

NEXT GENERATION SCENARIO PLANNING: A TRANSPORTATION PRACTITIONER'S GUIDE



U.S. Department
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16. Abstract This report profiles the next generation of scenario planning for transportation practitioners. It provides a summary of the history, key benefits and driving issues that warrant a scenario-based approach. It includes a framework for scoping a scenario planning process tailored to specific issues and local agency capacity. It also illustrates the different considerations associated with conducting a scenario planning process based on variable future orientations: what is likely to happen (probable), what we want to happen (desirable) and what could happen (uncertain). Finally, it walks through the six-phase scenario planning process and highlights key considerations practitioners should consider when developing and implementing a scenario-based process. The report also includes profiles of recent scenario planning efforts from across the United States.					
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NEXT GENERATION SCENARIO PLANNING:

A TRANSPORTATION PRACTITIONER'S GUIDE

PURPOSE:

In 2011, the Federal Highway Administration (FHWA) developed the “Scenario Planning Guidebook,” detailing a method to conduct a basic scenario planning process. This document attempts to build on that foundational work and define the “next generation” of scenario planning to support improved transportation planning and decisionmaking. “Next Generation Scenario Planning: A Transportation Practitioner’s Guide” highlights the history and benefits of scenario planning, making the case for its increased use and application in light of several driving issues challenging communities today. It emphasizes the importance of scoping and scaling the planning process to align with specific community or organizational needs. It also demonstrates how the set of future orientations (what is likely to happen, what we want to happen, and what could happen) affect how a practitioner might work through the six-phase scenario planning process. Finally, it profiles recent examples of scenario planning in action.

GOALS:

- The primary goals of “Next Generation Scenario Planning” include:
- Describing the evolution of scenario planning and the characteristics of the next generation of scenario planning in response to emerging issues.
- Identifying the planning elements important in developing a scenario planning workplan.
- Providing a framework for scoping a scenario-based planning process based on the questions a community is trying to answer, driving issues and goals related to decisionmaking and information sharing.
- Providing example applications of scenario planning that address emerging issues and support the creation of scenario-based plans and implementation strategies.

AUDIENCE:

Metropolitan Planning Organizations (MPOs), State and local Departments of Transportation (DOTs), transit agencies, local governments.

This document can be used by transportation practitioners seeking to understand how scenario planning can be incorporated into existing transportation planning processes, and how best to design and apply a scenario planning process tailored to their planning goals or challenges. It serves as a resource geared towards agencies and practitioners, including those with limited resources, providing a scoping framework to help transportation planning practitioners and agencies design the right type of scenario planning process to overcome common challenges, address emerging issues, and further build support for transportation plan implementation.

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CHAPTER

WHAT IS SCENARIO
PLANNING?

1



INTRODUCTION

Communities constantly evolve in response to social, political, economic, technological, and environmental forces. Effectively planning for this change requires the cultivation of a participatory and informed decision-making process that regularly considers what is *likely* to happen, what *could* happen and what the community *wants* to happen in the future. Scenario planning provides a way to consider the issues and opportunities of different futures and plan accordingly.

Scenario planning is distinct from traditional long range planning, which often focuses only on what is likely to happen, leaving little room to consider “What if?” or to re-examine what people want to happen. As of 2017, the United States is experiencing noticeable shifts away from past trends and new levels of uncertainty based on rapid advancements in technology, changing climate conditions, evolving market preferences, major economic restructuring, and other transformational forces. These dynamics present compelling reasons for the use of scenario planning as a framework to better address long range planning.

Using a scenario-based planning approach in community planning has three primary goals: 1) informing community members and decision-makers on what the future could look like based on the need to address emerging trends, impacts of external forces, concerns about future uncertainties, and/or changing community values and preferences; 2) prompting creative thinking and shared problem-solving to identify different strategies needed to plan for a desired or more resilient future; and 3) helping to build consensus for a decision or plan adoption based on shared knowledge exchange, tradeoff discussions, and consideration of multiple “What if” futures (Figure 1.1).



FIGURE 1: GOALS OF SCENARIO PLANNING¹



¹ Adapted from Van Notten, P.W.F., et al. (2003). "An Updated Scenario Typology." *Futures* 35(5), p. 423–443.



SCENARIO PLANNING
CAN ADDRESS A
RANGE OF ISSUES AND
VARY IN SCOPE AND
SCALE

Practitioners new to scenario planning may wonder, “What are scenarios?” Scenarios are hypothetical but plausible stories about the future. Scenarios are not forecasts, or alternatives—though both may be used as the basis for developing scenarios.

Scenarios can include narrative descriptions, visualizations (photographs, renderings, mapping, etc.), and data summaries to help people imagine a future that is different from today—whether that is a desirable or undesirable future.

Scenarios developed to support public policymaking concerning infrastructure investments often focus on a targeted geographic area and include spatially-based physical characteristics that can be visualized and analyzed against a set of community goals or key indicators. This could include scenarios that assume different ideas about how growth and development character might take shape over time; how the use of different modes of transportation or deployment of automated and connected vehicles might influence travel behavior or travel demand; or how changing climate conditions could affect existing infrastructure.

Scenarios can also address issues that may not be as easy to represent spatially but are influenced by (or can influence) place-based planning and policymaking. This includes scenarios that illustrate how different policies or transportation investments relate to desired public health outcomes, housing affordability, or economic development goals. Scenarios can also be crafted to support creative thinking relative to the availability of funding or revenue streams. Regardless of the components, a good scenario is descriptively vivid enough to paint a clear picture of the future and provide enough detail to foster comparative insights on issues and opportunities relative to how that scenario supports or threatens community or institutional goals. These insights can provide critical information on the need for policy or plan changes.

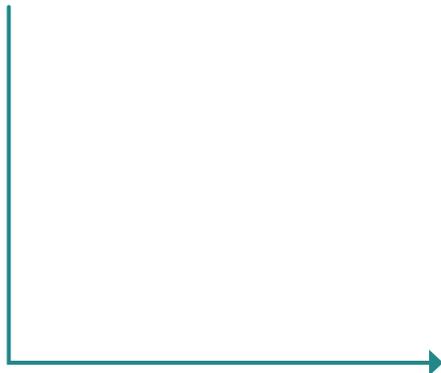
There isn't a one-size-fits-all approach to scenario planning. It is a scalable process that can be used for different planning purposes and at different times in the planning process. It can be used in a purely informational or exploratory way to create a better understanding of emerging issues; or it can facilitate tradeoff discussions and build consensus for a decision regarding changes to policies or investment priorities. The level of resources required to conduct a scenario-based planning process can range from high—which might include a robust process of public engagement, heavy use of geographic information systems (GIS), and data-rich visualization or quantitative decision support tools—to low, which may involve a small working group and qualitative information gathered from existing research to hypothesize future conditions and facilitate comparative analysis discussions. While the scale and level of effort may vary, there are some common building blocks to deploying an effective scenario planning process:

- The scenarios crafted *represent a plausible future* condition that can evolve naturally, can result from unanticipated or uncontrollable events, or can develop through purposeful changes in the current course of action.
- Scenarios *act as a proxy for an unknown or desirable future*—the scenarios themselves do not represent a plan of action. They are stories that allow for the evaluation of how different futures can support or detract from community or organizational goals. They can be used to identify needed changes in specific policies, plan details, or other actions—or they can identify a need for more careful monitoring of key issues or emerging trends to ensure plans remain resilient and relevant to changing conditions.
- *Scenarios raise awareness and engage diverse stakeholders* in creative thinking about how to create policies, plans and strategies to achieve desired community or institutional goals.



TABLE 1: FUTURE ORIENTATION OF SCENARIOS

FUTURE ORIENTATION	PROBABLE FUTURES	DESIRED OR UNCERTAIN FUTURES	
PROMPTED BY QUESTIONS SUCH AS...	What is most likely to happen?	What is the future we want?	What might the future look like?
SCENARIOS ARE CONSTRUCTED BY...	Identifying likely or predictable trends and projecting them into the future. Trends could reflect conditions that may or may not be within the community's control.	Identifying future conditions or end states that reflect desires or goals based on things the community can control.	Identifying future conditions that reflect a different end state resulting from transformational changes, emerging issues, or potential threats that may or may not be within the community's control



COMMUNITY ISSUES AND SCENARIO DEVELOPMENT

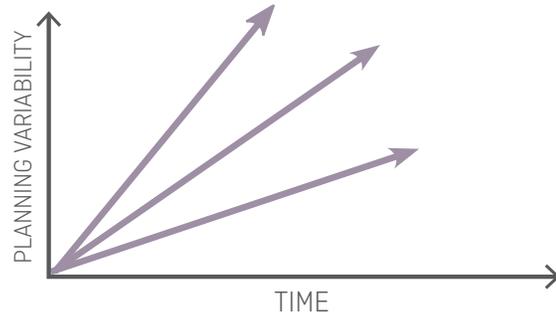
Scenario planning is best applied when there is a need or interest in revisiting assumptions about the current policy direction, uncertainty about future conditions, or recognition of previously unaccounted changing or emerging trends. For instance, a region might use scenarios to explore how different transportation investments could help economically reposition the area to attract desired industries. Another community might conduct scenario planning to identify specific mitigation or adaptation strategies in response to changing climate conditions. Yet another example could be the use of scenario planning to identify a new vision for community growth that reflects changing preferences for where and how people want to live and travel within their communities.

The development of scenarios can be driven by different future orientations. Scenarios can reflect *probable or likely future conditions* based on past or emerging trends; they can also represent *desirable future conditions* that reflect community aspirations; or they could include hypotheses about *uncertain futures* that may have transformational impacts on the community over time.

TRENDS ANALYSIS VS. SCENARIO PLANNING

Trends analysis:

extrapolating from the past to the future



Scenario planning:

creating possible futures and assembling options

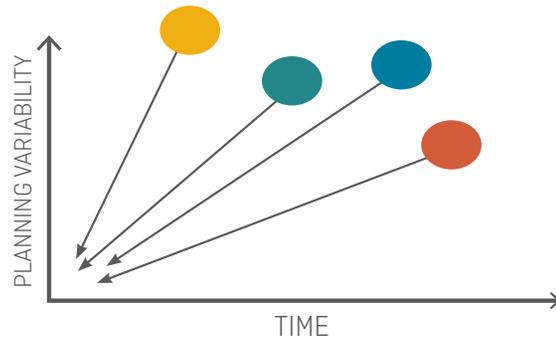


Figure based on graphic at Acumen.sg. (2015). "How to Scenario Plan for Projects." <http://acumen.sg/scenario-planning-for-projects>

The one thing all scenario planning efforts have in common is that they shift the focus from predicting the future to preparing for, and realizing ways to achieve a desired future. This makes scenario planning a powerful tool for transportation agencies as they plan a system to meet needs decades into the future, in concert with other policy partners in land use, housing, and more. Through scenario planning, these stakeholders explore various forces affecting their communities (e.g., health, transportation, economics, environment, land use), and related tradeoffs between potential solutions; their values and feedback are reflected in a common plan for moving forward.²

² FHWA. "What is Scenario Planning?" http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning

USE OF SCENARIO PLANNING IN LONG RANGE TRANSPORTATION PLANNING

Long range transportation planning is a participatory public process that seeks to identify specific policies, plans, and projects to address future travel needs. For many years, the typical approach to long range transportation planning entailed the identification of a single, 20–30-year forecast for jobs and housing growth to estimate future travel demand. Practitioners would use tools like travel demand models to estimate likely traffic volume increases on existing roadways and potential increases in transit ridership. With an emphasis on reducing or holding congestion steady, the model results helped to identify specific long-term transportation project needs to manage congestion, often leading to long lists of capacity-enhancing improvements.

Scenario planning was first introduced to long range transportation planning in the mid-1990s. It prompted a change in the traditional approach by allowing for the examination of multiple future forecasts. Instead of only asking “Where do the forecasts suggest we are headed?”, scenario planning enabled questions like, “Where do we want to go, and what options do we have to get there?” Many early scenario-planning efforts sought to demonstrate how different patterns of land development could influence travel

demand, travel behavior, and transportation choices, and vice versa. These scenarios often relied on the creation of placetype-based assumptions with details on the density, diversity and design characteristics of development. Questions such as “How and where do we want to grow as a community?” served as the driving forces for scenario development.

Early scenario planning efforts often addressed concerns about rising vehicle miles traveled (VMT) and associated greenhouse gas (GHG) emissions, anti-sprawl and pro-smart growth debates, and the realization of limits to building our way out of congestion. Many of these efforts helped raise awareness about the interrelated nature of land use and transportation and, in several cases, resulted in more coordinated efforts to change both land use and transportation policies to help implement aspirational or more desirable futures.

A study by Bartholomew, Ewing and Meakins published in 2010 by the Federal Highway Administration (FHWA) looked at more than 28 scenario planning projects completed across the United States from 2003 to 2010. From this analysis, the authors surmised that “a shift to compact development—increasing average regional density by 50 percent by 2050, emphasizing infill, mixing land uses, and increasing the price of automobile use—could result



SCENARIO PLANNING
CAN SUPPORT THE
IDENTIFICATION OF
MORE COMPREHENSIVE
SOLUTIONS TO GROWTH
& TRANSPORTATION
CHALLENGES

3 Bartholomew, K., Ewing, R., and Meakins, G. (2010). “Integrated Transportation Scenario Planning,” FHWA-HEP-10-034. Metropolitan Research Center at University of Utah, Salt Lake City, UT.

in 25 percent fewer VMT compared to amounts projected under trend conditions.” While transportation agencies have little authority over land use decisions, the convening power and technical capacity of metropolitan planning organizations (MPOs) and other transportation agencies combined creates a powerful voice in helping to inform comprehensive regional planning. This practice helps to bring integrated land use and transportation planning into more common practice by demonstrating how both land use (travel demand) and transportation choices (travel supply) can be optimized to achieve a range of desired regional goals concerning quality of life, economic development, or environmental outcomes.

Another application of scenario planning in transportation has been its use in helping to identify community values and potential value conflicts. The use of a single future or single predictive forecast inherently assumes that current trends are desirable and that no competing values or conflicts exist. By posing the question, “Where do we want to go?”, scenarios open the door for differing viewpoints and goals to emerge. These different values can be translated into measures of effectiveness or indicators that reflect those values, and can be used to evaluate how well different scenarios perform against those indicators. For example, if equitable access to opportunity is an important emerging community value, a measure of effectiveness for scenario

evaluation could be to quantify how each scenario improves access by different modes of transportation in areas where there are underserved, distressed, or otherwise disadvantaged populations. The iterative process of seeing how different futures perform against a range of community values can help facilitate effective tradeoff discussions and ultimately help build broader consensus for a preferred direction.

More recent applications of scenario planning in transportation reflect the concern, “Where could we end up if X happens?” Specific issues like rising fuel costs, impacts of climate change, catastrophic events, economic downturns, global shifts in trade patterns and technological advances are creating uncertainty and raising questions like, “Are our current plans and investment priorities still valid in light of major forces that may be out of our control?” or “Are near-term changes in how people work, preferences for urban living, deployment of connected and autonomous vehicle technology and the changing economic landscape going to fundamentally change travel behavior and travel demand?” Scenario planning processes oriented around these types of questions can often result in increased awareness about future threats or uncertainty, prompt important stakeholder engagement and research, and facilitate valuable discussions about how to create more resilient transportation plans in the face of uncertainty.

PLAUSIBLE SCENARIOS TO PROMPT “WHAT IF” THINKING EXAMPLES FROM FORESIGHT 750



The National Cooperative Highway Research Program’s (NCHRP) Foresight 750⁴ series includes six publications that provide information on how different events and emerging trends could influence transportation in the next half-century. One element of the work includes the identification of four plausible future scenarios that can be used by transportation agencies to craft exploratory scenarios at the local level. Given the uncertainty of these scenarios, the report also includes the identification of signposts or key indicators that can help agencies determine which of these future paths is becoming most likely, as conditions and trends change over time.

SCENARIOS:

Momentum: Sociodemographic shifts reflect current trends; slow population growth; robust world trade; changing technology makes travel safer and more fuel efficient; urban mega regions continue to grow along with lower density suburbs. *Transportation Implications:* Modest travel growth, continued concern with auto safety and travel reliability; less reliable Federal funding and subsequent increase in State and local power in transportation decisionmaking.

Global Chaos: Significant financial instability and recession in the United States; increased weather events such as storms, floods, and droughts; shortened lifespans and

falling population; global destabilization leads to shortages of jobs and oil. *Transportation Implications:* Rising fuel prices, decreased infrastructure investment; deteriorating transportation systems; slowing travel; shrinking congestion; transportation revenue sources grow unreliable.

Tech Triumph: Fundamental shifts in technology such as autonomous cars and advanced wireless communications lead to significant changes in travel patterns and booming economic growth; rapid population growth and significantly longer lifespans; diffusion of economic activity as people are no longer physically tied to their jobs; lower density development dominates. *Transportation Implications:* Dramatically improved safety; travel is less degrading to the environment; new technology such as self-driving vehicles is increasing the need for new transportation infrastructure.

Gentle Footprint: Low-impact lifestyle choices dominate; greater regulation results in significant social and economic control; people are guided by a desire to live more sustainably; carbon taxes lead to reduced energy consumption. *Transportation Implications:* Multimodal transportation networks are expanded; reduced focus on increasing highway capacity; land use planning guides transportation investments.

4 NCHRP (2012). “NCHRP Report 750: Strategic Issues Facing Transportation,” Vol. 1–2. Transportation Research Board, Washington, DC.

REPORTED CHALLENGES OF USING SCENARIO PLANNING IN TRANSPORTATION

While scenario planning is seeing increased applications in transportation planning, there remain some challenges and barriers to more widespread use. Often-cited examples include resource limitations (such as time, money, and staff capacity), the complexity of data and issues that need to be identified and assessed, a lack of technical training, and difficulties implementing policy changes or actions once desired outcomes have been identified.

NCHRP's "Snapshots of Planning Practice: Scenario Planning Applications"⁵ report published in 2013 outlined both real and perceived challenges, including:

- Magnitude of public involvement required
- Required funding
- Lack of knowledge and skill to develop appropriate scenarios
- "Low/no growth" challenges (how does scenario planning apply if limited growth is anticipated?)
- Data requirements may result in increased time and cost for planning activities.

5 Cambridge Systematics. (2013). "Snapshots of Planning Practice: Snapshot 3: Scenario Planning Applications," NCHRP 8-36, Task 120. Transportation Research Board, Washington, DC.

In addition to these common challenges, agencies and practitioners also cite an interest in having more readily available tools and guidance to expand the use of scenario planning to address issues well beyond transportation and land use-related topics. Examples include: incorporating emerging issues such as climate change adaptation, improving public health outcomes, and addressing autonomous and connected vehicle deployment; and identifying methodologies and tools for addressing non-spatial issues such as social equity or school quality. These are issues that are forecasted differently into the future or are not easily geographically linked to topics concerning physical development or transportation infrastructure.

Additional research conducted by the National Association of Regional Councils in 2016 reiterated many of these same findings with a call to action for a broader consortium of public and private entities to organize, invest and share resources to provide technical assistance and more interoperability between tools and datasets to support a broader range of scenario planning activities.⁶

6 PlaceMatters. (2016). "Scenario Planning: Presentation to NARC Members on Scenario Planning Tools and Opportunities to Accelerate Their Use in Regional Planning." Presented in a webinar for NARC, Washington, DC: <http://www.narc.org/wp-content/uploads/MARC-Webinar-on-Scenario-Planning-Tools-and-Research.pdf>





THE NEXT GENERATION OF SCENARIO PLANNING: ADDRESSING CHALLENGES AND EMERGING ISSUES

The Next Generation Scenario Planning Report: A Transportation Practitioner's Guide provides information on how to scope and design a scenario planning process to best meet the needs or challenges of a community or organization. It includes a summary of the different kinds of scenario futures—probable, desired, and exploratory—and describes how those can be used to address common issues facing transportation organizations. It emphasizes the importance of clearly setting expectations about the purpose, goals and expected outcomes of a scenario planning process and includes real-world, recent examples of addressing emerging trends, crafting a new vision or desired future, and dealing with uncertainty.

This report provides practitioners with a more expansive list of “how-to’s” and a menu of options for incorporating scenario-based planning into the transportation planning processes. While it does not address all the challenges cited above, the information aims to enhance the knowledge base of practitioners by offering key considerations for designing a scenario-based process that results in more informed decision-making, fosters resilience in plan making, helps build consensus and creates the framework for plan implementation.

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CHAPTER

WHY USE SCENARIO
PLANNING
TO SUPPORT
TRANSPORTATION
PLANNING?

2



ADDRESSING CHANGING COMMUNITY GOALS

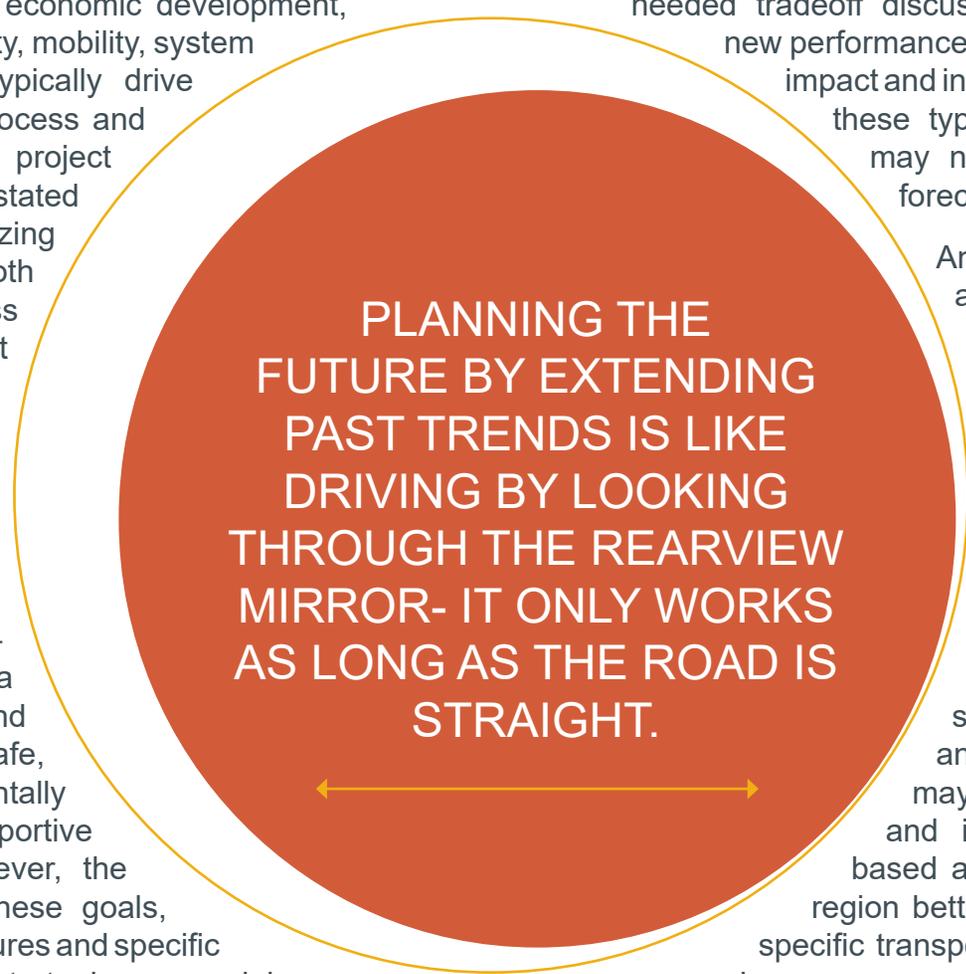
Long range transportation planning includes the development of plans that define how a state, region, county, or city intends to expand, manage, and operate the multi-modal transportation network over time. Goals for economic development, environmental protection, safety, mobility, system preservation and reliability typically drive the transportation planning process and result in the identification of project needs that help achieve stated transportation goals. Prioritizing these needs often involves both a technical and political process to identify the top projects that meet stated transportation performance goals, aligns with the community's vision, and aligns with available funding.

The basic goals of transportation haven't changed much in the last century—as most individuals want a system that moves people and goods in the most efficient, safe, cost-effective, environmentally responsible, economically supportive and equitable manner. However, the more detailed definition of these goals, associated performance measures and specific project-based implementation strategies can and do change in response to changing community values, competing interests, and constraints. For example, many communities today want to see more walking, biking and transit use—which has led

to an interest in using new measures of multimodal productivity or multimodal accessibility to identify project needs. Without a scenario planning process, it would be difficult to facilitate the needed tradeoff discussions associated with establishing new performance measures and evaluating how those impact and influence existing priorities. Addressing these types of changing community values may not be possible through the single forecast, predict and plan method.

Another example of a scenario-based approach to addressing changing community goals might involve a region in economic transition seeking to use transportation investments to better position itself for targeted job sectors. Some industries may value locations that provide the best access to creative-class workers, who often prefer living and working in locations that are more urban, walkable and served by transit. The logistics, freight and goods movement sector, however, may value locations with strong highway and inter-regional mobility. A scenario-based approach in this case would allow a region better to define its economic goals and specific transportation strategies to advance those goals.

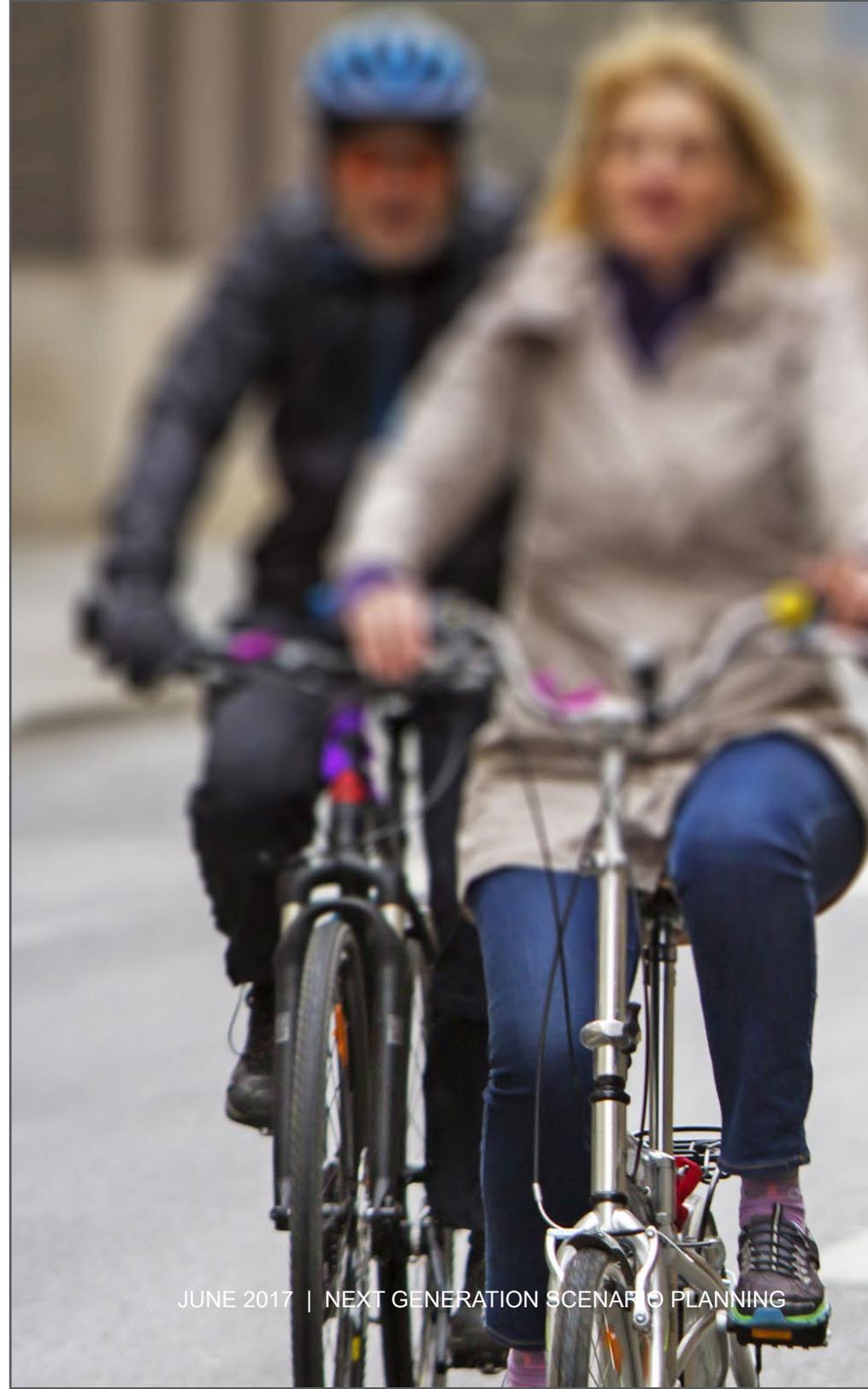
Many of the early scenario planning efforts were in direct response to changing goals related to how transportation priorities reinforced or detracted from community sustainability- and livability-focused



PLANNING THE FUTURE BY EXTENDING PAST TRENDS IS LIKE DRIVING BY LOOKING THROUGH THE REARVIEW MIRROR- IT ONLY WORKS AS LONG AS THE ROAD IS STRAIGHT.

interests. These initial efforts involved developing specific aspirations for community design and explored how changing both land use and transportation patterns could achieve those goals. The recognition that shifts in land use policies influenced travel demand and the range of transportation solutions (influencing community design or environmental outcomes) prompted many regions to rethink how to better coordinate land use and transportation planning. Even today, the exploration of different land use scenarios and their impacts on transportation choices, environmental outcomes, and preferences on community design remains one of the more common applications of scenario planning.

The way people live and work today is very different than it was 50 years ago. Issues of equitable access, housing affordability, financial constraints, and environmental limits are also prompting an interest in defining new goals to shape the transportation system. Scenario planning provides a framework to identify these changing goals, identify new measures of effectiveness, and develop and evaluate different scenarios to demonstrate how those goals might be achieved.





SCENARIO
PLANNING PROMPTS
CONSIDERATION OF
BOTH OPPORTUNITIES
AND THREATS TO
ACHIEVING A DESIRED
FUTURE.



ENSURING RESILIENCE

Planning for resilience encompasses a wide range of issues. In transportation, one major focus is to assess potential risks to infrastructure in response to changing climate conditions—most notably sea-level rise and more frequent extreme weather events—and plan accordingly. However, planning for resilience in transportation can also mean looking at other transformational forces—or issues related to uncertainty—that are beyond the region’s or institution’s control (e.g., major changes in global trade patterns, rapid deployment of connected and autonomous vehicles, federal funding austerity) to better understand the strengths and weaknesses of current policies, plans, or investments considering those potential future conditions. Doing so can highlight areas where there may be a need to alter course, or it could simply result in the identification of new monitoring systems that can help identify when a change in the current course of action may be needed. It can also result in an increased level of understanding among elected officials, stakeholders and the general public on future threats and uncertainties that could impact regional goals.



Excerpt from “A Framework for Establishing Critical Infrastructure Resilience Goals” (2010), National Infrastructure Advisory Council.

“Our nation faces an increasingly complex set of risks that are interwoven into all facets of our businesses, infrastructures, and communities. The threat of hurricanes, financial instability, pandemics, cybercrime, social unrest, terrorism, and other disruptive events that flow from our participation in a global economy has become a part of our everyday lives. While we continue to work toward a safer and more secure world, the reality is that we must address emerging risks with diligence, commitment, and the understanding that we cannot reroute hurricanes, intercept every cyber-attack, or prevent every disruption. ”



“Resilience, or lack thereof, is a complex and dynamic feature of communities and regions. It is both a process and an outcome. It requires communities to anticipate threats, reduce their vulnerabilities, mobilize their resources and assets, and plan for a better future. ”

Excerpt from “Planning for A More Resilient Future: A Guide to Regional Approaches” (2015), National Association of Development Organizations.



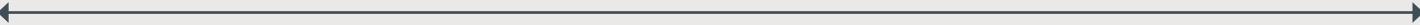
BEYOND TRAFFIC 2045: U.S. DOT SCENARIOS



In “Beyond Traffic 2045: Trends and Choices,” the United States Department of Transportation (U.S. DOT) gave consideration to changing conditions and uncertainties. While considerable effort was directed at likely future forces, it also considered changes of which we cannot be sure:

- Technological changes and innovation in vehicles, infrastructure, logistics, and the delivery of transportation services.
- New sources of travel data that have the potential to improve travelers’ experience, support more efficient management of transportation systems, and enhance investment decisions.
- Automation and robotics that will affect all modes of transportation, improving infrastructure maintenance and travel safety and enabling the mainstream use of autonomous vehicles.
- The effects of climate change, including global mean sea level rise, temperature increases, and more frequent and intense storm events.

LIMITATIONS OF PREDICT AND PLAN



Prior to the major regional transportation planning efforts of the 1950s, transportation planning was largely reactive. With massive early comprehensive planning efforts beginning in the mid-20th century, a science of transportation planning emerged. Along with the implementation of the Interstate Highway System, the notion of multi-modal transportation systems became a focus. Major urban transportation studies like the Detroit Metropolitan Area Traffic Study, the Chicago Area Transportation Study, and the Penn-Jersey Transportation Study applied new analytical tools to attempt to forecast transportation demands. Typically, a single long-range forecast of land use, employment, and population was tested against a series of transportation alternatives. These transportation alternatives were defined by features such as:

- Create a grid street system
- Emphasize a radial street system
- Emphasize limited-access facilities
- Emphasize scenic boulevards
- Improve the bus transit system
- Implement fixed guideway rail system

These early practices introduced the concept of evaluating various modal transportation alternatives against a fixed land use forecast of jobs and housing allocated across the region—a common practice still. This approach relies on a base assumption—that future travel demand and travel behavior can be accurately predicted by extrapolating past trends. This “predict and plan” based approach can be limiting in that it often fails to capture emerging issues, changing community values, and changing societal conditions.

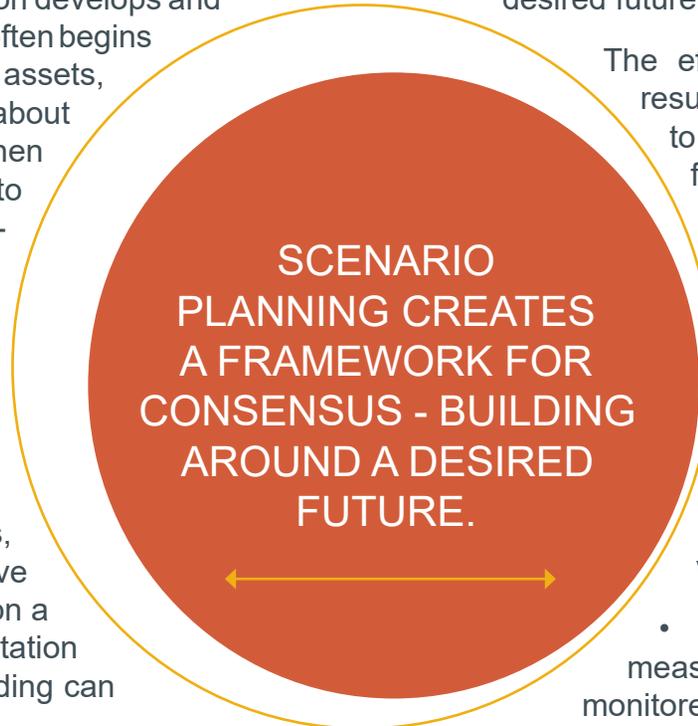
An example of this dynamic was the inability to foresee the enormous change in household demographics that took place in the later part of the 20th century, notably the widespread entry of women into the workforce. Decades ago, transportation plans were based on expectations about household dynamics at a time when the labor force was dominated by men and the participation rates for women were much lower. As women entered the workforce and the two-income household became more common, major errors in transportation demand forecasts became apparent. Today, there are similar uncertainties as practitioners study and try to predict the lifestyle and transportation preferences of millennials, retiring baby boomers, and others.

SUPPORTING VISIONING AND CONSENSUS-BUILDING

An increasing number of MPOs, departments of transportation (DOTs), and regional organizations engage in major visioning or regional blueprint efforts, which seek to create a long-term framework and set of goals for how a region develops and invests its resources over time. Visioning often begins with the identification of key community assets, values and aspirations that tell a story about a desired future. Scenario planning is then used to demonstrate the different ways to achieve that future as it relates to spatially-based characteristics of development, transportation and community design. Coming to consensus around an aspirational story or vision of the future can create the building blocks needed for long term community and political support for implementation efforts (such as funding major transportation efforts, changing policies, etc.) needed to achieve vision-based goals. Without consensus on a vision, making local changes to transportation priorities or building support for new funding can be challenging.

Notable examples of using scenario planning to develop a vision for the future are: Envision Utah; Hillsborough County, Florida's Imagine 2040; the Nashville MPO's Tri-County Transportation and Land Use Study; and the Metropolitan Washington Council of Governments' Greater Washington Region Forward 2050 Initiative. These efforts included scenario evaluations that illustrated the implications of different ways in which the community could grow and make transportation investments relative to funding needs,

impacts on VMT, and other key indices that reflected the vision-based goals. These visioning efforts included extensive public outreach and community engagement to help unify around a desired future.

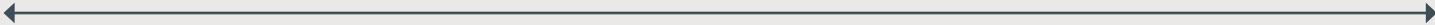


The effectiveness of achieving a regional vision resulting from a scenario-based process leading to implementation relies heavily on a range of factors, including:

- The inclusiveness of stakeholder engagement and buy-in for the vision from entities with direct control over local land use policies, housing, economic development, and transportation investment decisions.
- The degree of policy, institutional, or investment changes required to achieve the vision.
- The identification of actionable and measurable implementation strategies that can be monitored against vision-based goals.

The establishment of a regional vision is often the first step in identifying the need and creating buy-in for changes in policies or investment priorities across a range of functional areas, including transportation. Scenario planning is an effective technique for illustrating how those changes could occur, aligning vision-based goals to performance measures and building support for long-term action.

FHWA: PLANWORKS AND VISIONING



WHAT: PlanWorks is an internet-based platform that uses “key decision points” to support collaborative decisionmaking in transportation planning to improve outcomes and build consensus. The PlanWorks support structure consists of four critical elements:

- **Decision Guide:** The decision guide introduces the likely points in the planning process at which choices will need to be made and suggests resources and case studies to help support decisions.
- **Assessments:** The assessments consist of interactive tools to help guide planning efforts and support project needs.
- **Applications:** Applications help to frame and support special topic areas (including things such as visioning, freight, and emerging issues) through the lens of collaborative decisionmaking.
- **Library:** The library contains case studies and other resources to help support a successful transportation planning effort.

Application: Visioning and Transportation

PlanWorks presents a decision support process to help transportation planners integrate a collaborative visioning element into their planning efforts. A Vision

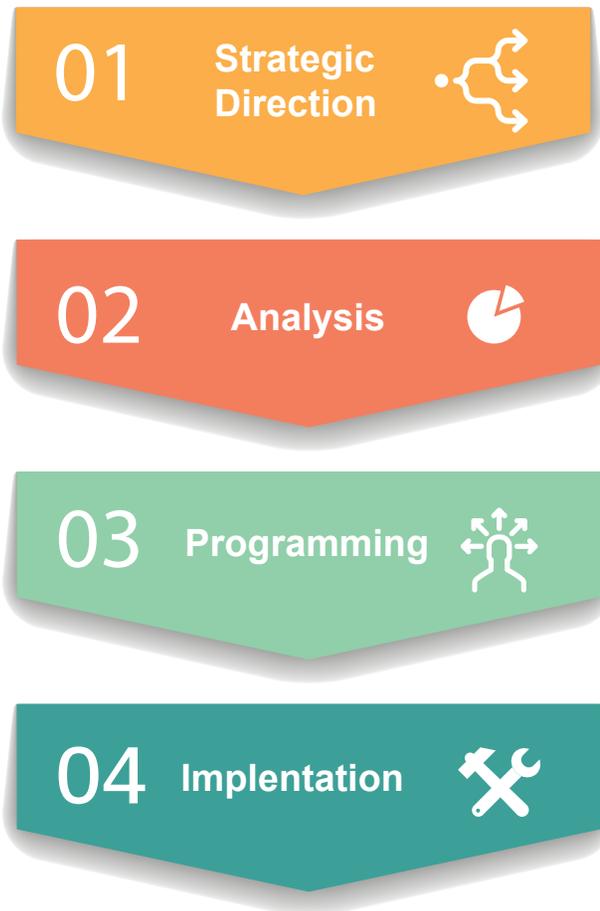
Guide organizes visioning for transportation planning into three main phases: 1) Preparing the Vision; 2) Creating the Vision; and 3) Implementing the Vision. Within each phase are critical activities and decision points that must be addressed in order to move on to the next phase. For example, in the “Preparing the Vision” phase, a planner is directed to think about questions such as, “Why are we doing this?” and “What are our resources?” A key decision point is to approve the scope of the visioning process. Activities and decision points can be filtered within the visioning guide by one of four Visioning Components: Reaching Stakeholders, Considering Communities, Forming Partnerships, and Tracking Commitments.

The decisionmaking framework of PlanWorks can be incorporated into scenario planning processes. It provides the key scoping elements and alignment of planning decision points with different transportation planning processes (long range transportation plans, corridor studies, etc.). It can be a helpful supplementary resource for transportation practitioners seeking to create a more collaborative planning process.

PlanWorks: <https://fhwaapps.fhwa.dot.gov/planworks/>

FIGURE 2: PHASES OF PERFORMANCE BASED PLANNING AND PROGRAMMING AND SCENARIO PLANNING

PHASES OF PBPP



PHASES OF SCENARIO PLANNING



Adapted from Twaddell, H., et al. (2016). "Supporting Performance-Based Planning and Programming through Scenario Planning," FHWA-HEP-16-068. Federal Highway Administration, Washington, DC.

FOSTERING PERFORMANCE-BASED PLANNING & PROGRAMMING

The practice of performance-based planning and programming (PBPP) in transportation ensures that as specific project needs are identified, programmed, and funded for implementation, they can demonstrably contribute to the goals and desired performance of the transportation system. This is most often done by establishing measures of performance (e.g., levels of congestion, rates of VMT, mode split, reliability) and analyzing how well different transportation investments positively impact those measures. This approach is inherently aligned with scenario-based planning. One of key first steps in the scenario planning process is the establishment of goals and associated performance measures, which are then used to craft scenarios and evaluate them. The scenario-based process can be an effective way to encourage the exploration and, ultimately, the establishment of new performance measures. These efforts can then be incorporated into the short-term programming phase most often associated with the Transportation Improvement Program (TIP) as well as the long range transportation planning process.

FHWA's "Supporting Performance-Based Planning and Programming through Scenario Planning" reports published in June 2016 describe how scenario planning can be used to support PBPP within transportation planning. Scenario-based approaches can be incorporated into the four phases of PBPP, as illustrated by figure 2 as adapted from the report.

CALIFORNIA SENATE BILL 375

In 2008, the State of California established the Sustainable Communities and Climate Protection Act (SB 375), which lays out goals for reducing greenhouse gas (GHG) emissions. Subsequent legislation set specific targets for GHG reductions by region, which in turn set in motion efforts by MPOs to develop Sustainable Community Strategies as part of their long range transportation plans. Many of these planning efforts involved scenario-based approaches that examined how the integration of transportation, housing and land use policies could be used to achieve GHG reduction targets. While the responsibility for land use changes falls upon local governments, the integrated approach to these MPO plans ensures that policies and priorities for transportation investments reinforce housing and land use strategies related to GHG reduction goals.

CONTINUING FEDERAL COMMITMENT

FHWA has been a longtime champion of scenario planning, and has sponsored nearly thirty scenario planning peer exchanges across the United States. These have typically involved early implementers of scenario planning presenting their lessons learned to an agency that has expressed interest. The earliest of these involved officials from the Thomas Jefferson Planning District Commission (Charlottesville-Albemarle MPO) sharing their experiences with the City of Honolulu and the Oahu MPO. The issues coming out of these peer exchanges have been relatively consistent over the past 12 years and include challenges such as a lack of funding, lack of data or other planning resources, lack of technical expertise, lack of a project champion, and little follow-through on implementation. More recently, FHWA initiated a January 2017 workshop hosted by the Mid-Atlantic Regional Council, which included discussions of lessons learned from three peer experts representing the Maricopa Association of Governments, Delaware Valley Regional Planning Commission, and the Wasatch Front Regional Council (Envision Utah). Key insights from this discussion included some new themes, including:

- It is an effective process for building linkages between regional transportation plans to other regional plans.
- Creating transparency and neutrality in assumptions behind scenario development is key building support with stakeholders.



THE FEDERAL GOVERNMENT
CONTINUES TO PROVIDE
RESOURCES TO SUPPORT
SCENARIO
PLANNING

- Scenarios should not only address desired futures, but also include some assumptions about future risks.
- Carefully communicating how the scenario elements link back to key community values and public feedback is key.

- Scenario planning benefits from a data-driven approach which is aided by Big Data, data management, and the use of performance measures. Keeping this information in one place and using it for ongoing monitoring and reporting on implementation also reinforces cross-agency support.⁷

FHWA has produced several resource documents to aid and encourage the implementation of scenario planning efforts. Among these resources are:

“FHWA Scenario Planning Guidebook”: Released in February 2011, this document presents a six-phase scenario planning framework based on common transportation planning approaches to scenario planning:

1. Scope the effort and engage partners.
2. Establish baseline analysis. Identify factors and trends that affect the study area.

⁷ McBrien, R.S. (2017). “Mid-America Regional Council Scenario Planning Workshop: Sponsored by the Federal Highway Administration.” Presented at the MARC Scenario Planning Workshop, Kansas City, MO: https://www.planning.dot.gov/Peer/Missouri/MARC_01-31-17.pdf

3. Establish future goals and aspirations based on values of the study area.
4. Create baseline and alternative scenarios.
5. Assess scenario impacts, influences, and effects.
6. Craft the comprehensive vision. Identify strategic actions and performance measures.

“Advancing Transportation Systems Management and Operations Through Scenario Planning”: Released in October 2015, this technical report is intended to identify potential uses of scenario planning for transportation systems management and operations (TSM&O). Examples of factors that could influence TSM&O include: changes in oil prices, climate changes, changes in consumer preferences resulting in less use of private vehicles, and implementation of connected cities and connected and autonomous vehicles.

“Supporting Performance-Based Planning and Programming through Scenario Planning”: This report, released in the summer of 2016, outlines ways that scenario planning can advance performance-based planning: using metrics, models, datasets, and tools to estimate and evaluate scenarios. It operationalizes the concepts of scenario analysis, whether applied to long range planning, short range planning, or operations by linking scenarios explicitly to performance measures.

Additionally, the joint effort of FHWA and the Federal Transit Administration (FTA) Transportation Planning Capacity Building Program has also created additional resources.⁸

⁸ U.S. DOT's Transportation Planning Capacity Building Program: <https://www.planning.dot.gov/>

FEDERAL TRANSPORTATION POLICY



Specific references to scenario planning in federal legislation first appeared in 2012, with the enactment of the Moving Ahead for Progress in the 21st Century Act (MAP-21), which encourages MPOs to develop multiple scenarios as part of a metropolitan transportation plan. For MPOs that chose to voluntarily include scenarios, MAP-21 encourages them to consider:

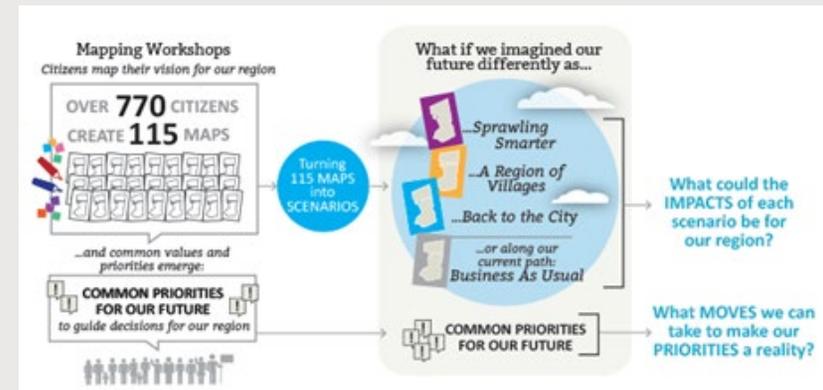
- Potential regional investment strategies.
- Assumed distribution of population and employment.
- A scenario that maintains baseline performance conditions.
- A scenario that improves the baseline conditions.
- Revenue-constrained scenarios based on the total revenues expected to be available.

The 2015 legislation Fixing America's Surface Transportation Act, commonly referred to as the FAST Act, continues the support for scenario planning with a new reference regarding the incorporation of resilience considerations.

SUSTAINABLE COMMUNITIES INITIATIVE

In 2010, federal support for scenario planning outside of the U.S. Department of Transportation came through the Sustainable Communities Initiative administered by U.S. Housing and Urban Development. This was the first program of its kind to provide funding support to regional entities seeking to advance more livable and sustainable regional goals. Many of these local planning efforts incorporated scenario-based planning approaches, bringing this practice to many regions for the first time.⁹

The One Region Forward planning effort was a scenario-based planning process to develop a regional plan for sustainability in the greater Buffalo Niagara region. The image demonstrates how a community mapping exercise helped identify key values and themes that created four scenarios. Scenario evaluations help illustrate key issues and opportunities of different growth dynamics, providing a blueprint for shaping new priorities for the region.



<http://www.oneregionforward.org/the-plan/scenarios/>

9 Marsh, D.S. (2014). "The Sustainable Communities Initiative: Collective Impact in Practice." Community Investments, 26(1), p. 30-36.

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CHAPTER

HOW CAN YOU
SCOPE A SCENARIO
PLANNING
PROCESS TO
BEST MEET YOUR
NEEDS?

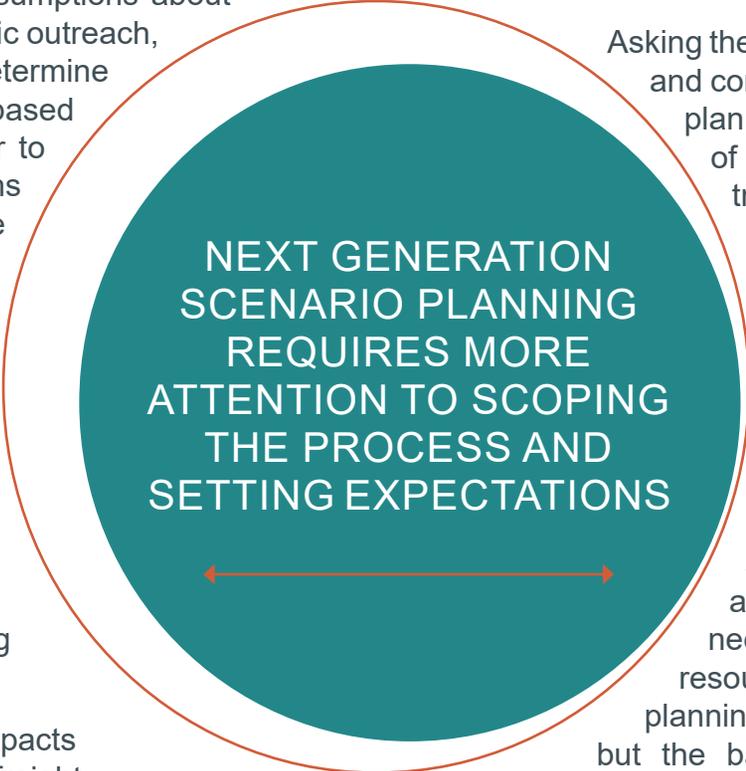
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DEFINING THE ‘WHY’

Long range transportation plan updates typically occur every 4-5 years. This regular planning cycle allows for a review of key assumptions about anticipated growth, transportation needs, funding and insights from stakeholders and the public. Many other planning processes also include regular update cycles to identify any needed change in key assumptions about the future. It is during this time that public outreach, research and analysis can be done to determine if there is a reason to use a scenario-based approach to inform the plan update or to address other issues. Specific questions that could be asked during this phase include:

- Have there been (or are there anticipated to be) notable changes to funding options at the local, state or federal level?
- Are there new trends or changes in travel behavior or travel demand happening in the region?
- Is economic growth rapidly speeding up or in notable decline?
- Are there uncertainties related to impacts of external forces (e.g., changes in freight and goods demand, deployment of connected and autonomous vehicles, economic restructuring) that may call current project priorities into question?



NEXT GENERATION
SCENARIO PLANNING
REQUIRES MORE
ATTENTION TO SCOPING
THE PROCESS AND
SETTING EXPECTATIONS

- Are there conflicts between elected officials, community stakeholders and the public on project priorities?
- Is there a need to address resilience concerns within the long range transportation plan, relative to climatic changes or other future forces?

Asking these types of questions helps define the “why” and confirms the need for embarking on a scenario planning process. If the answers to these types of questions is “no,” then the community or transportation agency will likely be well served by a traditional planning process that builds on existing goals and assumptions about a single, desired future. However, if the answer to any of these types of questions is “yes,” then there could be some benefit to applying a scenario-based approach.

Once there is a defined need for a scenario-based approach, there are several considerations that go into designing a scenario planning process tailored to local needs, topical issues, capacity and available resources. Scoping the right kind of scenario planning process pulls from a variety of resources, but the backbone of the suggested framework is derived from research contained within two articles: “Scenario Planning for Urban Planners: Towards a Practitioners Guide,”¹⁰ and “An Updated Scenario Typology.”¹¹ Additional insights came from “Scenario/Sketch Planning Tools for Regional

10 Chakraborty, A. & McMillan, A. (2015). “Scenario Planning for Urban Planners: Toward a Practitioner’s Guide.” *Journal of the American Planning Association*, 81(1).

11 Ibid - Adapted from Van Notten, P.W.F., et al. “An Updated Scenario Typology.”

IDENTIFYING DRIVING FORCES



Another method that can help to determine the need for a scenario-based approach is to define the driving forces of potential change within the community. This is commonly used to narrow down the issues related to uncertainty about the future and to determine resiliency strategies to prepare for that future. These driving forces could include internal factors related to conditions at the local level or external dynamics beyond local control. Two examples of this approach include:

In 2014, the Town of Sahuarita, Arizona embarked on a scenario planning approach in concert with the development of its municipal growth plan. City officials determined the need for identifying driving forces that could impact their ability to achieve long-term community goals. The primary driving forces of concern included: availability of water supply; availability of state land for growth; ability to attract workforce; availability of high-quality recreation amenities; and willingness to create financial tools. These informed the development of four scenarios: Low Support for Public Financing, Constrained Water Resources, Overcoming All Barriers, and The Best Bedroom Community. Each described a future where

the community was able to successfully adapt to those driving forces. A handful of municipal plan goals and policies were then assessed against each scenario to glean insights into their effectiveness. These findings informed recommendations for municipal plan updates and reframed local discussions to more strategically address issues of resiliency for achieving long-term goals given uncontrollable future forces.¹²

In support of its 2045 Long Range Transportation Plan update, the Delaware Valley Regional Planning Commission (DVRPC) employed a scenario-based approach that started with the identification of Future Forces that could significantly affect the greater Philadelphia region. These forces translated into specific scenarios, including: Enduring Urbanism, Free Agent Economy, Severe Climate, Transportation on Demand, and the U.S. Energy Boom.¹³ From these scenarios, the region identified a set of priority actions that would be beneficial in achieving long-range community and transportation goals regardless of which future forces might occur.

12 Marlow, J., Oliver, H., Quay, R., & Marra, R. (2015). "Integrating Exploratory Scenario Planning into a Municipal Plan Update," Working Paper. Lincoln Institute of Land Policy, Cambridge, MA.

13 Delaware Valley Regional Planning Council (2016). "Greater Philadelphia Future Forces." Philadelphia, PA: <http://www.dvrpc.org/connections2045/futureforces/#page-4>

Sustainability,”¹⁴ which reinforces the value of a typology-based approach and the different types of decision support tools. Finally, this section also reflects the practitioner’s perspective gained from profiling past and current scenario planning activities across the U.S.

SCOPING THE SCENARIO PLANNING PROCESS

Scoping the scenario planning process results in the development of a workplan that defines the scope, level of effort, work products, and intended outcomes. The following three steps (illustrated in Figure 3.1) reflect the primary scoping considerations:

- **Set Process Goals:** What questions do the scenario characteristics and comparisons need to help answer? How will that inform the current plan making or plan update process? What are the outcomes that elected officials and community members can expect from this process?
- **Identify Future Orientation:** Is this process aimed at exploring different futures based on what is likely to happen, what we want to happen or what could happen?
- **Scale and Detail the Key Planning Elements:** What are the individual components of the scenario planning process that are required to meet the process goals?

These are not a linear set of questions; rather, they can apply iteratively during the scoping process to address agency or organizational capacity and resources available and the desired outcomes.

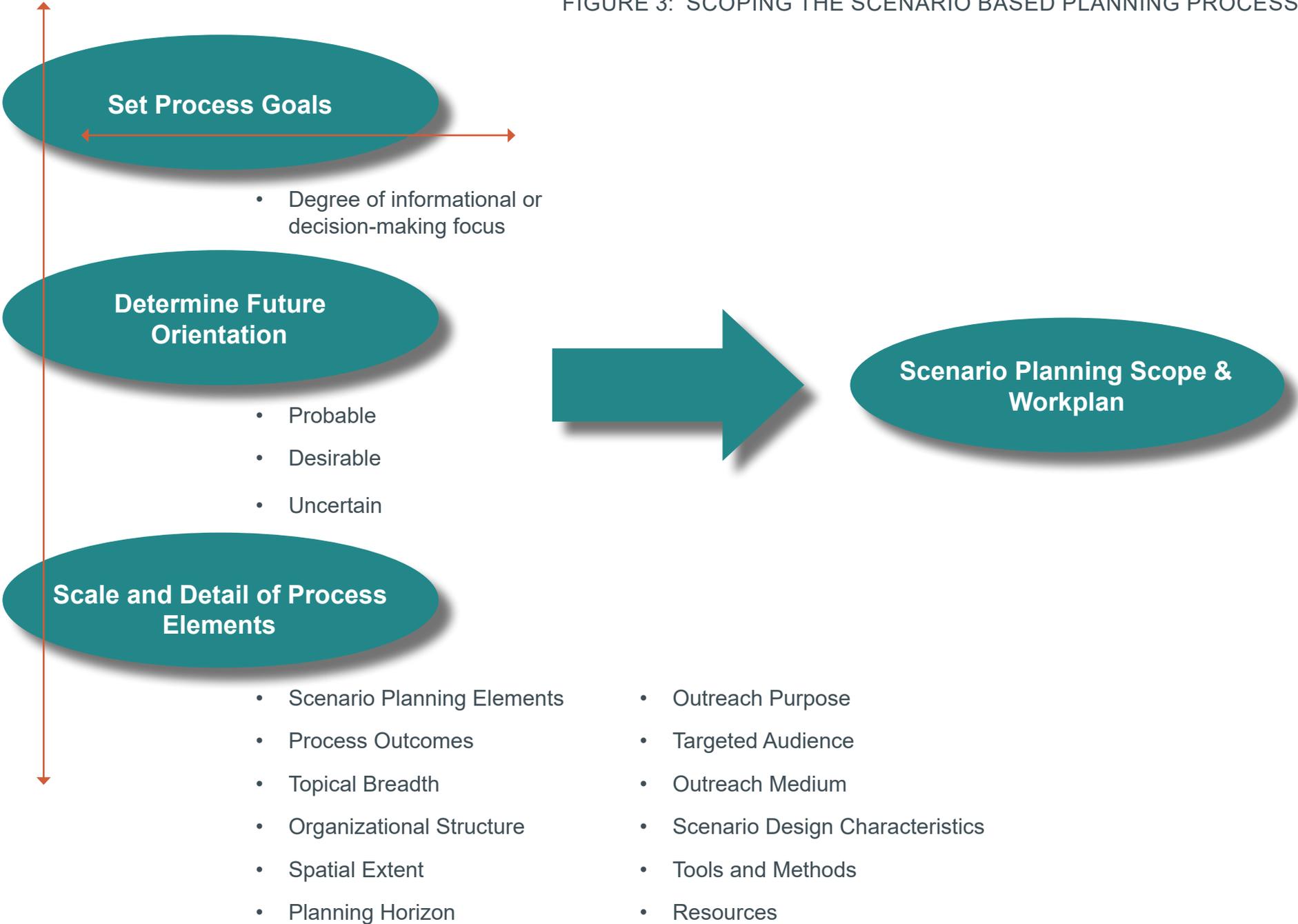
14 Avin, U., et al. (2016). “Sketch Tools for Regional Sustainability Scenario Planning,” NCHRP 8-36, Task 117.

WHAT’S THE DIFFERENCE BETWEEN SCENARIOS AND ALTERNATIVES?



Scenarios aim to compare issues and opportunities of *different futures* – whether desirable or not. Each scenario typically has a set of supporting strategies or project alternatives that can be analyzed and looked at to determine the best set of options for supporting that future or preparing for it. Alternatives are typically developed to support of a *single future* – whether they are alternatives to achieve a desired end state, adapt to changing conditions or position for resilience.

FIGURE 3: SCOPING THE SCENARIO BASED PLANNING PROCESS



SETTING PROCESS GOALS AND DEFINING OUTCOMES

Defining process goals and identifying specific outcomes helps clarify expectations for participants about the purpose and intended use of scenario analyses and community feedback. At its best, scenario planning provides new insights from public engagement, research, and analyses; fosters shared knowledge exchange and problem solving; and builds consensus and momentum for a specific action or decision. However, the level of effort related to public engagement, organizational collaboration and partnering, data-driven analyses, and implementation details will vary. An important factor to consider in scaling the scenario planning process is to determine the likelihood for a needed change from the current path or trend course of action as reflected in existing policies, plans, and project priorities. The bigger the change that may be on the horizon, the more robust the process may need to be to create the needed support for that change.

DECISIONMAKING FOCUS

The early applications of scenario planning in transportation often had a desirable future orientation with both an exploratory and decision-making focus. For many, the integrated land use and transportation-based scenarios were very exploratory in nature. They sought to increase awareness and identify a desirable future that could drive new policy direction based on stated preferences. Yet many of those same efforts occurred as part of a long range transportation plan update and therefore set the expectation that a preferred scenario would be identified and guide long range transportation policies and project priorities accordingly. While this did occur in some cases, often the decision-making outcome was not the adoption of a new plan that reflected the preferred scenario. Rather, it was a decision to start working across agencies (each with different decision-making authority) incrementally

SCENARIO PLANNING OUTCOMES



The degree of information sharing and decisionmaking that comes out of the scenario planning process is influenced by the desired outcomes. The bullets below provide a sampling of hypothetical outcomes:

- Identify specific policy changes and project investment needs to meet performance targets through the long range transportation planning process – desired future orientation
- Inform community members, elected officials and other interested parties about driving forces that could influence regional goals – uncertain future orientation
- Identify specific resilience strategies in response to specific future threats or uncertainties – uncertain future orientation
- Engage participants in tradeoff discussions to address value conflicts and reach consensus on a vision and associated implementation strategies – desired future orientation
- Identify strategies for achieving community and transportation system performance goals given likely changes in future funding streams – probable future orientation
- Identify cross-organizational implementation strategies and build consensus for achieving regional goals – desired future orientation

to refine policies, plans, and project priorities in support of the new policy direction inferred by the preferred scenario or select scenario components. Based on these early experiences, the “Next Generation Scenario Planning” framework includes a greater emphasis on early scoping activities to more directly define specific decision-making outcomes and expectations.

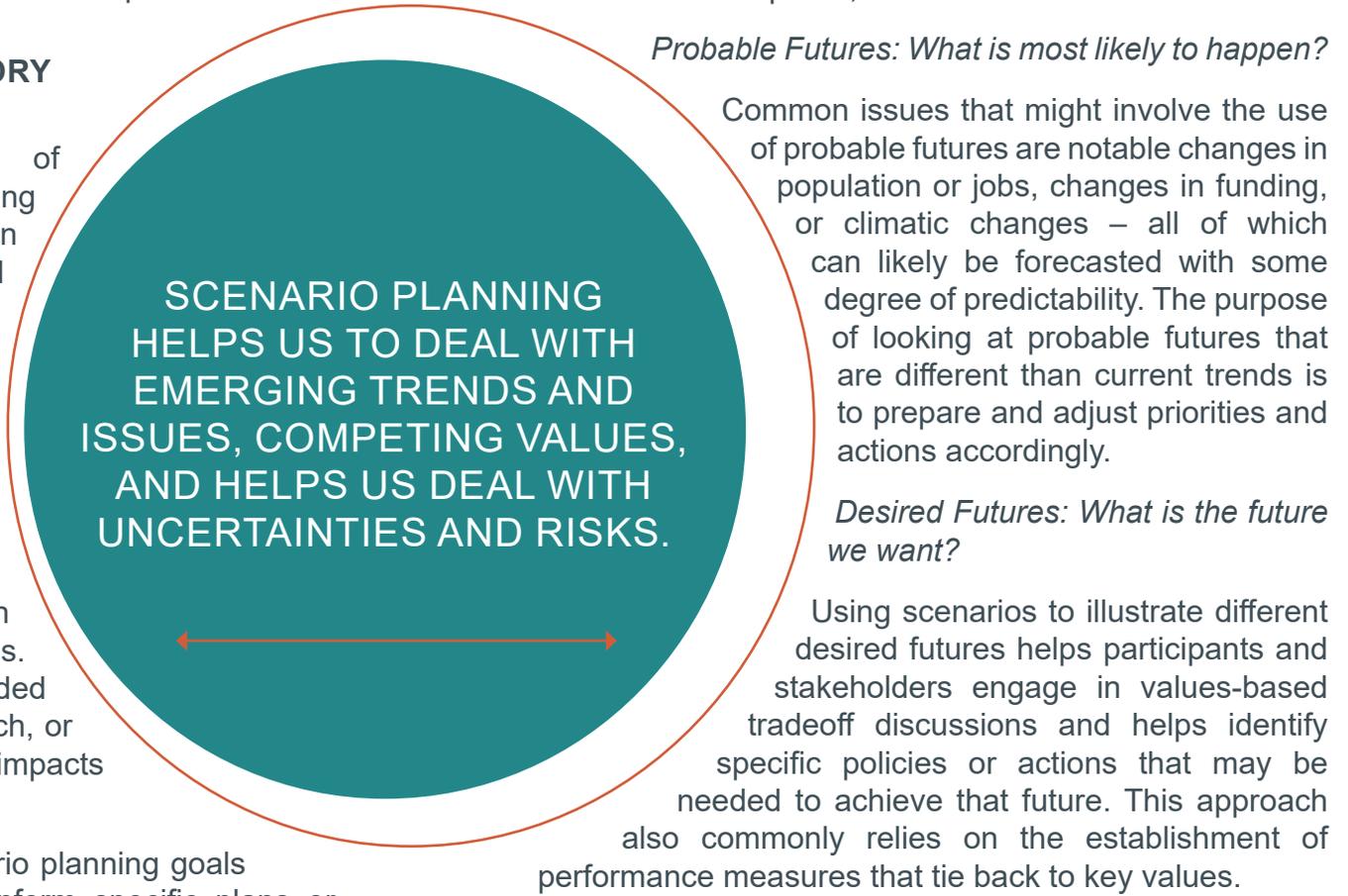
INFORMATIONAL AND EXPLORATORY FOCUS

One of the more notable areas of expanded interest for scenario planning in transportation is its use with an informational focus to build shared understanding of emerging issues, the interrelated issues and opportunities of transportation relative to other societal factors, or the impacts of future unknowns on the transportation system or community as a whole. The informational and exploratory focus of scenarios often results in some type of action, but it doesn’t necessarily result in an immediate change in policies or plans. Rather, it may build support for needed changes in the future, additional research, or new monitoring to better track potential impacts of future forces.

Early discussions about how the scenario planning goals can directly or indirectly be used to inform specific plans or policy updates is a critical step in right-sizing the process, setting expectations, engaging the right stakeholders, and building consensus for next steps.

IDENTIFYING A FUTURE ORIENTATION

Determining the future orientation of the scenario planning process relates directly back to the “why” questions, key issues, and desired outcomes. The three common future orientations as introduced in Chapter 1, Table 1 include:



Uncertain and Exploratory Futures: What could the future be?

Scenarios designed around uncertain futures help identify potential “what-ifs” that can be assessed and considered relative

to how they might positively or negatively impact community and transportation goals. From these insights, participants can identify as set of resiliency strategies or key actions that are beneficial regardless of which future scenario comes to be.

All scenario planning processes include at least one trend scenario for comparison against other scenarios with different future orientations. The trend scenario can reflect a projection of the future based on current policies, plans, or community goals. The business-as-usual scenario is then compared with other scenarios to identify specific changes that may be needed to achieve a more desirable future; or to demonstrate potential threats or vulnerabilities and identify specific courses of action to achieve desired goals in the face of uncertain futures, transformational forces, or emerging trends.

SCALING AND DETAILING KEY PLANNING ELEMENTS OF THE SCENARIO PROCESS WORKPLAN

Table 2 includes a summary of the different planning elements that can define the scope and workplan for the scenario planning effort. This table is not a comprehensive list, but rather provides specific variations, considerations, and examples of each planning element.

SCENARIO PLANNING WORK PLAN ELEMENTS



- Scenario Planning Elements
- Process Outcomes
- Topical Breadth
- Organizational Structure
- Spatial Extent
- Planning Horizon
- Outreach Purpose
- Targeted Audience
- Outreach Medium
- Scenario Design Characteristics
- Tools and Methods
- Resources

TABLE 2: PLANNING ELEMENTS TO CONSIDER WHEN SCOPING YOUR NEXT GENERATION SCENARIO PLANNING PROCESS

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
PROCESS OUTCOMES	<p>Informational and Awareness Building; Focus on Emerging Trends or Uncertainties; Development of a Consensus Based Vision; Identifying Actions for Resilience; Building Interagency Support and Agreements on Implementation Strategies for a Shared Vision; Establishing New Performance Measures and Associated Strategies; Creation of Policy</p> <p>Recommendations and Plan Updates</p>	<p>Clarity on process goals is key in setting expectations with project stakeholders and the public. The degree to which the process seeks to result in specific policy changes will drive an increased need for broad outreach and data-driven quantitative and qualitative analyses. Informational and exploratory focused efforts may need to pull from existing research and expert panels to create plausible scenarios and associated alternatives.</p>	<p>Informational and Awareness Building: Insights can lead to adjustments in future plan-making activities, new collaborations for integrated planning, or a call for additional research or monitoring of trends.</p> <p>Development of a Consensus-Based Vision: Consensus emerges around the need for changing current policies, plans, and project priorities to achieve community goals.</p> <p>Creation of Policy Recommendations and Plan Updates: Scenarios inform preferences on specific alternatives, policy actions, or new priorities that are directly incorporated into plan updates.</p>
TOPICAL BREADTH	<p>Single Issue, Comprehensive, or Problem Oriented</p> <p>Future Orientations: Probable, Desired or Uncertain/ Exploratory</p>	<p>Decisions about the range of topical issues to address and the future orientation can drive the complexity of the process and need for targeted engagement. Comprehensive approaches may require new data and tools to effectively demonstrate interrelated analyses of cause and effect as well as broad outreach. Single-issue or problem-focused efforts may require more in-depth research, expert panels or detailed analyses focused on specific issues.</p>	<p>Single Issue: Fiscal Uncertainty or Variability in Funding</p> <p>Comprehensive: Regional Sustainability Plan</p> <p>Problem-Oriented: Reducing VMT</p> <p>Uncertain Impacts: Deployment of Automated and Connected Vehicles</p>

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
ORGANIZATIONAL STRUCTURE	Single Organization with Decision-making Authority; Coalition of Organizations with Decision-making Authority	The organizational structure sets expectations about who will lead the process, and defines the roles and responsibilities for decision-making and taking actions necessary to act upon recommendations. Broad topical breadth and a decision-making focus typically requires a coalition-based approach. Single-issue, informational-oriented processes may work within a single agency.	<i>Single Organization with Decision-making Authority:</i> State DOT <i>Coalition of Organizations with Decision-making Authority:</i> MPO, Local Governments, State DOT, Housing Authority
SPATIAL EXTENT	<i>State; Region; Subarea, Corridor</i>	Setting the spatial extent can drive the analytic and research needs as well as define the stakeholder and public outreach approach. It also defines the organizational structure based on agencies, jurisdictions, and other geographically based authorities.	<i>State:</i> Statewide Transportation Plan; Statewide Resiliency Planning <i>Regional:</i> Long Range Transportation Plan; Regional Blueprint or Vision <i>Corridor:</i> Multimodal Corridor Plan
PLANNING HORIZON	<i>5-10 years; 20-30 years; 50+ years</i>	The longer the planning horizon, the easier it may be to imagine very different futures; the shorter the horizon, the more applicable the outcomes may be to immediate programming or project priorities. Likewise, the longer the horizon, the less confidence stakeholders may have in the probability or predictability of those futures; whereas the shorter the horizon limit, the greater the imagination about the future, thereby creating scenarios similar to past/ current trends.	<i>5-10 Years:</i> Management and Operations Planning for Extreme Weather Events <i>20-30 Years:</i> Long Range Transportation Plan, Climate Change Mitigation and Adaptation Plan <i>50 + Years:</i> Regional Vision

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
OUTREACH AND ENGAGEMENT			
OUTREACH PURPOSE	<i>Inform Only; Seeking Feedback; Joint Fact Finding; Seeking Consensus</i>	<p>The purpose of the outreach defines the methods and targeted audience for outreach and engagement. The purpose for the outreach also reinforces the scenario planning process goals related to decision-making and information sharing.</p>	<p><i>Inform Only:</i> Information shared with the public to deepen understanding of changing values, interrelated issues, emerging trends or other external factors.</p> <p><i>Seeking Feedback:</i> Used to prompt conversation, or gain input on preferences regarding different futures or current decisions.</p> <p><i>Joint Fact Finding:</i> Engagement targeted to gain new information from stakeholders and the public on community values; experts on emerging trends or driving issues.</p> <p><i>Seeking Consensus:</i> Scenarios and engagement designed to increase shared understanding of issues, facilitate tradeoff discussions, and identify shared preferences and consensus on a path forward.</p>

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
<p>TARGETED AUDIENCE</p>	<p><i>Public; Elected Officials; Government Agencies; Private Sector; Other Stakeholders; Experts in Topical Areas of Interest</i></p>	<p>The purpose for engagement drives the targeted audience. Key considerations require thought about who needs to be informed, who can provide needed insights or feedback, and who needs to buy in to the outcomes to reach a decision.</p> <p>Additional thought should be given to the diversity of participants (demographic, socioeconomic, agency orientation, issue-based) to ensure identification or confirmation of all community values, and help prompt interdisciplinary creative thinking regarding emerging issues. Communication techniques may need to be tailored to different audiences at different phases of the planning process.</p>	<p><i>Public:</i> Beneficial when the planning effort seeks to identify or confirm values, enact major policy changes, pass a referendum, or take other actions requiring broad community support. <i>Government Agencies:</i> Important</p> <p>when addressing multivariate issues requiring cross-agency action; may also be a target audience for smaller-scale exploratory scenarios with an uncertain future orientation that has broad impacts.</p> <p><i>Other Stakeholders:</i> Important for all types of topical breadth and future orientations – yet can be tailored to specific issues, problems or comprehensive nature of the planning process. Other stakeholders representing local advocacy groups, non-profits, cultural institutions, business interests, etc. are also critical for building support around major policy changes, passing referendums, or taking other actions requiring broad community support. Specific engagement of the private sector, research entities, or other issue-based stakeholders can also be beneficial when addressing uncertainty or emerging trends.</p>

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
OUTREACH MEDIUM	<i>Web-based; Face-to-face; Hybrid</i>	Different engagement mediums, methods, and techniques can be aligned with the outreach purpose and targeted audiences. More interactive techniques (face-to-face) are effective when trying to build consensus or prompt creative thinking through shared knowledge exchanges. Web-based techniques are very effective for information sharing, fact finding, and seeking feedback. The most common approach is a hybrid of the two.	<p><i>Web-based:</i> Online preference surveys, information sharing through social media, virtual open houses</p> <p><i>Face-to-face:</i> Community meetings with interactive activities, focus groups, tabletop exercises, door-to-door surveys, open houses, elected official workshops</p> <p><i>Hybrid:</i> Using both web-based and face-to-face means of engagement</p>
SCENARIO DESIGN CHARACTERISTICS	<i>Future Orientation (Probable, Desirable, Uncertain); Spatially Based Extent (State, Regional, Corridor); Topical Issues; Non-Spatial Issues; Visualization Components; Performance Metrics and Evaluation Factors</i>	Clarity on key issues, topical breadth, evaluation metrics and future orientation (probable, desirable or uncertain) defines the scenario design characteristics. Scenario design characteristics reflect the components of the future 'story' regarding that scenario. They can include non-spatially related elements described narratively, and/or include spatially related mapping or visualizations to demonstrate geographic impacts. They can be designed with quantifiable and qualitative factors. Good scenario design provides clarity on key assumptions and effectively illustrates the interrelated nature of different topical variables on community or process goals.	<p><i>Probable future orientation, single issue of fiscal uncertainty:</i> Scenarios may be developed with simple spreadsheets to illustrate forecasts of different funding levels and how that could impact project priorities. Project priorities could then be modeled and evaluated against transportation system performance goals.</p> <p><i>Desirable future orientation, comprehensive issues of regional sustainability:</i> Scenarios likely developed in one of several GIS-based tools with visualization and analytical capabilities able to account for the multivariate relationship of land use, transportation, housing, fiscal impacts, etc.</p>

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
<p>(Cont.)</p> <p>SCENARIO DESIGN CHARACTERISTICS</p>			<p>Likely includes performance metrics and 3D visualizations to illustrate development character and impacts of different futures.</p>
<p>TOOLS AND METHODS</p>	<p><i>Qualitative or Quantitative; Performance Metrics; Preferencing Feedback Support; Spatial Visualization and Analytics; Multi-variate Topical Issue Relationship analysis; Predictive Modeling Tools; Low Tech Tabletop Exercises or High-Tech Computer-Aided Tools; Expert Panels</i></p>	<p>Tools and methods for scenario planning align with the process purpose, topical breadth, and future orientation. Varying degrees of data gathering or creation, research, engagement of expert panels, analysis and visualization, and values tradeoff facilitation tools and methods can be tailored to address key issues. The level of effort and technical capacity required to develop and evaluate scenarios varies greatly. While there is a wide range of quantitative and visualization tools and methods to support probable and desired future scenario analysis and evaluations related to place-based spatial issues (e.g. land use, transportation, environment), there are fewer ready-made tools or methods to address future uncertainties. Yet the use of expert panels, identification of future forces and the use of published research can aid in these processes. Regardless of the tools and methods employed, caution should be taken to differentiate scenarios from probable or adopted forecasts.</p>	<p><i>Computer Based Multivariate Scenario Design and Analysis Tools:</i> Envision Tomorrow, UrbanFootprint and RapidFire, UrbanSim, CommunityViz, Energy and Emissions, Reduction Policy Analysis Tool, Rapid Policy Assessment Tool.</p> <p><i>Convening Expert Panels and Pulling From Existing Research:</i> Issues such as deployment and adoption of Connected and Autonomous Vehicles benefit from convening private- and public-sector experts and the use of published research to develop plausible scenarios to illustrate the issues and opportunities associated with the deployment of this new technology.</p>

(Continued)

PLANNING ELEMENT	POTENTIAL VARIATIONS	CONSIDERATIONS	EXAMPLES
RESOURCES	<i>Integrated into Recurring Statutory Funding; Opportunity-Based; or Joint Agency-Funded</i>	Scenario planning can be folded into the existing, mandated transportation planning processes, or it can be supported through opportunity-based grants or joint entity funding.	<i>Integrated into Recurring Statutory Funding:</i> MPO planning funds for long range plan updates are commonly used to support scenario planning. <i>Opportunity-Based:</i> Federal, State, or regional planning grants; private foundations or non-profits. <i>Joint Agency-Funded:</i> Combination of recurring planning funds from multiple agencies.

TABLE 3: EXAMPLES OF PLANNING ELEMENTS TAILORED TO KEY ISSUES

Process Goals & Key Issues	Example 1: Using Scenario Planning to Build Consensus for A Desired Future at the Regional Level in Conjunction with a Long-Range Transportation Plan Update	Example 2: Using Scenario Planning to Ensure Resilience of Current Transportation Priorities in Response to Declining State and Federal Revenues
PLANNING ELEMENTS		
Outcomes	Creation of Policy Changes and Project Priority Updates in Long Range Transportation Plan	Identifying Financial Resilience Strategies and Actions
Topical Breadth	Comprehensive, Addressing Regional Growth and Sustainability Goals	Single Issue, Problem Based
Organizational Structure	Coalition of Organizations: Cross-agency partnerships with authority over transportation and land use decision-making	Single Organization (DOT)
Spatial Extent	Region	Statewide
Planning Horizon	Long Term: 30 years	Long Term: 20 years
Outreach and Engagement	<p>Targeted Audience: Public, elected officials, government agencies, interest groups, other topical stakeholders</p> <p>Outreach Purpose: Shared Knowledge Exchange, Fact finding (community values), and Feedback (preferences and tradeoff discussions);</p> <p>Engagement Medium: Web-based and face to face</p>	<p>Targeted Audience: Elected Officials, Transportation Agency Staff</p> <p>Outreach Purpose: Shared Knowledge Exchange (demonstrating future threats and emerging trends), Creative Problem Solving and Feedback (Identifying Actions)</p> <p>Outreach Medium: Face to face</p>
Scenario Design Characteristics	Desirable end states inclusive of visualizations and topical variables related to community design (density, diversity, design), transportation (accessibility, mode split, VMT, choices, travel time), environment (air quality, water quality), etc.	Probable and uncertain trends in state and federal funding; alternative funding options (public-private partners, new local sources, etc.); existing project priorities and associated transportation system performance
Tools and Methods	Multivariate scenario-based design, visualization and analysis tools; multimodal accessibility, travel demand or other transportation analysis tools; expanded performance measures; high-tech and high-touch engagement tools and methods on-line and in person	Sketch analysis tools to test project alternatives under different funding levels against system performance goals; economic forecasting methods. Hi-touch, in person engagement methods (work sessions, elected official briefings)
Resources	Combination of statutory based funds (MPO Planning Funds) and Joint Agency (local government participation)	Statutory based funds

TRANSPORTATION RESEARCH BOARD'S CONFERENCE ON THE USE OF SCENARIO PLANNING IN TRANSPORTATION PLANNING

In the summer of 2016, more than 100 participants convened in Portland, OR, to learn about the latest in the application of scenario planning to support transportation planning. A major focus of the conference sessions was to present examples and methods for addressing future uncertainty on a range of topics. Many of the issues driving uncertainty came out of NCHRP's Foresight 750 Series. In one session, participants were taken through a mock exploratory scenario planning exercise. Each table was given a large worksheet to develop four distinct scenarios, given two driving issues: "U.S. Response to Climate Change" and "Federal Transportation Spending." For each issue, the variations reflect high- or low-based responses. Participants were then asked to contemplate plausible characteristics and reactions to each future condition. The scenarios were mapped out in the four quadrants as follows:

- *High levels of Federal funding for transportation, aggressive response to climate change adaptation and mitigation*
- *Low levels of Federal funding for transportation, aggressive response to climate change adaptation and mitigation*



Workshop design by Thera Black, SCJ Alliance Image Credit: Renaissance Planning

- *High levels of Federal funding for transportation, low level response to climate change adaptation and mitigation*
- *Low levels of Federal funding for transportation, low level of response to climate change adaptation and mitigation*

While the key characteristics of these scenarios differed among each group engaged in the process, the resulting information exchange and awareness-building on how these issues could impact the future of transportation provided the greatest value to participants.

UTILIZING NEW TOOLS AND METHODS

One of the challenges with scenario planning is that it often introduces a need for addressing new issues, broader topical areas of analysis, or future conditions that have yet to be studied or validated. This means that practitioners may need to incorporate different methods or tools to engage the public, hypothesize unknowns, predict probable trends, or assess the impacts of multivariate alternatives in support of different scenarios. Tools for engaging the public often include methods and mediums that help communicate scenario assumptions and impacts (visually, narratively and/or quantitatively) and offer opportunities for feedback on preferences. These types of tools are very important in facilitating tradeoff considerations. Sketch-planning-based forecasting methods may be needed when trying to evaluate impacts of multivariate influences like land use, housing affordability, multimodal accessibility, travel behavior, and travel demand for which current travel-demand tools may not be adequate. The use of existing research can be effective when trying to determine potential conditions in the future that have otherwise not been forecasted.

The selection of specific tools and methods should relate back to the key "why" questions, topical breadth, spatial extent, level of resources and technical capacity available, the desire for public engagement, and the desired outcomes in terms of information sharing and decisionmaking. There are many tools and techniques readily available to support scenario planning. This includes something as simple as a tabletop exercise with flip charts, to more complex computer-aided modeling and multivariate analysis, to highly interactive online public engagement and visualization software. Many of the existing transportation planning tools, techniques, and outreach methods can also easily be brought to bear and used to support different phases of the scenario planning process. The following highlights some of the common methods and tools aligned with different scenario process goals, as well as references to other tool-based guidance resources.

TOOLS, METHODS AND RESOURCES FOR SCENARIO PLANNING



SCOPING THE TRANSPORTATION PLANNING PROCESS:

FHWA's PlanWorks website provides practitioners with a comprehensive set of steps for designing a planning process to address a wide range of planning needs. This online tool can be paired with this guide to tailor and scope a scenario planning process.

<https://fhwaapps.fhwa.dot.gov/planworks/Home>

DIGITAL PUBLIC ENGAGEMENT AND COLLABORATION TOOLS:

Over the last decade, an increasing amount of public outreach and engagement has been happening online, and digital platforms are being used in face-to-face workshop settings. These types of tools can help support the need for broad and diverse participation, fact findings and gaining input on scenario preferences and priorities. Examples: CrowdGauge, Engaging Plans, MetroQuest.

NEW PERFORMANCE MEASURES DEVELOPMENT TOOLS:

Identifying specific key indicators or metrics beyond traditional transportation measures can help better connect values with scenario evaluations. Examples include: PlanWorks (Performance Measures Checklist), Community Vision Metrics Web Tool, STAR Community Rating System,

Federal Fiscal Impact Model, Transportation and Health Tool, or other locally derived methods.

"The Why and How of Measuring Access to Opportunity" by the Governor's Institute on Community Design provides information on developing new measures of performance oriented around factors such as access to destinations.

<http://www.govinstitute.org/resource/measuring-access-to-opportunity/>

VISIONING AND MULTIVARIATE SCENARIO DESIGN AND ANALYSIS TOOLS AND RESOURCES:

Creating integrated scenarios that address transportation, land use, infrastructure, housing, and environmental considerations requires a comprehensive planning approach. This is most often needed to support scenario planning for "desired futures" or to enrich performance-based planning approaches. Examples: Envision Tomorrow, UrbanFootprint and RapidFire, UrbanSim, CommunityViz, Energy and Emissions, Reduction Policy Analysis Tool, Rapid Policy Assessment Tool.

"Sketch Tools for Regional Sustainability Planning," from the National Cooperative Highway Research Program (NCHRP 08-36, Task 117) is a report that helps guide decisions about the use of different tools based on the level of complexity, the future orientation (probable, desirable, uncertain) and how each tool can help inform



the different phases of the scenario planning process. This work reflects a detailed analysis of CommunityViz, EnvisionTomorrow, i-PLACES3, INDEX/SPARC INDEX, UPlan, and UrbanFootprint tools.

RESEARCH AND RESOURCES ON EMERGING TRENDS:

“Beyond Traffic 2045, US DOT” presents and analyzes the long-term and emerging trends on the transportation system. Includes example scenarios that can be used to facilitate local and regional discussions.

https://www.transportation.gov/sites/dot.gov/files/docs/BeyondTraffic_tagged_508_final.pdf

“Paths of Automated and Connected Vehicle Deployment: Strategic Roadmap for State and Local Transportation Agencies” (2015) by J. Zmud, M. Tooley, R.T. Baker, and J.A. Wagner at Texas A&M Transportation Institute describes potential public-sector responses to varying scenarios for AV and CV deployment rates.

<https://tti.tamu.edu/publications/catalog/record/?id=42741>

The National Cooperative Highway Research Program report series “NCHRP Report 750: Strategic Issues Facing Transportation in Volumes 1-6,” includes six reports on pressing issues in transportation that a scenario-based approach could be effective in addressing at the local level.

http://www.trb.org/NCHRP750/Foresight_Report_750_Series.aspx

GENERAL SCENARIO PLANNING RESOURCES:

FHWA maintains website content that includes information on best practices, tools, and insights from peer workshops regarding the use of scenario planning. Resources include published reports and summaries of the key findings from scenario planning peer workshops.

https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/

The Scenario Planning Applications Network (SPAN) is a voluntary group of practitioners interested in advancing access to and interoperability of scenario planning tools.

<http://scenarioplanning.io/>

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CHAPTER

PLANNING WITH
FORESIGHT

4





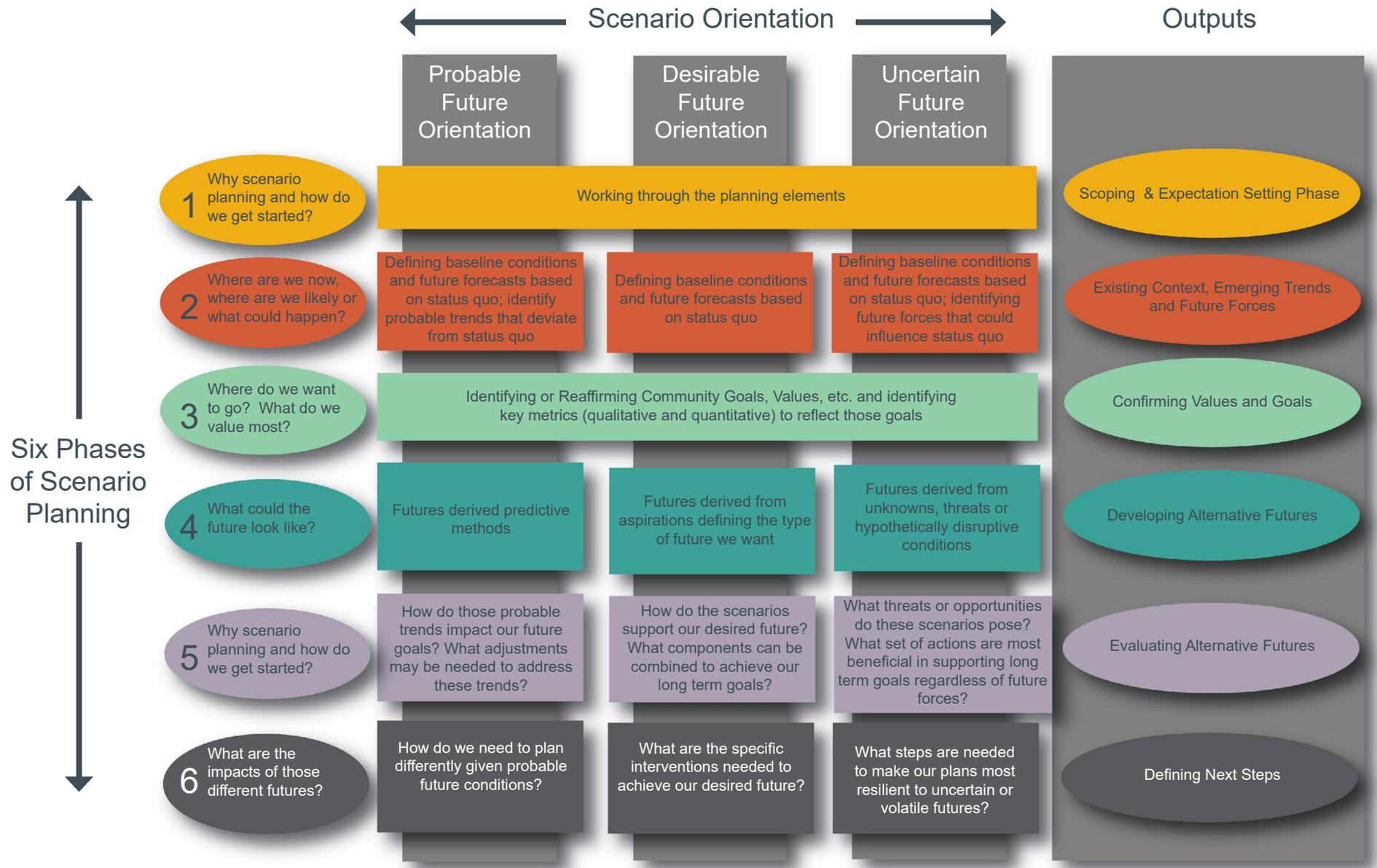
HOW TO PUT THE SIX-PHASE SCENARIO PLANNING WORKPLAN INTO ACTION?

Scenario planning involves an informational and direction-setting process that aims to create more informed decision-making about transportation priorities and investments. In some cases, it is incorporated directly into an existing transportation planning process like the update of a long range transportation plan, where its purpose is to influence policy changes and transportation project priorities. In other cases, it can be applied in parallel with or before a specific decision or policy change to better understand “What if” or to address emerging trends. Regardless of the process goals as described in the previous chapter, all scenario planning efforts benefit from utilizing the six-phase approach and framework as illustrated in Figure 3.2. This diagram is based on FHWA’s 2011 Scenario Planning Guidebook,¹⁵ but it integrates additional considerations regarding project goals and future orientations and reflects a greater diversity of options, deriving from the planning elements previously described.

Each scenario planning phase can vary in terms of the iterative needs and feedback loops required to move on to the next step. Additionally, defining the specific next steps or implementation actions needed to address probable futures, desired futures or uncertain futures can take on multiple forms depending on the decision-making and informational focus areas. To illustrate these variations, real-world examples are interspersed throughout.

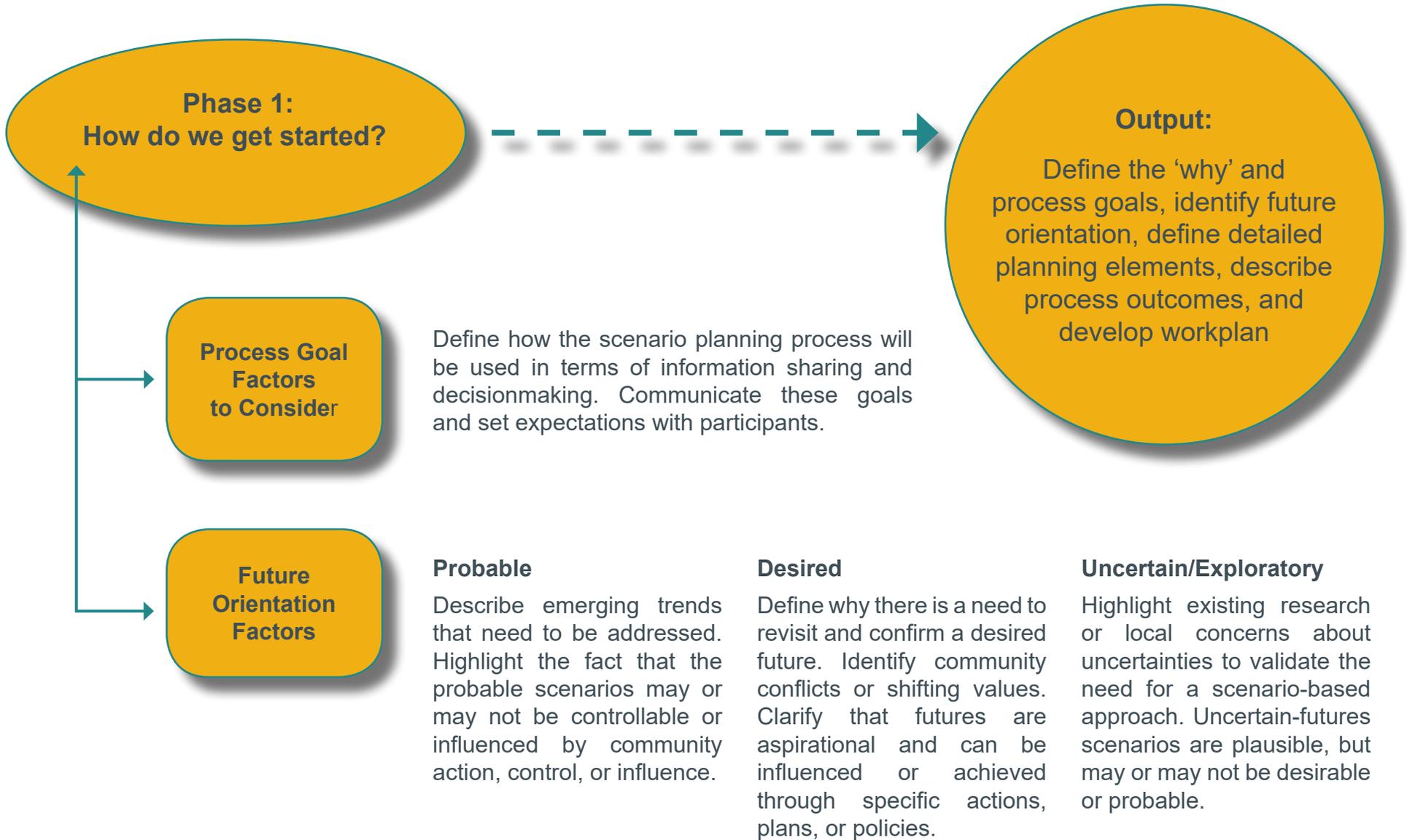
15 FHWA. (2011). “FHWA Scenario Planning Guidebook.” Federal Highway Administration, Washington, DC.

FIGURE 4: NEXT GENERATION SCENARIO PLANNING AND THE SIX-PHASE PROCESS¹⁶



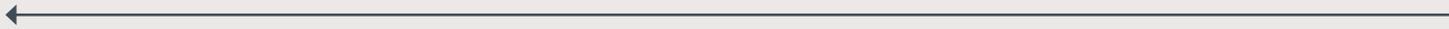
16 Adapted and excerpted from FHWA Scenario Planning Guidebook (2011); see Footnote 14.

FIGURE 5: HOW DO WE GET STARTED?



WASHINGTON STATE FREIGHT MOBILITY PLAN

WASHINGTON STATE DOT



Problem or Driving Issue:

As a precursor to updating the State of Washington's freight mobility plan, stakeholders wanted to better understand how external global trade forces could influence freight demands across the state relative to an emphasis on ports, rail, and interstate trucking routes. Doing so could create new insights on the state freight plan relative to the emphasis of different modes and routes as well as help to create a more resilient plan considering somewhat uncertain global conditions.

Summary:

The foundation of WSDOT's process was to use scenario planning to better prepare for an uncertain future instead of trying to predict the future and plan for it. To do this, WSDOT created four long-range scenarios: "One World Order," "Naftastique!," "Technology Savior," and "Global Marketplace." These scenarios were used to try and understand the implications of combinations of events on the state's freight system. The results of the scenario analysis were compared with trends analyses and near-term industry trends to ground in truth what appeared to be probable outcomes (based on current data) and to test the validity of scenario assumptions.



Process Goals:

Exploratory/Informational and Decision Support

Futures Orientation: Uncertain

Scenario Process Outcomes: The Washington State Mobility Plan used scenario planning to prepare the state's freight systems for future uncertainty. Additional process goals included meeting federal MAP-21 guidance for state freight plans; providing strong, fact-based evidence to secure federal funding for Washington's freight priority projects; and guiding investments made in the state's freight system.

FIGURE 6: WHERE ARE WE NOW?

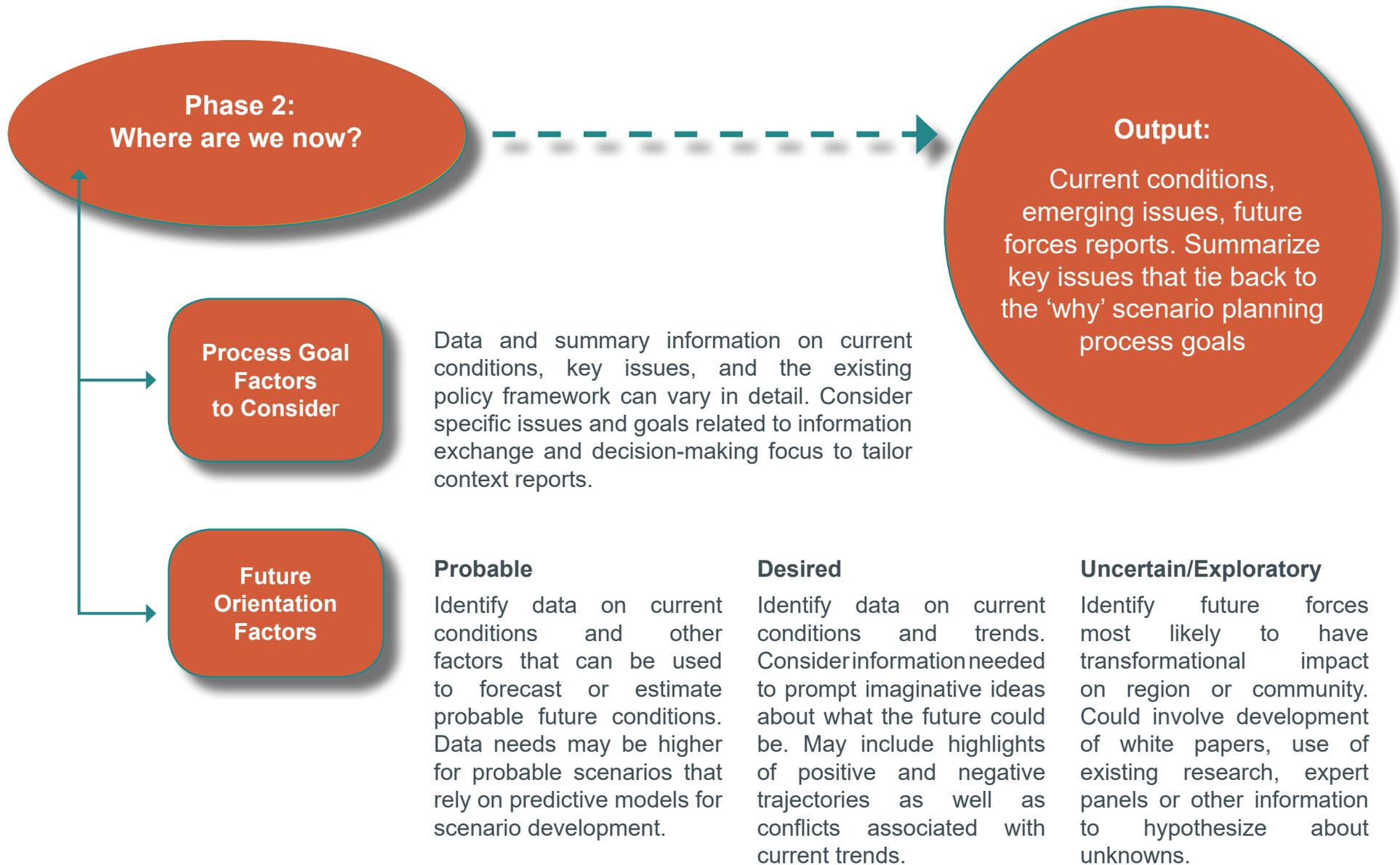
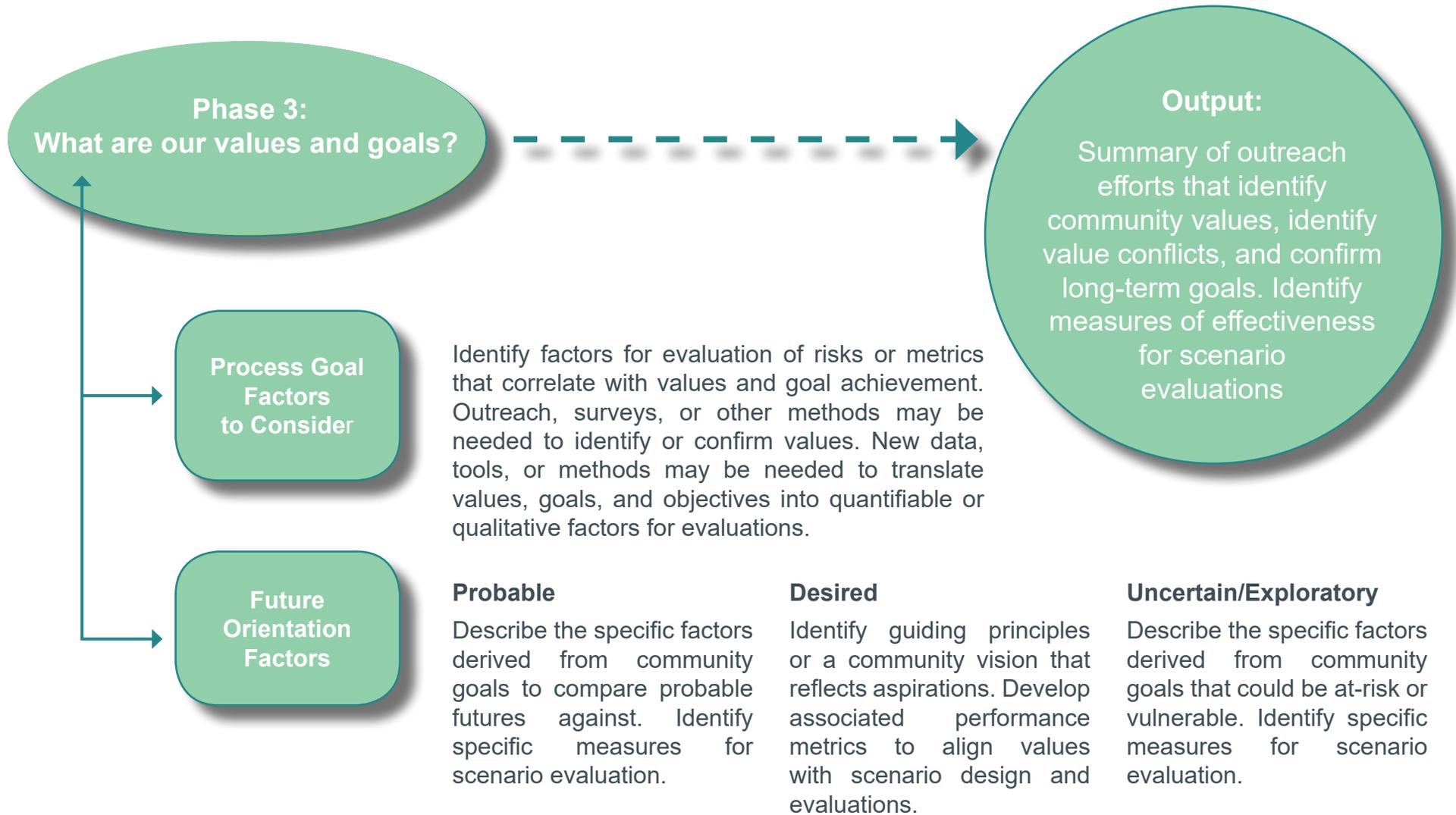


FIGURE 7: WHERE DO WE WANT TO GO?



ENVISION UTAH



Problem or Driving Issue:

The Salt Lake City region of Utah continues to seek opportunities for creating more sustainable growth patterns. Recognizing some of the challenges with implementation of the Envision Utah vision crafted more than 20 years ago, and emerging new issues and opportunities associated with transportation funding, housing affordability, technology advances, and other factors, planners used a scenario planning process. The process helped to further identify implementation opportunities and build support for achieving the desired vision and doing so considering some variability associated with future uncertainty and shifting trends.

Summary:

One of the earliest scenario planning efforts, Envision Utah brought together people from all walks of life, including developers, conservationists, business leaders, and the

public to consider alternative futures for the growth of Utah and to create a “Quality Growth Strategy” rooted in community values and informed by data. In 2015, Envision Utah’s “Your Utah, Your Future” effort significantly expanded and updated the Quality Growth Strategy. “Your Utah, Your Future” included eleven topics ranging from water, transportation, and land use to housing, agriculture, education, public lands use, and more.

Process Goals:

Informational/Exploratory and Decision Support

Futures Orientation:

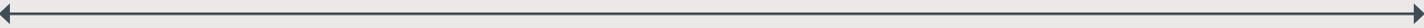
Desirable and Uncertain

Scenario Process Outcomes:

Between 1997 and 1999, Envision Utah held over 200 workshops and obtained input from 20,000 residents to create the Quality Growth Strategy, a shared vision for the future of Utah. A wide range of quality-of-life measures were projected for each scenario that allowed participants to understand the consequences of the land-use and transportation strategies embodied in each scenario. The 2015 Envision Utah’s “Your Utah, Your Future” process included eleven topic areas and each issue area had three to five scenarios that presented alternative sets of choices and outcomes for that topic and modeled those out to 2050. These scenarios demonstrated specific implementation strategies and options that reinforced long-term vision goals in light of future uncertainties.

VTRANS2040 SCENARIO ANALYSIS

VIRGINIA OFFICE OF INTERMODAL PLANNING AND INVESTMENT



Problem or Driving Issue:

Virginia's multimodal long range plan for 2040 acknowledges that projecting current trends beyond 10 years doesn't account for changes to values, travel behavior, and the global economy. Therefore, the 2040 component of the plan incorporated scenario-based analysis. The analysis combined alternative assumptions for each of four types of drivers: demographic and social changes, economic changes, influences of technology, and energy and environment considerations. The results of the scenario analysis are being used to gauge the resilience of the transportation investment plan and to identify policy recommendations that address the implications of the scenarios.

Summary:

The VTrans2040 scenario analysis used a sketch planning, data-driven quantitative and qualitative approach. For each scenario driver, the project team pulled from existing and new research, expert panels, focus groups and other public outreach to develop scenario assumptions and alternatives. Scenario components included different development place types, population generational variations, different job industry types and growth rates, and related differences reflecting specific geographies and influences on travel behavior. To address technology drivers, the analysis included extensive research on

autonomous and connected vehicles and related topics such as mobility-on-demand services. This research provided insights on specific components of future travel demand that the technology drivers would likely affect, allowing for the project team to incorporate assumptions into each of the scenarios.

Process Goals:

Informational/Exploratory and Decision Support

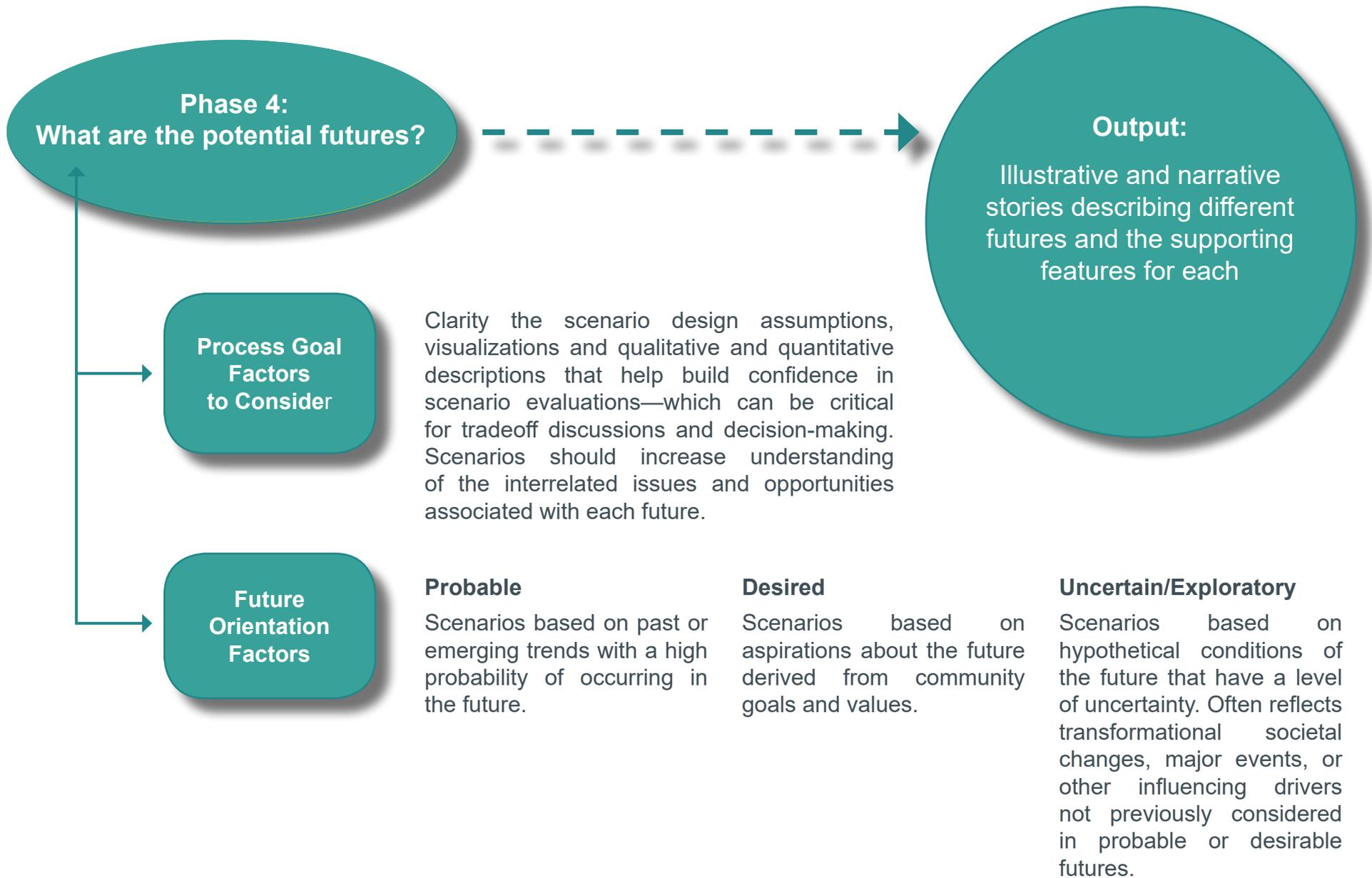
Futures Orientation:

Desirable and Uncertain

Scenario Process Outcomes:

Scenario Process Outcomes: The scenario planning effort will conclude in 2017 with an interactive, web-based exercise that provides information and gathers input from the public on the most pressing driver opportunities and threats, and what they might mean for investment decisions. This information will be factored into the state plan update process and shared statewide with MPOs that have expressed interest in making use of the research, assumptions and insights for use in their own scenario planning efforts.

FIGURE 8: WHAT COULD THE FUTURE LOOK LIKE?



AUTOMATED VEHICLES/CONNECTED VEHICLES (AV/CV) DEPLOYMENT SCENARIOS

TEXAS A&M TRANSPORTATION INSTITUTE

Problem or Driving Issue:

The transportation industry sought to understand the potential implications of the deployment of autonomous/connected vehicles relative to different rates of deployment over time. Scenarios helped to explore specific actions DOTs might need to take to address infrastructure, operational, and organizational adaptation needs.

Summary:

A strategic roadmap was developed to help state and local agencies explore potential implications of the deployment of AV/CV technology using two extreme, but plausible, scenarios: “Revolutionary” and “Evolutionary.” To measure possible impacts, several “influencing areas” were identified, including society, technology, economy, and policy. For each influencing area, factors and projection metrics were developed to evaluate outcomes under the two scenarios. Reactions to scenarios were gauged and potential organizational changes were evaluated to help design a set of next steps for agencies looking to prepare for these emerging technologies.

Process Goals:

Informational/Exploratory

Futures Orientation:

Uncertain



Scenario Process Outcomes:

This process was a research effort that can be utilized by MPOs or other transportation agencies seeking information on plausible futures concerning the deployment of AV/CV technology. It included information on potential areas of policy change, design, and operational strategies in response to the two AV/CV deployment scenarios to help transportation agencies be better prepared in the face of uncertainty.

CENTRAL NEW MEXICO CLIMATE CHANGE SCENARIO PLANNING PROJECT (CCSP) US DOT VOLPE NATIONAL TRANSPORTATION SYSTEMS CENTER AND THE MID-REGION COUNCIL OF GOVERNMENTS (MRCOG)



Problem or Driving Issue:

With a strong growing region, local community members sought to identify a plan for more sustainable growth that would help mitigate factors contributing to climate change. Additionally, the region continues to experience impacts of climate change and therefore wanted to better understand how future growth could be oriented to adapt to those changing conditions.

Summary:

The Central New Mexico region is an environmentally delicate area that is greatly affected by climatic extremes such as heat waves, droughts, and floods. This area is additionally experiencing significant population growth, which is expected to continue. To support the sustainability of this sensitive region, the MRCOG undertook a scenario planning process, supporting the organization's metropolitan transportation plan, to identify new actions

or strategies to help achieve community sustainability goals, reduce carbon emissions, and prepare for the likely challenges associated with climate destabilization.

Process Goals:

Informational/Exploratory and Decision Support

Futures Orientation:

Desirable, Probable

Scenario Process Outcomes:

The CCSP process elevated the discussion of climate change in the region and strengthened support for stronger land use and transportation integration. Stakeholders recognized that more analysis on specific climatic impacts may be needed to further inform policy changes over time.¹⁷ While the trend scenario assumptions were ultimately used in the development of the Futures 2040 Metropolitan Transportation Plan, plan incorporated several new strategies to support long-term achievement of the preferred scenario as identified by the public and stakeholders which also includes more cross-agency coordination and efforts to achieve shared goals.

¹⁷ Rasmussen, B.K., et al. (2015). "Integrating Climate Change in Transportation and Land Use Scenario Planning: An Example from Central New Mexico." U.S. Department of Transportation, Washington, DC.

FIGURE 9: WHAT ARE THE IMPACTS OF EACH FUTURE?

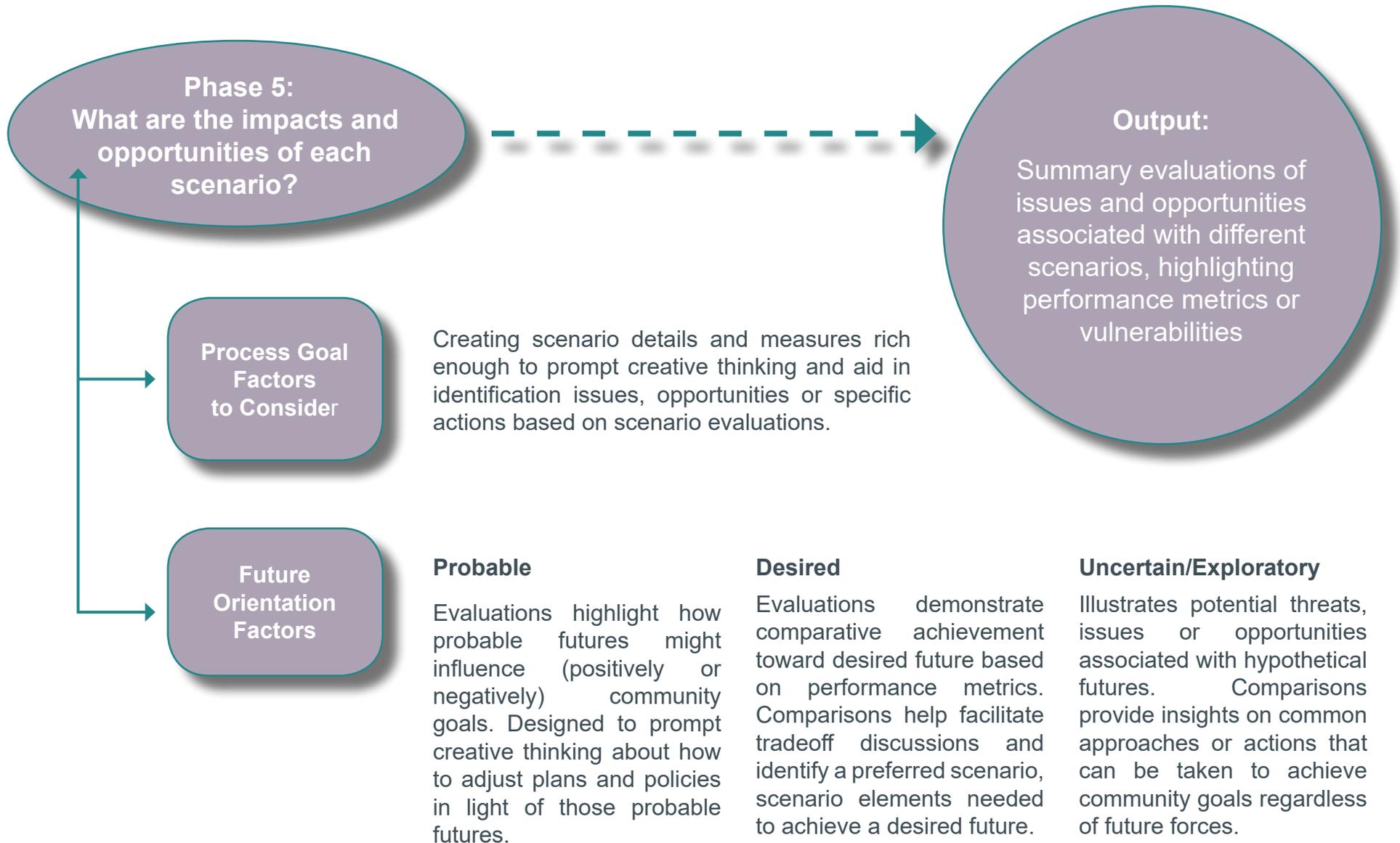
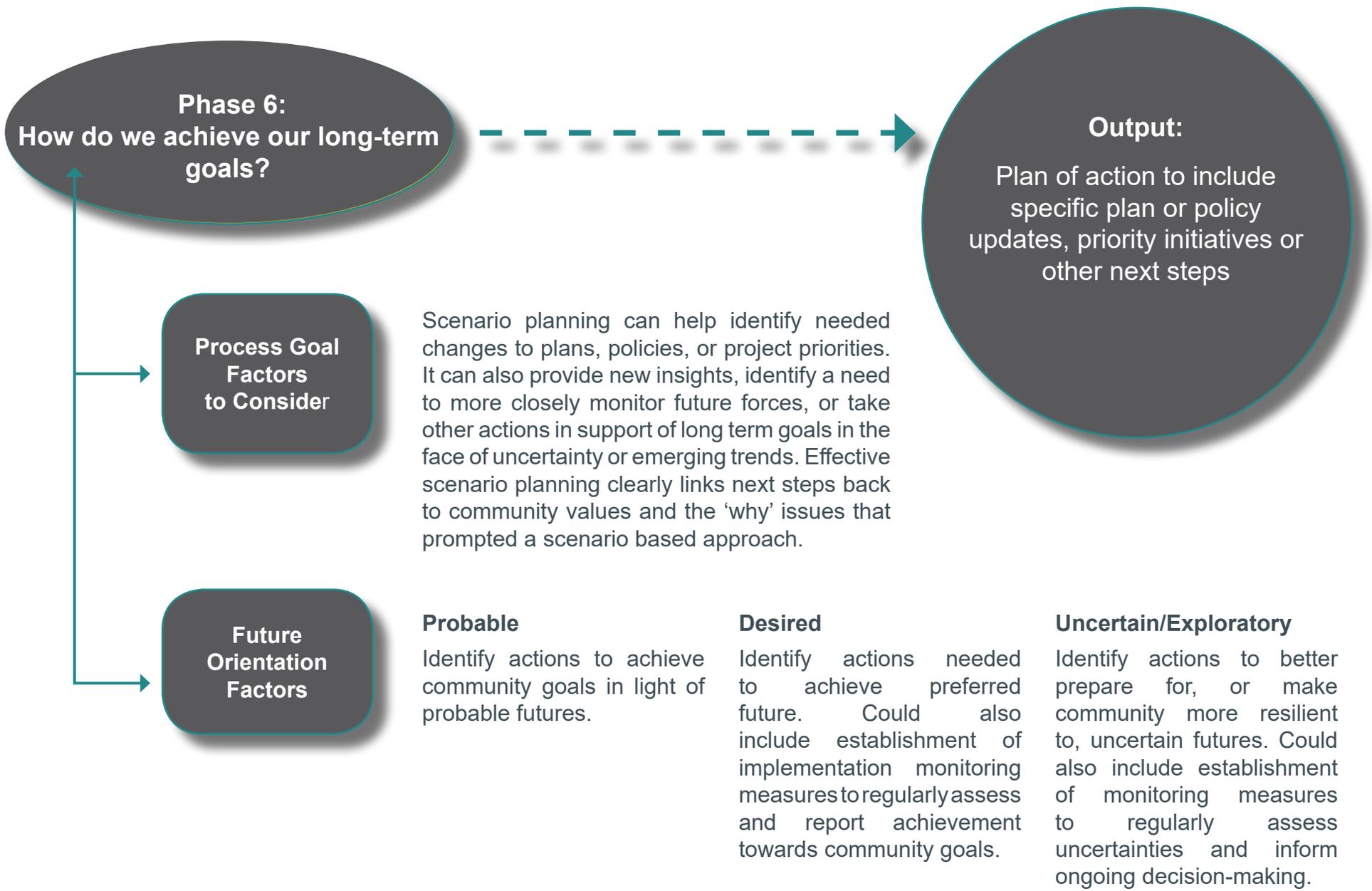


FIGURE 10: HOW DO WE ACHIEVE THE FUTURE WE WANT?



CONCLUSION

Scenario planning is an effective technique to support a range of transportation planning needs. As described throughout this guide, it is an effective method to address future uncertainty, build consensus around desired futures, and support more informed decision-making. It can help community members, transportation practitioners, and elected officials identify transportation needs and prioritize transportation investments considering different futures — whether desirable or uncertain. It helps to integrate transportation into broader community goals and engage more diverse stakeholders into a process of knowledge exchange and consensus building. It provides a method to prompt creative problem solving and ensure that the plans adopted today reflect a more informed view of what might be possible or what might be desired in the future. Most importantly, it is an approach that helps everyone strengthen his or her skills in futures thinking¹⁸, which is increasingly becoming an important element of planning.

Yet scenario planning is also a technique that has a time and place within the larger context of transportation planning. Its use should be prompted when the community issues, concerns, or challenges warrant the approach. It should be scoped in a way that sets expectations with stakeholders and the public about the outcomes of the process and how it will, or will not, be used to influence decision-making, potential policy changes, or drive implementation efforts. As demonstrated by its use by local governments, MPOs and DOTs nationwide, scenario planning appears to be here to stay as an enhancement to the traditional transportation planning processes. Efforts by U.S. DOT, non-profits, researchers and transportation practitioners continue to contribute to best practices, particularly in advancing access and interoperability to tools and establishing the causal relationships between future uncertainties and implications to transportation planning that are likely to emerge. The guide's appendix provides additional references and resources pointing to key documents, research, and other guidance on scenario planning.

¹⁸ Futures thinking stands in contrast to forecasting. The former considers multiple outcomes for multiple time periods, and the latter is limited to a single prediction and time period.

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SUGGESTED WEBSITES

Colorado State University Scenario Planning Institute: <http://scenarioplanning.colostate.edu/>

FHWA, PlanWorks: <https://fhwaapps.fhwa.dot.gov/planworks/>

FHWA, Scenario Planning and Visualization: http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/

FHWA’s Office of Planning, Environment, and Realty – [Geographic Information System \(GIS\) Clearinghouse](https://www.gis.fhwa.dot.gov/): <https://www.gis.fhwa.dot.gov/>

FHWA/FTA’s Transportation Capacity Building Program – [Scenario Planning](https://www.planning.dot.gov/scenario.asp): <https://www.planning.dot.gov/scenario.asp>

Lincoln Institute of Land Policy: www.lincolnst.edu

National Cooperative Highway Research Program (NCHRP) [750 Foresight Series](http://www.trb.org/Resource.ashx?sn=n20-83B): <http://www.trb.org/Resource.ashx?sn=n20-83B>

[IntroductiontotheReportsWEB2](#)

Scenario Planning Applications Network (SPAN): <http://scenarioplanning.io/>

Sonoran Institute: www.sonoraninstitute.org

NEXT GENERATION SCENARIO PLANNING:
A TRANSPORTATION PRACTITIONER'S GUIDE



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