employment growth for 2045 (8%). More information on growth allocations and scenario modeling was discussed in HRTPO's second peer panel session.

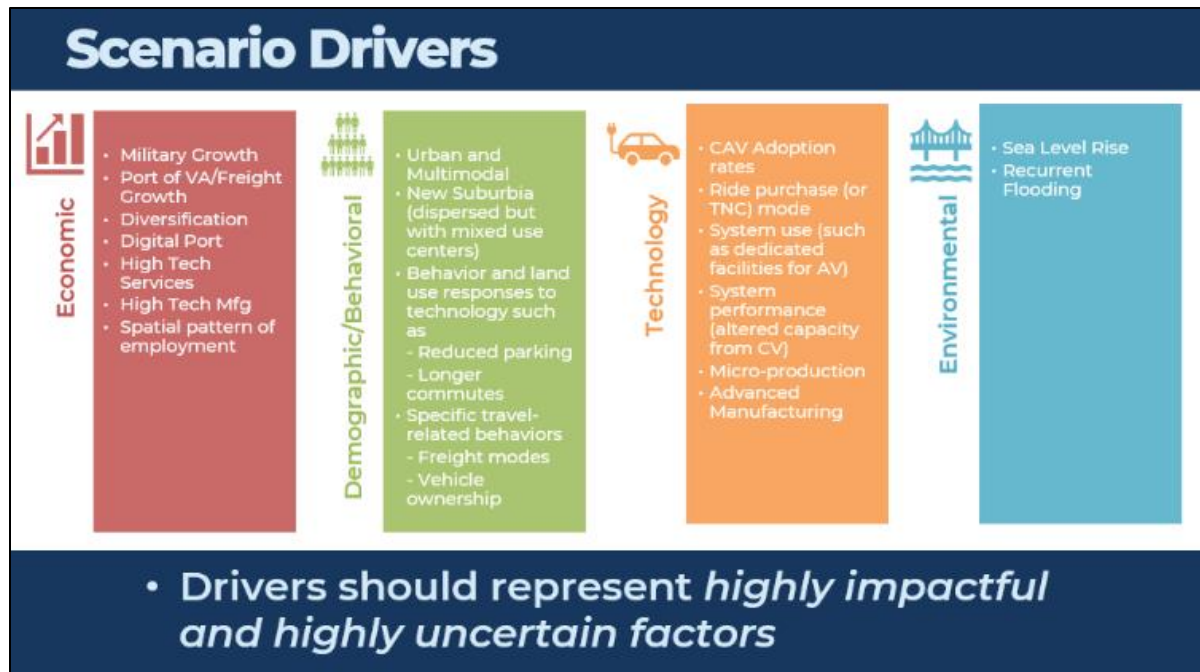


Figure 7: HRTPO's Scenario Drivers

Through this experience, HRTPO identified several important takeaways:

- Establish scenario planning objectives and approach early.
- Expect to identify a lot of drivers of change at the beginning of the scenario planning process. Having a system to organize and prioritize drivers is important to capture those that are likely to have the most significant impact.
- For exploratory scenario planning, create scenarios that are distinct. Each scenario should include distinct drivers that will produce different patterns of economic and population growth in the region, and new or novel technologies that will affect travel behavior.
- Ensure staff have a firm grasp of data tools. If possible, create manuals that new staff can refer to in the event of turnover of technical staff.
- Develop place types using a common regional land use classification system. This was critical for standardizing data from locality comprehensive plans and analyzing patterns across the Hampton Roads region.
- Ensure stakeholders have a solid understanding of exploratory scenario planning and ensure there is early and continuous regional input (including from decision makers).
- Obtain approvals at critical milestones. HRTPO emphasized that obtaining Board approval at major decision points ensured their scenario planning process was robust, objective, and that key assumptions were supported.
- Budget appropriate staff time. HRTPO enlisted the Virginia DOT to help run their model once they had developed their scenarios and needed to stress-test candidate projects.

***Martin Rivarola, Assistant Director of Transportation and Land Use, Mid-America Regional Council (MARC)***

MARC is the nonprofit association of city and county governments and the MPO for the bi-state Kansas City region. In addition to spanning two states, the Kansas City region includes nine counties (eight within the MPO boundary), 119 cities, more than 2.1 million people, and 4,400 square miles.

MARC's goals with scenario planning were to raise public awareness of possible futures and the driving forces of change, set the direction for the region, inform updates to their regional vision statement, and apply a multi-disciplinary approach to inform future work in transportation, housing, environmental planning, and emergency management. Like HRTPO, MARC hoped that developing a scenario planning process would provide a framework for updates to the region's long-range Metropolitan Transportation Plan (MTP), as well as project prioritization, policy goals, and overall decision-making and actions for their region.

MARC's work on scenario planning began in the fall/winter of 2016 with a series of driving forces workshops. MARC organized driving forces into four main areas: 1) Rapidly emerging new technologies, 2) Climate change and more extreme weather events, 3) Globalization of the regional economy, and 4) Shifting demographics. Through these driving forces workshops, MARC solicited input on the potential impacts of each driving force. For example, climate change was identified as a driving force with the potential to result in population growth in Kansas City region and other non-coastal areas.

Over the next year, MARC worked to construct and analyze alternative futures, and used this information to refresh their regional vision and integrate findings into regional plan updates. Like HRTPO, MARC hosted a FHWA-FTA sponsored TPCB Scenario Planning Workshop in January 2017, which featured three peer agencies. In addition, MARC conducted significant public outreach via pop-up engagements in the community, public meetings, social media, and other forms of online engagement.

Following this public engagement and outreach, MARC drilled down into the potential impacts of each driving force to identify the most significant and most likely impacts. Results were placed on a coordinate plane to visualize impacts that were likely and significant, unlikely and significant, likely and not significant, or unlikely and not significant (see Figure 8). From this exercise a list of the top impacts from each driving force was created. Driving forces and impacts were mapped against MARC's existing plans and strategies to identify gaps and emphasis areas that did not have formal plans and needed to be formalized.

MARC's work to define driving forces and potential impacts helped inform updates to their regional vision statement, scenario development and analysis, and MTP. With scenario planning specifically, driving forces provided a useful way to engage the public on tangible issues and inform decisions that would ultimately affect regional plans and strategies. MARC used the findings to create two growth scenarios and four transportation network scenarios, which were described in more detail during the second peer panel session. The learnings from the driving forces exercises helped clarify community goals for the region, which in turn helped with project scoring and selection, and with the overall MTP process.



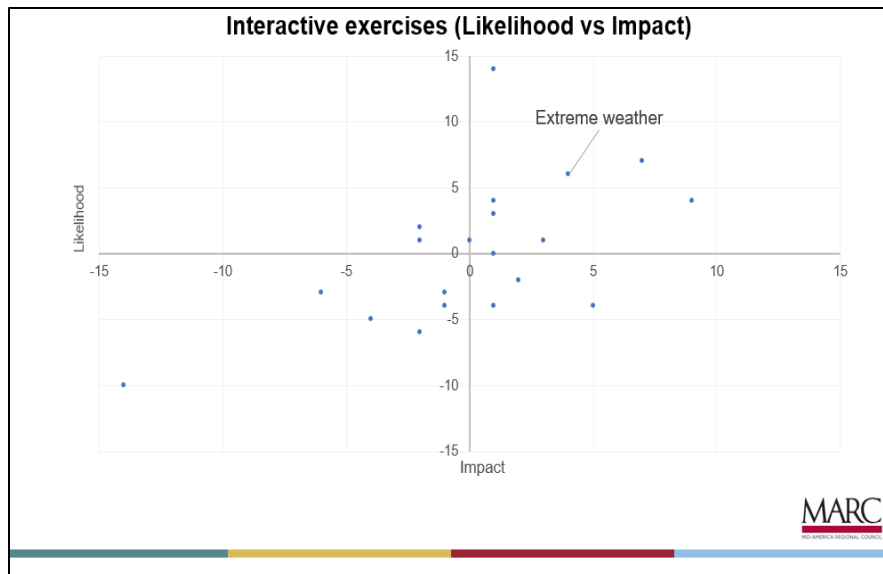


Figure 8: MARC Likely/Significant Scenario Grid (Source: MARC)

## Peer Panel 2: Assessing and Implementing Scenarios

### ***Dale Stith, Principal Transportation Planner, Hampton Roads Transportation Planning Organization (HRTPO)***

HRTPO’s second presentation focused on how they evaluated projects in each of the scenarios developed for their 2045 LRTP:

1. **Baseline Scenario** – tested “business as usual.”
2. **Greater Growth on the Water** – tested greater cross-harbor travel.
3. **Greater Growth in Urban Centers** – tested more urban and multimodal travel patterns.
4. **Greater Suburban/Greenfield Growth** – tested more overall regional travel.

HRTPO used several scenario modeling tools to evaluate candidate projects and test their resiliency. Tools used included a land use model, travel demand model, economic model, and HRTPO’s project prioritization tool.

Like PART, HRTPO also used CommunityViz as their regional land use growth allocation model. A key input in setting up the CommunityViz model was HRTPO’s regional land use dataset, which synthesizes existing and future land use data from locality comprehensive plans into a single set of regional land use categories, providing a common language for analyzing and planning. These regional land use categories were adopted as the place types in the CommunityViz model; place types are the geography used to allocate growth based on capacity and suitability factors. HRTPO’s regional land use dataset identifies place types at the parcel level, a level of detail which was too cumbersome for modeling purposes due to the significant quantity of polygons. As a result, HRTPO developed an 80-acre translational layer to simplify their geography. This translational layer was also used to associate place types with

Transportation Analysis Zones (TAZs) in the regional travel demand model, resulting in a unified base map where the socioeconomic data in each place type exactly correlated with the socioeconomic data in each TAZ – important for evaluating growth implications on the transportation system. The translational layer reduced HRTPO’s geography inputs from several hundred thousand features (parcel-based land use) to approximately 50,000 features, which made running the models easier. Quantitative summaries were calculated for each place type by sampling multiple locations across the region to determine the average population and employment for each land use (e.g., agricultural, high density residential, etc.). This sampling produced typical population and employment densities for each place type which were then calibrated to TAZ socioeconomic control totals. These quantified place types, together with the four scenario narratives HRTPO developed, were used as data inputs in HRTPO’s regional land use model which allocated growth according to three main factors:

1. **No build areas** – non-developable land. For example, water and wetlands, parks, and other protected areas, etc.
2. **Capacity mapping** – determines how much employment or population growth can be allocated to a location. Capacity is year and scenario agnostic.
3. **Suitability factors** – controls where growth will be allocated based on the most desirable/suitable factors as defined in each scenario narrative. This can be in the form of specific special features (e.g., proximity to schools) or specific place types (e.g., residential, industrial) that act as attractors/detractors to growth. Suitability is scenario specific.

Next, the outputs from HRTPO’s regional land use model were passed to their regional travel demand model. The outputs from the land use model allowed HRTPO to analyze scenario impacts on travel behavior. Specifically, how activity density and vehicle ownership impacted trips made, how the spatial allocation of activity impacted travel patterns for people and freight, and how proximity to transit facilities and the availability of connected/autonomous vehicles impacted travel mode preference. These effects were measured by vehicle miles traveled (VMT), vehicle hours traveled (VHT), trips generated (by mode and purpose), and others. Outputs from the travel demand model could then be further analyzed with HRTPO’s economic model, which calculates economic-based performance measures related to travel reliability, safety, emissions, market access, and gross regional product (note that the economic model was not completed in time for use in HRTPO’s 2045 LRTP but will be used in the 2050 LRTP).

The final step for modeling each of HRTPO’s greater growth scenarios was to assess project performance using HRTPO’s project prioritization tool. Broadly, this tool looks at project utility (ability to solve a transportation problem), economic vitality (potential for economic gain), and project viability (project readiness and compatibility). The tool places projects in one of seven categories (e.g., highway, transit, etc.). Projects are scored by category to ensure they are evaluated using appropriate measures and are aligned with suitable funding sources. Within the prioritization tool, several performance measures are scenario specific. These scenario measures were calculated for each project across each scenario and then averaged. Overall, the scenario modeling process (see Figure 9) allowed HRTPO to select the most resilient and robust projects for the 2045 LRTP by identifying those that scored well across all scenarios. Looking ahead to HRTPO’s 2050 LRTP, the agency plans to re-examine their drivers of change and trends, to factor in other considerations as part of the 2050 scenario narratives – for example, the potential for

westward migration due to lack of affordable housing and sea level rise – and to incorporate new resilience and economic modeling tools.

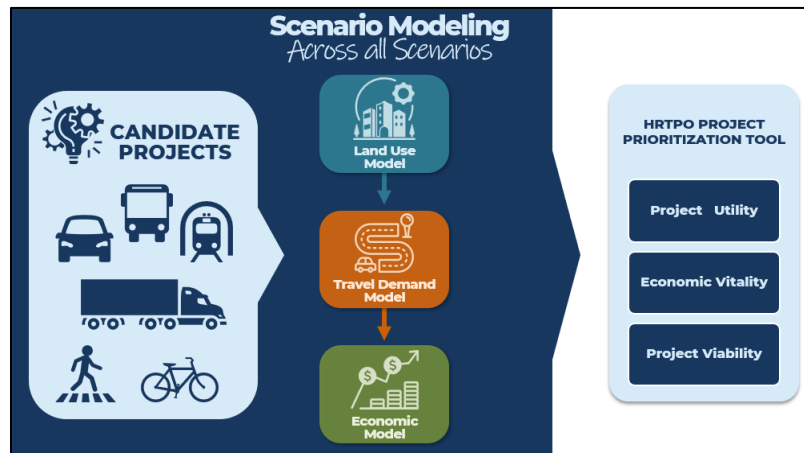


Figure 9: HRTPO Scenario Modeling Process (Source: HRTPO)

**Martin Rivarola, Assistant Director of Transportation and Land Use, Mid-America Regional Council (MARC)**

MARC’s second presentation provided an overview of their scenario modeling process and the details of modeling activities and results.

Overall, MARC’s scenario planning process lasted approximately 3.5 years and involved many steps. Scenario planning activities were divided into two key phases: 1) driving forces workshops to collect input on the most significant drivers of change and associated impacts, and 2) modeling the scenarios and using model outputs to prioritize projects and update the region’s MTP.

Feedback provided during MARC’s driving forces workshops helped to clarify regional priorities and identify gaps in existing plans. This information was used to update MARC’s policy framework and create new policy goals related to data, technology, and financial sustainability. Next, MARC simplified the alternative futures and scenario narratives that had been developed from the driving forces workshops in order to communicate these with the public. Each one of these four initial scenarios contained a dominant driving force that would lead to significant change. MARC’s scenarios included:

1. **Slow and Steady** – the region experiences slow population growth, where personal car ownership is the norm, rural communities shrink, and new development is shared between urban and suburban areas.
2. **Wild Weather** – Kansas City experiences more severe weather events which negatively impact critical infrastructure. The region also experiences significant in-migration as super storms and rising seas drive people from the coasts to solid, inland ground.
3. **Tech City** – technology advances quickly, creating rapid economic growth and unemployment due to job automation. Density decreases in the region and telecommuting is the norm.

4. **Rising Phoenix** – rising energy prices lead to a depressed economy, population growth stagnates, and labor shortages lead to rising wages.

MARC adjusted its scenario narratives to develop scenarios that could be more easily measured, appropriately modeled, and communicated to the public. MARC developed two land use growth scenarios – “Let it Ride” and “Take the Wheel” – which modeled population and employment growth based on current trends (Let it Ride) and greater growth in focused areas (Take the Wheel). MARC used several tools to model these scenarios and demonstrate the way in which present choices could affect future goals, as well as how these choices would affect the transportation system. Specifically, MARC used a combination of economic, land use, travel demand, and environmental modeling tools to project impacts related to land consumption, infrastructure costs, VMT, VHT, transit and active transportation, connected and autonomous vehicles, and greenhouse gas emissions. The outputs from the land use model were measured against four transportation network scenarios including:

1. **Freeze frame** – no further investments in the transportation system beyond what is in MARC’s 2018-2022 Transportation Improvement Program (TIP).
2. **If you build it...** – invests in all projects in MARC’s 2040 Transportation Outlook Plan.
3. **Hop on the bus, Gus** – no further investments in the transportation system beyond what is in the 2018-2022 TIP for the roadway system, but with expanded investment in transit services.
4. **Money DOES grow on trees** – focuses on maximizing roadway capacity by implementing additional projects beyond the 2040 Transportation Outlook Plan.



*Image 1: Martin Rivarola from MARC presenting at the Scenario Planning Peer Exchange (Source: MARC)*

Land use and transportation network modeling produced several interesting results. For example, each land use growth scenario had a significant impact on travel demand. MARC’s focused growth scenario (Take the Wheel) projected better transit service, and produced mode shift from automobiles, as well as significant savings (\$9 billion) in infrastructure costs. However, the modeling results did not show

considerable changes to highway-related measures. MARC decided to stress-test these results by modeling the impact of autonomous and connected vehicles to see if that would create greater impacts on VMT, VHT, and automobile trips. Modeling showed that a fleet-based ownership model for autonomous vehicle technology had more desirable impacts to the region. Combined with more compact land use patterns, modeling fleet-based autonomous vehicles showed a drop in VMT, VHT, and automobile trips, and a large increase in transit trips in the region. MARC also modeled a greenhouse gas emissions scenario to quantify emissions across the land use and transportation network model outputs. This modeling showed that an approach which combines land use strategies with a heavy focus on transit services and fleet vehicle electrification leads to the greatest reduction in greenhouse gas emissions over time.

Ultimately, MARC found that its focused growth scenario (Take the Wheel) was the best way to meet the goals and vision for the region. Electric vehicle adoption and pricing strategies, combined with focused growth and multimodal – primarily transit – investments would help the region make significant reductions in greenhouse gas emissions. The results from these exercises were used to inform project scoring in MARC’s MTP update. The projects submitted were assembled into scenarios and run through the agency’s economic, land use, travel demand, and environmental modeling tools to evaluate relevant metrics and were then prioritized on a scale of High, Medium, or Low in the MTP.

## Virtual Presentation: Introducing a New Transportation Planning Paradigm

Todd Litman is the Founder and Executive Director of VTPI. Mr. Litman joined the peer exchange virtually from British Columbia, Canada. The summary below provides highlights of the themes discussed during his presentation on “Introducing a New Transportation Planning Paradigm.”

The new transportation planning paradigm outlines a shift from mobility-based to accessibility-based planning. Whereas mobility-based planning emphasizes travel by automobiles, assumes automobile travel is preferred over other modes, and aims to maximize travel speed and distance, accessibility-based planning emphasizes travel by multiple modes, recognizes the unique and important roles of non-auto modes, and aims to maximize people’s ability to reach services and activities. Recent changes in travel demands have prompted the shift from mobility-based to accessibility-based planning. Although increases in automobile travel continued to grow over the past 100 years, between 2000 to 2005 automobile travel began to level off. Most experts agree that the peaking of automobile travel will continue in the future and will likely begin to decrease owing to changing demographic and economic factors (e.g., aging population, changing consumer preferences) and new technologies and modes.

Other important conceptual differences between mobility and accessibility include:

- **Mobility** – favors fast modes and longer trips, ignores land use impacts, supports highway expansion and sprawl. Supports goals related to increasing traffic speeds, reducing congestion delays, increasing parking convenience, and reducing traffic accident rates.
- **Accessibility** – favors multi-modalism, recognizes the roles of non-motorized and public transport, recognizes land use impacts on accessibility, and supports comprehensive, integrated planning and smart growth development. Supports goals related to increasing affordability,

improving economic opportunities, creating more attractive and vibrant streets, increasing public safety, fitness, and health, and protecting local environments.

The benefits of valuing accessibility-based planning were discussed. These include improved travel options; more opportunities for non-automobile travel, resulting in improved public health and local economic activity; reduced automobile travel which can lead to reduced traffic and parking congestion, consumer savings, safety improvements and energy conservation; and more compact communities, leading to improved accessibility, especially for non-drivers.

Transportation equity analysis was another important concept discussed, which was categorized into five main areas:

- **Fair Share** – each person receives a fair share of public resources, measured by the per capita share of transportation resources.
- **External Costs** – travelers minimize and compensate for external costs, measured by infrastructure costs, congestion, crash risk and pollution that travelers impose on others.
- **Inclusivity** – transportation systems provide basic mobility for disadvantaged groups, measured by the quality of travel for people with disabilities and other groups.
- **Affordability** – lower-income households can afford basic mobility, measured by transportation costs relative to income and the quality of affordable modes.
- **Social Justice** – policies address structural inequities, measured by whether organizations address inequities such as racism and classism.

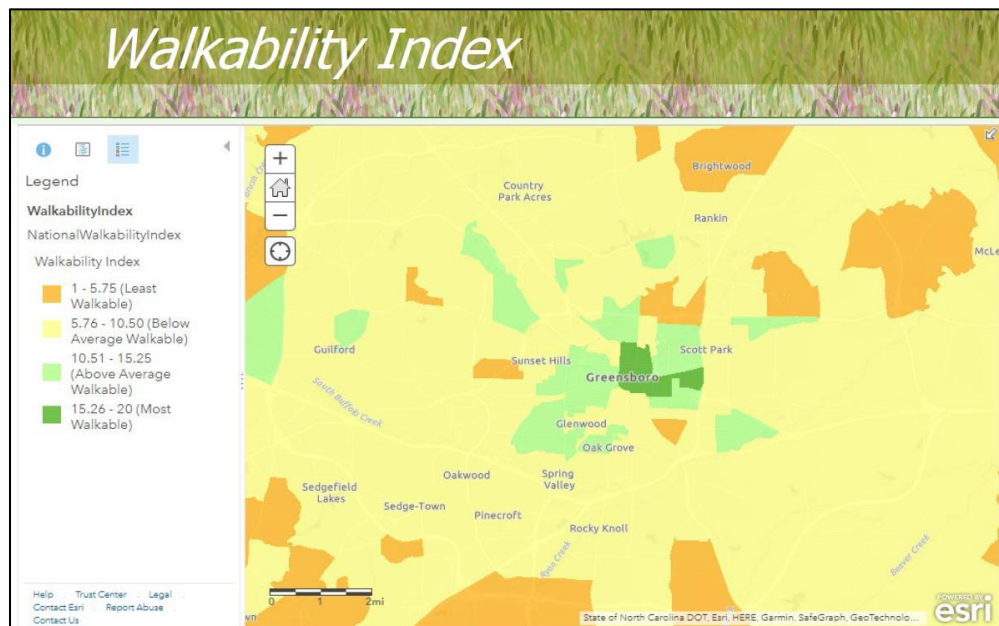


Figure 11: Walkability Index for Greensboro, North Carolina. Source: Todd Litman

Finally, Mr. Litman presented several planning tools that can be used to help visualize the benefits of a multimodal, equitable, mobility-based transportation system. Specifically, in the Greensboro area, the H&T Affordability Index was used to demonstrate the larger total annual driving costs for communities living outside of the more compact, and walkable areas of central Greensboro, and the Walkability Index

was used to illustrate the range of walkability scores for Greensboro and the outlying areas (see Figure 11).

## **Breakout Group Discussions**

Day One of the peer exchange concluded with breakout group discussions to reflect on the information and concepts presented by the day's speakers – Jeremy Raw (FHWA), Mark Kirstner (PART), Dale Stith (HRTPO), Martin Rivarola (MARC), and Todd Litman (VTPI). Participants were assigned into one of five breakout groups facilitated by a member of the peer exchange planning team.

Breakout groups were asked to discuss the following questions:

1. Identify three takeaways from the peer presentations that resonate with your respective group.
2. Is there a “driver” of change in your community that has not been mentioned today? What does the future look like when an individual “driver” of change is dominant?

The summary below provides highlights of the themes discussed in breakout groups:

### **Participant takeaways from peer presentations**

- Documentation is essential to be able to recreate the scenario planning process in the future. It can also support communication efforts with the public and elected officials.
- Participants felt that significant staff resources and time would be needed for scenario planning, and in particular adequate computing power to perform the modeling discussed.
- Scenario planning could be used to help create or update regional vision statements; developing scenario narratives could be especially helpful for this work.
- The importance of engaging with stakeholders, including community members and elected officials, was a key theme. In general, participants were concerned about finding ways to communicate scenarios and the scenario planning process with the public, as well as tailoring messages to address rural concerns.
- Participants expressed concern about conducting scenario planning for an entire region and hoped to find ways to ensure the goals of individual jurisdictions were adequately incorporated.
- Participants wondered whether changes in TAZ geography might complicate the scenario planning process. Participants also discussed the differences in approaches between PART, HRTPO and MARC, and whether an exploratory approach would be better suited to some contexts compared to predictive or normative approaches.
- Some participants expressed concerns with figuring out how to prioritize scenarios and select the right number of scenarios, as well as which data sources to use. Participants also wanted to ensure scenarios were distinct.

### **Important drivers of change**

- Several drivers of change were discussed as being important to communities in the Piedmont Triad. These included: land use changes, including increased residential and industrial development in the region; development encroaching into rural areas; activity centers; technological changes and innovations; affordable housing and general housing needs; catastrophic unplanned events; microtransit and the future of transit services; the political

landscape; the uncertainty of continued funding for climate adaptation materials and infrastructure; and equity, including changes to population demographics and diversity.



*Image 2: Piedmont Triad Scenario Planning Peer Exchange Day One Group*

## Roundtable Discussions

Day Two of the peer exchange included two roundtable discussions. Discussion topics included: 1) Next Steps for Advancing Scenario Planning at Your Agency, and 2) Engaging Stakeholders and Long-Term Considerations for Scenario Planning. Participants in the Day Two discussions included PART and MPO staff, local partners, peer presenters, and FHWA and U.S. DOT Volpe Center staff. Key themes from the discussions are provided below.

- **Staff resources.** Participants discussed the need for more staff resources to conduct scenario planning. There were concerns about introducing scenario planning and the technical skills and extra resources that would be required. Peer agencies suggested exploring partnerships with local universities and State DOTs who may be able to provide modeling and other technical expertise.
- **Stakeholder engagement and outreach.** Driving forces workshops, public meetings, speaking engagements, and obtaining internal approvals require considerable time and effort and participants were encouraged to allow plenty of time for these activities. HRTPO scheduled regular check-in points with their Board and decision makers during their scenario planning process. From the outset, MARC engaged with the public and key stakeholders to identify driving forces. HRTPO did not share the technical specifics of their scenario modeling with the public so as not to overwhelm them with detail; these details were shared with technical stakeholders only. HRTPO and MARC emphasized that scenario planning can provide a structured framework for conducting conversations with partner agencies in addition to the public and non-governmental stakeholders.
- **How to simplify scenario planning.** Scenario planning offers a way to systematize determining “when, where, and how” development will happen. It can be done simply, without complex modeling and project prioritization tools. HRTPO chose to take a data-driven approach to their



scenario planning, but there are many other approaches to scenario planning. Modeling tools are helpful because they allocate growth more consistently. Peers suggested using question prompts to initiate conversations internally on scenario planning: *What are you worried about? What are you taking into consideration for your long-range transportation plans? What are you thinking about for future growth? What development is in the pipeline, and in which TAZs? Are you using tools, and if so, which ones?* Questions can also be presented without the label of “scenario planning.”

- **Drivers of change.** Developing drivers of change was seen as a helpful way to initiate conversations internally around scenario planning. Participants felt that a “no-build” scenario could be a starting point to understand how congestion and certain conditions might worsen if agencies could not secure financing and were not able to accommodate new growth in their region.
- **Data.** There was interest in how peers approached socio-economic data inputs for each scenario and their familiarity with modeling tools prior to initiating scenario planning. Both peers used the same population and employment control totals across each scenario, with the HRTPO adding additional growth above the approved control totals in their greater growth scenarios. HRTPO was not familiar with CommunityViz when their scenario planning process began and reiterated the importance of documentation to remember how to use modeling tools and replicate the process in future. MARC hoped to test different control totals across multiple scenarios for their next MTP update. Parcel tagging was also discussed, which, despite its significant time commitment, helped to increase the consistency of model outputs.

## Next Steps

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Following the peer exchange, participants were asked to complete an evaluation form intended to gather participant views on the overall quality of the event, the most valuable aspects of the peer exchange, important takeaways and usefulness of information learned, and suggestions for future improvements to the TPCB program. Participant feedback indicated that peer presentations were the most valuable aspect of the peer exchange, followed by the overview provided on scenario planning and the breakout group discussions. Important takeaways highlighted by participants included: peers' use of exploratory scenario planning and ideas for public engagement (e.g., developing scenario narratives, creating StoryMaps, etc.).

For next steps, PART and MPO staff plan to apply scenario planning approaches to develop land use forecasts and identify priority projects as part of long-range transportation plans and updates. PART staff continue to engage with peer agencies on the topic of scenario planning.

# Appendices

## A. Event Participants

First Name	Last Name	Agency	Day One	Day Two
Andy	Bailey	North Carolina DOT	X	
Loretta	Barren	FHWA North Carolina Division	X	X
Oliver	Bass	Guilford County	X	
Liz	Biskar	U.S. DOT Volpe Center	X	X
Sheila	Carmon	City of Greensboro	X	X
Soon	Chung	North Carolina DOT	X	
Dana	Clukey	Greensboro DOT	X	
Hanna	Cockburn	City of Greensboro	X	
Matt	Day	Triangle J Council of Governments	X	
Caroline	Drake	Town of Clemmons	X	
Andrew	Edmonds	High Point MPO	X	X
Kevin	Edwards	City of High Point	X	
Jeff	Fansler	Winston-Salem MPO	X	
Alexius	Farris	North Carolina DOT	X	
Kaylen	Francis	City of High Point	X	
Joe	Geigle	FHWA North Carolina Division	X	X
John	Hanes	High Point MPO	X	X
George	Hoops	FHWA North Carolina Division	X	X
John	Kim	PART	X	X
Tae-Gyu	Kim	North Carolina DOT	X	
Mark	Kirstner	PART	X	X
Kyle	Laird	PART	X	X
Todd	Litman	Victoria Transport Policy Institute	X	
Wannetta	Mallette	Burlington-Graham MPO	X	X
Tim	Mangum	Randolph County	X	X
Lydia	McIntyre	Greensboro Urban Area MPO	X	

Suzette	Morales	FHWA North Carolina Division	X	X
Reaghan	Murphy	Centralina Regional Council	X	
Michele	Nance	Centralina Regional Council	X	
Kim	Nguyen	North Carolina DOT	X	
Andy	Piper	City of High Point	X	X
Jeremy	Raw	FHWA Office of Planning	X	X
Martin	Rivarola	Mid-America Regional Council	X	X
Alex	Rotenberry	North Carolina DOT	X	
Francis	Ryu	PART	X	X
Jeff	Sovich	City of Greensboro	X	
Hunter	Staszak	Winston-Salem MPO	X	
Dale	Stith	Hampton Roads TPO	X	X
Frankie	Tran	Burlington-Graham MPO	X	
Tram	Truong	City of Greensboro	X	
Christian	Walters	PART	X	X
Yuan	Zhou	City of Greensboro	X	X

## B. Peer Exchange Agendas

### **Piedmont Authority for Regional Transportation (PART) Scenario Planning Peer Exchange**

Sponsored by the Federal Highway Administration (FHWA)

**Wednesday, May 3, 2023**

**PART Administrative Office  
107 Arrow Road  
Greensboro, NC 27409**

*Overview: This peer exchange, hosted by PART, introduces the concept of scenario planning to build awareness and encourage information-sharing among PART, its MPOs, and two peer agencies. The event will provide an opportunity to share information on the Piedmont Triad's current scenario planning efforts. Peer experts Dale Stith, Principal Transportation Planner from the Hampton Roads Transportation Planning Organization (HRTPO), and Martin Rivarola, Assistant Director of Transportation and Land Use at the Mid-America Regional Council (MARC), will provide presentations on their agencies' scenario planning activities and perspectives on using scenario planning in the transportation planning process. The peer exchange will feature an additional, virtual live presentation from Todd Litman, Founder and Executive Director of the Victoria Transport Policy Institute (VTPI).*

<b>Time</b>	<b>Session</b>	<b>Speaker(s)</b>
8:30 – 9:00 AM	<b>Registration and Check-in</b>	
9:00 – 9:30 AM	<b>Welcome and Introductions</b>	<ul style="list-style-type: none"> <li>• <b>Jeremy Raw</b> FHWA Office of Planning</li> <li>• <b>Mark Kirstner</b> PART</li> <li>• <b>George Hoops</b> FHWA North Carolina Division</li> <li>• <b>Liz Biskar</b> U.S. DOT Volpe Center</li> </ul>
9:30 – 9:50 AM	<b>Getting Started: An Overview of Scenario Planning</b>	<ul style="list-style-type: none"> <li>• <b>Jeremy Raw</b> FHWA Office of Planning</li> </ul>
9:50 – 10:45 AM	<b>Scenario Planning in the Piedmont Triad: Setting the Course - Past, Present, and Future</b>	<ul style="list-style-type: none"> <li>• <b>Mark Kirstner</b> PART</li> </ul>
10:45 – 11:00 AM	<b>Break</b>	
11:00 AM –	<b>Peer Presentation 1:</b>	<ul style="list-style-type: none"> <li>• <b>Dale Stith</b></li> </ul>

12:00 PM	<b><i>Using Scenario Planning to Prepare for Uncertainty</i></b>	Hampton Roads Transportation Planning Organization (HRTPO)  • <b>Martin Rivarola</b> Mid-America Regional Council (MARC)
12:00 – 1:15 PM	<b>Lunch</b>	
1:15 – 2:15 PM	<b>Peer Presentation 2:</b> <b><i>Assessing and Implementing Scenarios</i></b>	• <b>Dale Stith</b> Hampton Roads Transportation Planning Organization (HRTPO)  • <b>Martin Rivarola</b> Mid-America Regional Council (MARC)
2:15 – 2:30 PM	<b>Break</b>	
2:30 – 3:15 PM	<b>Virtual Presentation and Q&amp;A:</b> <b><i>Introducing a New Transportation Planning Paradigm</i></b>	• <b>Todd Litman</b> Victoria Transport Policy Institute
3:15 – 4:15 PM	<b>Breakout Group Discussion and Report-Out</b>	Facilitators, Peer Exchange Participants
4:15 – 4:30PM	<b>Recap of Day / Next Steps</b>	

**Piedmont Authority for Regional Transportation (PART)**  
**Scenario Planning Peer Exchange**  
 Sponsored by the Federal Highway Administration (FHWA)  
**May 4, 2023**

**PART Administrative Office**  
**107 Arrow Road**  
**Greensboro, NC 27409**

*Overview: This scenario planning peer exchange, hosted by PART, introduces the concept of scenario planning to build awareness and encourage information-sharing among PART, its MPOs, and two peer agencies. Day 2 of the peer exchange will allow participants to come together, ask questions, and discuss opportunities to translate learning into practice.*

**Day 2 (Thursday, May 4, 2023)**

<b>Time (EDT)</b>	<b>Session</b>	<b>Speaker(s)</b>
9:00 – 9:15 AM	<b>Welcome and Goals of Day 2</b>	<b>Jeremy Raw</b> FHWA Office of Planning
9:15 – 10:15 AM	<b>Discussion Topic 1: Next Steps for Advancing Scenario Planning at Your Agency</b> <ul style="list-style-type: none"> <li>• How to prioritize individual factors in scenario plan development               <ul style="list-style-type: none"> <li>○ Organizing individual “drivers” into scenario narratives</li> </ul> </li> <li>• How to evaluate scenarios to achieve your intended outcomes</li> <li>• How to build environmental considerations and equity into scenario planning</li> </ul>	<b>Group Participation</b>
10:15 – 10:30 AM	<b>Break</b>	
10:30 – 11:30 AM	<b>Discussion Topic 2: Engaging Stakeholders and Long-Term Considerations for Scenario Planning</b> <ul style="list-style-type: none"> <li>• The benefits of engaging the public with scenario plan development</li> <li>• How to manage core scenario planning staff turnover</li> <li>• How to institutionalize scenario planning at your organization</li> </ul>	<b>Group Participation</b>
11:30 AM – 12:00 PM	<b>Wrap-up</b>	

## C. Additional Resources

- FHWA-FTA TPCB Website: [https://www.planning.dot.gov/peer\\_program.aspx](https://www.planning.dot.gov/peer_program.aspx)
- FHWA Scenario Planning Publications and Resources:  
[https://www.fhwa.dot.gov/planning/scenario\\_and\\_visualization/scenario\\_planning/publications/](https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/publications/)
- MARC's Regional Transportation Plan: <https://connectedkc.org/>
- HRTPO's 2045 Long-Range Transportation Plan Scenario Planning Website:  
[https://www.hrtpo.org/page/2045-long\\_range-transportation-plan:-scenario-planning/](https://www.hrtpo.org/page/2045-long_range-transportation-plan:-scenario-planning/)