

HOW TO USE

Exploratory Scenario Planning (XSP)

Navigating an Uncertain Future

ABOUT THIS PUBLICATION

This comprehensive manual demonstrates how to use exploratory scenario planning (XSP) to build collaborative capacity to adapt to rapid urbanization, the effects of climate change, economic volatility, inequity, and other forces within or beyond our control. Scenario planning can help communities deal with uncertainty by envisioning variations on what might occur to prepare for what ultimately does occur. Whereas traditional, or normative, scenario planning can help determine a desired future and set an action plan, exploratory scenario planning recognizes that the future is uncertain, considers a range of possible futures, and crafts an adaptive management plan that actively responds to changes on the ground as the future unfolds.

Designed for urban planning professionals, government officials, students, and scholars, this handbook defines XSP and its applications, guides the reader through a step-by-step process, and recommends best practices. Case studies illustrate practical lessons learned from previous applications of the process, showing planners how to use XSP most effectively. Sample workshop agendas and templates enable practitioners to create exploratory scenarios, analyze outcomes, and develop robust strategies for the future.



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Back Cover:

Faith Sternlieb facilitates action planning for a team from Casa Grande, Arizona, at the Growing Water Smart Workshop in February 2020. *Credit: Diego Lomelli Trejo*

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Executive Summary



In an era of unprecedented uncertainty about the future—whether due to climate change, rapid urban development, technological advancement, economic downturn, or other factors—urban planners and government officials face new challenges. They must create actionable, politically feasible blueprints that help communities and the systems they rely on adapt in sustainable and resilient ways to physical, fiscal, and social forces beyond their control. Indeed, trends of the past are no longer reliable predictors of the future and the pace of change can be impossible to anticipate, which makes effective urban planning more complex—and community collaboration more critical—than ever before.

City council member Dick Powell (Casa Grande) passes the mic back to Marjo Curgus (Del Corazon Consulting) after delivering the Casa Grande team's message and call to action at the Arizona Growing Water Smart Workshop in Phoenix, February 2020. *Credit: Dakin Henderson*

Originally developed in the mid-20th century for military and corporate strategizing, scenario planning has evolved to help urban planners address issues as diverse as water and land use, transportation management, regional growth, and climate resilience. Cities and other regional entities now regularly use scenario planning, either as a stand-alone exercise or by integrating it into traditional urban planning to aid visioning, knowledge exchange, and consensus building.

Distinct forms of scenario planning have emerged to guide different types of processes, depending on a community's needs, availability of data, and other factors. **Exploratory scenario planning** helps urban planners prepare for probable, desired, and uncertain futures by guiding practitioners to consider possibilities of what might happen to prepare for what ultimately does occur (FHWA 2017). The more traditional **normative scenario planning**, for instance, identifies a desired end state and guides participants in achieving their aspirations. Such plans, however, can quickly become irrelevant in future social, environmental, population, and market changes—and planners must be able to adapt quickly.

The focus of this manual, exploratory scenario planning (XSP), has emerged as a way to prepare for uncertain futures like those projected for climate change, automation, and human migration. By exploring the driving forces and implications of multiple futures, XSP can help participants prepare for any and all of them. Rather than relying on a single vision of the future, practitioners develop distinct potential futures (scenarios), strategies to deploy, and indicators to signal the time to pivot or adapt. Through this process, communities can identify the actors, strategies, contingency plans, and collaborations that will be required to respond to possible futures and adapt to changing conditions in real time.

Because it encompasses possibilities, rather than relying on assumptions, XSP can enable communities to generate robust plans that account for a wide range of possible futures—even when those futures lie at opposite ends of the spectrum of possibility. It can support early stages of a strategic planning process by helping participants clarify the issues, develop the most effective strategies, and identify contingency plans that need to be more broadly developed. It can also test existing strategies against one or more futures.

XSP explores the root drivers, or causes, of possible futures, which allows planners to prevent major problems from escalating. It includes outside stakeholders for greater buy-in for eventual implementation, which further helps build the community's adaptive capacity and resilience. Ultimately, whether it is integrated into a traditional planning process or is deployed as a stand-alone effort, XSP encourages consideration, collaboration, and consensus to help people and organizations prepare most effectively for whatever lies ahead.

This manual is a comprehensive resource for organizations interested in using XSP at the organizational, local, or regional level. After chapter 1 introduces the process, its history, and its contemporary applications, chapter 2 guides the reader step-by-step through a prototypical XSP process, presenting best practices and lessons learned from previous applications. Though the details can vary, XSP usually involves a series of discussion-based workshops and is facilitated by a core leadership team that engages a wider group of stakeholders.

In the model laid out here, project leaders begin by developing a focal question for the XSP process to answer, such as “How can we best adapt our economy to thrive alongside the impacts of climate change?” The stakeholder group—including representatives from groups outside government and without traditional urban planning backgrounds—then comes together for the first workshop. They assess the driving forces that shape the future, identify critical uncertainties about their community’s future, and decide which factors should be considered in the scenario exploration.

Next, project leaders develop approximately four descriptive, memorable, and distinct visions of the future, known as scenario narratives. Participants then explore these scenarios at a second workshop and devise *robust* strategies, which apply to all scenarios, and *contingent* strategies, which apply only to specific scenarios. The resulting strategies can then be folded into formal plans and revised for practical application.

Chapters 3 and 4 cover detailed case studies in which XSP was used by U.S. urban planning entities. Chapter 3 concerns three XSP projects in Colorado piloted by a joint program of the Lincoln Institute of Land Policy and the Sonoran Institute. In the Keystone Policy Center’s 2017 Colorado Water and Growth Dialogue, participants determined how changes in urban form and landscaping practices could help the Front Range region meet growing urban demand for water. The Denverlight update to the City and County of Denver’s integrated transportation and land use plan, also in 2017, used XSP to explore how the city could better serve its residents over the next 25 years. Last, the City of Fort Collins used XSP to develop its first Municipal Sustainability and Adaptation Plan, which included considerations of how the city could sustain services and thrive despite the uncertainty and impacts of climate change.

In chapter 4, additional case studies show how uniquely suited XSP is to handle disparate projects, purposes, and urban planning needs. Though all cases include the participation of a broad base of stakeholders in a formal process with quantitative inputs and technical planning tools, each used XSP differently and for different reasons. The University of Arizona’s Water Resources Research Center’s 2014 XSP exercise developed scenarios for the Upper Gila Watershed to help preserve the rural region’s agricultural lifestyle, with creative diagrams that map the many uncertainties under consideration. In 2016, the Atlanta Regional Commission (ARC) launched an XSP process to further develop the Atlanta metropolitan area’s newly adopted regional plan, particularly in its analysis of transportation trends; ARC also incorporated an innovative framework to help participants consider more factors without feeling overwhelmed. Last, the National Center for Smart Growth’s 2018 XSP process used advanced data analysis to stimulate a conversation about sustainability in the Baltimore–Washington region.

Finally, chapter 5 provides guidance and recommendations based on the assorted case studies. The appendixes provide suggested workshop agendas, procedural guidance, and templates for creating exploratory scenarios and analyzing outcomes.

Intended for audiences both new to and familiar with urban planning processes, this manual shows how XSP can play a critical role in local and regional planning. It arms would-be practitioners with the background knowledge, procedural guidance, practical strategies, and key lessons learned to use this tool successfully. It prepares readers to facilitate—or even lead—an effective, impactful XSP process in their own contexts.

CHAPTER 1

Exploring Scenario Planning



Jeremy Stapleton facilitates action planning with a team from the City of Avondale, Arizona, at the Arizona Growing Water Smart Workshop in Phoenix, February 2020. *Credit: Diego Lomelli Trejo*

This chapter provides an overview of the practice of scenario planning, its history, and its typology before delving into exploratory scenario planning (XSP) more specifically. It then covers use cases of XSP to help practitioners determine how best to apply it.

What Is Scenario Planning?

Accelerated urban growth in recent years has made effective and resilient planning more complex—and collaboration more critical—than ever before. Given the pace of climate change and technological advancement, communities face a host of unknown and uncontrollable forces that will influence the environment, the economy, political and social conditions, and the quality of life. Trends of the past are no longer reliable predictors, so professional planners must look ahead and prepare for increasingly uncertain futures.

The goal of planning is to set a course for a community's best possible future. Scenario planning can take many forms, but its core purpose is to empower communities to plan for an uncertain future by exploring multiple possibilities of what might happen. Developed in the 20th century for military and corporate strategies, scenario planning has evolved to aid planning in diverse fields for a wide range of situations and issues, including water, land use, transportation, regional growth, and even global preparedness in cases of war, climate action, or other world challenges. In adopting the practice for use in city, rural, and regional plans, urban planners have combined it with traditional planning methods like visioning and consensus building and have developed metrics and indicators to better track and revise their strategies.

Scenario planning accounts for even the best laid plans likely being disrupted by driving forces such as climate change, mass migration, economic and political volatility, and other chronic stressors (e.g., health conditions; racial, gender, or economic inequality; and food or housing insecurity) and acute shocks (e.g., natural disasters, terrorism, pandemics, and economic crashes). Scenario planning offers a relatively quick and inexpensive way to build consensus and capacity for resilience. It also empowers professional planners by giving them an awareness of the different ways the future may unfold for their communities—regardless of their scale or resources.

What Is Exploratory Scenario Planning?

People who are intimidated by the classical scenario planning approach—who say, “I can’t possibly do that because I don’t have a million dollars and two years”—find great value in XSP, which allows for exploratory scenario planning for the future in smaller places, on smaller budgets, and at smaller scales.

—Armando Carbonell, vice president of programs,
Lincoln Institute of Land Policy

Distinct forms of scenario planning have emerged to guide different types of processes, depending on a community's planning needs, the availability of data, and other factors.

Normative scenario planning is more traditional and focuses on how to achieve a desired end state, weighing community values alongside policy objectives to gain consensus on a direction for a community's future.

Predictive scenario planning analyzes past patterns to forecast the future and develops a plan to organize and invest resources to achieve that agreed-on vision.

Yet, as the future unfolds with its myriad social, environmental, and market changes, such plans can quickly become irrelevant. Unintended or unexpected futures (like COVID-19) catch planners off guard, rendering their communities vulnerable to forces a more effective planning process could have helped them adapt to.

By contrast, **exploratory scenario planning (XSP)** focuses on the implications of different futures. Rather than relying on a single vision of the future, XSP envisions multiple possible futures—desirable and otherwise—and provides a process for assessing how best to prepare for the uncertainties at play while pursuing an overarching vision. Through this process, communities can identify metrics and prepare contingency plans for the plausible ways the future might unfold—and they can adapt to changing factors in real time.

Exploratory scenario planning has emerged as a way to contend with uncertainty and develop effective, long-term responses. Simply put, the practice guides planners, community members, and other stakeholders through the practical considerations of various futures, often incorporating input from diverse stakeholders and other data to inform decision making.

Exploratory scenario planning envisions multiple possible futures—desirable and otherwise—and provides a process for assessing how best to prepare for the uncertainties at play while pursuing an overarching vision.

A budding best practice in public planning, XSP can enable communities to develop robust and effective plans that account for a broad range of plausible futures, over the short or long term. XSP can be especially useful at the beginning of a comprehensive, long-range, or strategic planning process to clarify the issues to consider and develop optimal strategies and contingency plans. It can also be used during the planning process or after it is completed to test strategies against future scenarios or to build consensus on how to implement them. As Miriam Gillow-Wiles, executive director of the Southwest Colorado Council

of Governments, notes, “It gives us a good if-then. We don’t have that in traditional planning. We’re good at making plans and putting them on the shelf. Having multiple scenarios gives us a chance to adapt as the world changes” (Gillow-Wiles 2018). XSP can also build “analytical and social” capacity among participants (Bentham 2017).

XSP is at its best when involving the individuals, agencies, and organizations responsible for implementing solutions, tracking progress, and improving performance. Whether XSP is integrated into a larger planning process or undertaken as a stand-alone effort, it encourages consensus and collaboration to mitigate problems and adapt to forces that determine our futures.

From War Games to Corporate Board Rooms

Scenario planning emerged after World War II, as the U.S. military sought to determine what its opponents might do and to prepare contingent strategies to combat threats and seize opportunities. In the ensuing decades, the United States and other countries began to use scenario planning to support military planning and operations and to consider possible paths that armed conflict or nuclear proliferation might take.

In *The Art of the Long View: Planning for the Future in an Uncertain World* (1991), Peter Schwartz recounts the legacy of Herman Kahn, a futurist, military strategist, and systems theorist who had been part of that early U.S. military effort. Kahn became a leader during the 1960s in using game theory to develop scenario planning during the Cold War for the RAND Corporation. Kahn later was also instrumental in refining scenario planning as a tool for business strategy (Schwartz 1991).

Pierre Wack and other planners in the London offices of the international oil company Royal Dutch Shell expanded the use of scenario planning in the business world throughout the early 1970s. The firm began developing scenarios about forces that could affect the future availability and price of oil—a strategic commodity—and included the plausibility of oil price shocks caused by disruptions of Mideast oil pipelines. Planning through these scenarios led the firm to begin making investments elsewhere to gain a competitive advantage in the global energy market. Indeed, when the Arab oil embargo occurred, Royal Dutch Shell was well positioned to respond, and it eventually became one of the world’s largest and most profitable oil companies.

A researcher, futurist, and scenario builder at the Stanford Research Institute, Schwartz joined Royal Dutch Shell’s Planning Group in the early 1980s to continue Wack’s work; in 1987, he cofounded the Global Business Network, a think tank and consultancy that worked with businesses, governments, and nongovernmental organizations using scenario planning as a strategic management tool. Among other accomplishments, after Nelson Mandela was freed from prison, in 1991 and 1992 the Global Business Network facilitated the Mont Fleur scenarios in South Africa, which stimulated debate about what the nation could be like a decade later. (In 2000, the Monitor Group acquired Global Business Network, which ceased to be an active entity following its subsequent acquisition by Deloitte in 2013.)

Today, Royal Dutch Shell continues to use what-if scenarios to rehearse plausible futures and plan for challenges. According to its website, scenarios “stretch our thinking and help us to make crucial choices in times of uncertainty and transitions as we grapple with tough energy and environmental issues” (Shell Global 2019). The RAND Center for Gaming also promotes the use of interactive scenario-based war-gaming to

improve decision making for public policy beyond national security strategy and defense planning. RAND’s website (RAND Corporation 2019) notes that climate change is a likely subject for scenario planning: it entails multiple stakeholders, deeply conflicting interests, and huge contrasts between short- and long-term perspectives. Various *Fortune* 500 companies also use scenario planning to adapt and compete.

As a best practice adapted from these sectors, XSP can help ensure that strategic urban planning processes result in forward-thinking operations in government and public policy. For example, metropolitan planning organizations (MPOs) have used scenario planning for decades to integrate transportation and land use planning. The Federal Highway Administration recommends using exploratory scenarios to analyze the health, transportation, livability, economics, and land use forces that will affect communities in the future, and its 2016 *Next Generation Scenario Planning* specifically incorporates XSP as an approach (FHWA 2017).

A New and Different Planning Approach

Significant events—like the Great Recession, catastrophic weather, and climate change—often cannot be predicted in advance, so planners do not prepare for them. XSP in its design addresses this reality and helps plan for uncertain futures. Unlike normative scenario planning—which asks stakeholders to envision the future in order to develop a plan that realizes it, taking a predict-and-plan approach to the community’s future—XSP asks what factors might disrupt that vision, which indicators will signal disruptions, and how to mitigate those disruptions. Participants can design and select solutions that promote the futures they want, prevent those they fear, and prepare for

those that may be inevitable. The process can also identify metrics to signal when to evolve plans and deploy contingent strategies allowing for adaptation as the future unfolds. Because the approach helps identify which strategies will be effective across most plausible futures, planners can invest resources with more confidence in their solutions.

XSP engenders a set of robust strategies effective across the entire range of scenarios considered and a set of contingent strategies to address and adapt to uncertain forces as they shape the future. Priority adaptation strategies often lie within political, economic, social, technological, legal, environmental, and demographic (PESTLED) categories. In the Intermountain West, for example, critical and uncertain factors include extreme drought, wildfire, flooding, population growth, an aging populace, and local and regional economies. These economies in turn depend on water supplies susceptible to shortages and managed by complex interstate compacts that allocate more water than what is available. Communities without diversified supplies, then, would be wise to plan for situations in which their anticipated water supply fails to materialize or becomes unaffordable.

Also, unlike predictive scenario planning, which extrapolates past and present trends to predict the future, XSP explores alternative futures through an interactive process defined by unknowns and by what might be required to achieve community goals. That allows stakeholders to identify adaptation strategies and contingency plans—and recognize when to implement them. Ideally, the process identifies the root drivers, or causes, of problems and leads to the design of systemic solutions that eliminate the causes rather than mitigate the symptoms of undesirable conditions. Immediately communicating these solutions to policy makers and implementation teams allows them to begin planning. XSP can help prepare for foreseen forces beyond the community's control and be a preventive



Ralph Marra of Southwest Water Resources Consulting leads a discussion during a plenary session of the Colorado Water and Growth Dialogue. *Credit: Jeremy Stapleton*

tactic guiding how a community invests resources and adapts to changing realities.

A successful XSP process engages multiple stakeholders, including those with conflicting interests and perspectives, to share information and establish a collective awareness of key drivers of change and how they could affect the future. As participants define various plausible futures, the process helps them understand each other's thoughts, fears, and hopes for the future without having to designate a single "correct" perspective. Expert opinion and data may inform discussions and establish common foundations, rather than forcing commitment to a shared vision—although such a commitment could emerge from the process. Software tools can support XSP by tracking large amounts of information, leveraging data, and quantifying or mapping various elements of a community's natural environment, social community, or physical infrastructure.

This transparent, responsive approach to fostering dialogue and developing action plans works well for building consensus, creating contingency plans, and establishing systems of mitigation and adaptation that support preparedness and resilience. XSP participants often cite dialogue and exchange of perspectives among stakeholders—establishing common awareness or even common ground—as a valued component of the process.

How Is XSP Used?

XSP addresses planning practitioners' increasing understanding that experience confirms that disruption happens:

- the biggest uncertainties we face are both acute (such as weather, economic recession, or security threats) and chronic (such as climate change, public health, automation, education, or income gaps); and
- solutions require collaboration on local, regional, and global scales.

The U.S. National Park Service uses XSP to prepare for potential and actual impacts of climate change on infrastructure, wildlands, visitation, and other aspects of managing public lands (Mow 2015). Other agencies use it to explore investments in energy, transportation, economic development, and organizational capacity and make plans for sustainability and resilience. XSP provides a framework and a process for asking what-if questions and for exploring the trade-offs of decisions. To guide participants in selecting the best solutions for their community, the economy, and the environment, it also supports inclusive processes that are driven by a triple bottom line (promote people, the planet, and prosperity).

The XSP process develops narratives of plausible futures that can—ideally with little revision—remain relevant over the planning horizon, which can be short-term, between updates of long-range strategic plans, or long-term, stretching decades into the future. Though especially useful at the beginning of a planning process, XSP also may be used to test established strategies against a range of future scenarios, particularly if performance metrics and indicators are tracked. That testing can enable agencies to proactively adapt their policies, practices, programs, and plans as conditions change, providing for ongoing engagement and periodic plan updates.

For example, local and regional planning efforts often use normative and predictive scenario planning to compare futures using projections and proposed actions in response to changes in population, transportation, housing, jobs, and other factors. The process can help determine which development patterns stakeholders prefer, such that they can begin to plan accordingly.

Using XSP to test a development plan against uncertainties the community faces identifies ways to adapt to and mitigate disruption. Stakeholders can assess positive and negative impacts of proposed actions on conditions like traffic congestion, infrastructure costs, air quality, water supply, open space, and affordable housing and consider how they hold up to forces beyond the community's control. Such tests foster the design of robust strategies that best serve the community's values and goals.

The XSP process can also be applied to public dialogue or used to enhance organizational capacity. Planners can use XSP to engage stakeholders in critical and expansive thinking, making their work more understandable to community members and garnering support for and participation in implementing their plans. Engaging top decision makers and key staff can expose and address cultural constraints, clarify trade-offs of decisions, and empower stakeholders to ask necessary questions and act with broader awareness.

Thinking about the future before it arrives can help us make decisions today that will perform better over time by: 1) providing insight into the forces that shape the system; 2) revealing implications of following the status quo; 3) exploring possible futures; and 4) illuminating options for action (Water Resources Research Center 2020).

In 2013, a joint program of the Lincoln Institute of Land Policy and the Sonoran Institute began applying XSP to community planning in order to better understand the value of the planning process and how to make it more accessible.

The impacts of climate change are already visible on farms and ranches and in neighborhoods. Endless debate and inaction allow critical vulnerabilities to remain that affect individuals and then scale to unravel societies. XSP can help find common ground on debated topics. The XSP process fosters an exchange among stakeholders who will be affected by forces shaping the future and the design of collaborative solutions that can mitigate fears and promote desired conditions.

The resulting initiative introduced XSP to local and regional planners to help communities anticipate and adapt to future events and conditions and become more resilient. It enhanced long-term planning efforts despite the existence of multiple stakeholders, controversial issues, and uncertain futures. Chapter 3 discusses the program's processes and outcomes in more depth.

CONSORTIUM FOR SCENARIO PLANNING

The Consortium for Scenario Planning is a community of practice that fosters the adoption and advancement of scenario planning at all scales. Through research, peer-to-peer learning, networking, training, and technical assistance, the consortium helps communities develop better plans to guide actions ranging from climate change adaptation to transportation investment. In addition to planners, it also convenes researchers and software providers to develop more effective tools and reduce barriers to entry in the field.

Established in 2017 by the Lincoln Institute of Land Policy, the consortium envisions a world in which communities are able to navigate uncertainty and complexity and invest in the most effective methods to pursue a prosperous, equitable, and sustainable future. Participants include rural, city, county, and regional planners; urban managers; developers of scenario planning tools; and academics. Activities include working groups, educational programming, and an annual conference.

Consortium leadership reviewed and contributed to this publication. For more information, visit www.scenarioplanning.io.

XSP FOR GLACIER NATIONAL PARK

Jeff Mow, the 22nd superintendent of Glacier National Park, has used XSP since 2010 to prepare for the impacts of climate change on park infrastructure, land management, and visitation policies. In his 2015 TEDx Whitefish talk “Managing Complexity and Uncertainty in the Face of Climate Change,” Mow relates how XSP has helped the park plan for an uncertain future:

In July 2008, Glacier National Park had flooding two to four inches deep across a quarter mile of road near the glacier, and we had to close the park in the middle of visitor season. This was the first time we had to do this. Normally we get floods with heavy rains in late fall or early spring. When the flood receded, we noticed the road was okay, with no erosion. We asked ourselves, “Was this a one-off?”—but the flooding became a pattern over several years. The weather service told us the flooding was due to weather events, but we realized the flooding was happening on the sunnier, warmer days. Was it due to the glacier melting? We realized we were in a new era—a no-historical-analogue future was right in front of us.

Some takeaways: Prepare for the unexpected. History may not necessarily be our guide to the future. We’re starting to see events with respect to climate change that are outside the realm of the variability we’re used to. Organizationally, how can we be more flexible in the face of climate change and its increase in variability? It’s also important to recognize that we don’t know the answers to some of the change we may be seeing, and an interim solution might be needed until we understand what’s going on. It’s one thing for your organization to make this shift, but it’s another to bring the public along. Planning for complexity and uncertainty is the biggest challenge.

It’s one thing for your organization to make this shift, but it’s another to bring the public along. Planning for complexity and uncertainty is the biggest challenge.

How do we navigate this no-historical-analogue future? At the National Park Service, we realize climate change is the biggest challenge coming at us. Uncertainty can be managed in different ways. In situations with high levels of uncertainty where we have very little control, we’ve used scenario planning to think about the multiple plausible futures.

In 2010, we began exploratory scenario planning at Glacier National Park. At its heart, the process is not forecasting the future but coming up with a range of futures. We looked at some uncertainties we knew the least about: temperature and precipitation patterns. We identified three patterns: Climate Complacency, with not a huge change in range of variability; Colorado Creeps North, where the climate looks like Colorado’s with a lot of variability from year to year; then, Race to Refuge, with a lot of fast-moving change. We started looking at decisions we could make now to prepare for each of these. We developed three hedge-your-bets scenarios of equal proportions—and some scenarios with a core and satellite decisions. We prepared “Going to the Sun Road Corridor” preliminary-concept scenarios, including ones that provide great flexibility in the face of uncertainty with visitation, technology, and the climate itself. As I think about staffing and infrastructure, I’m thinking about these scenarios. Organizationally, scenario planning is important to avoid management surprises—thinking about and rehearsing the future to avoid surprises.

Glacier National Park has 2.5 million visitors a year, so we really have a bully pulpit to talk about climate change. If you look at what’s happening, it can be a downer, and we want to communicate a message of hope and the possibilities. And that’s where scenario planning helps us talk about climate change with the public. My mentor some 20 years ago told me to [be aware of planning challenges] in the face of climate change, where there is so much uncertainty. He understood there was going to be more and more ambiguity in the ways we do our job and less and less certainty. Scenario planning helps us feel comfortable with working in the gray, with a lot of possibilities for the future. (Mow 2015)

CHAPTER 2

Designing and Facilitating an XSP Process

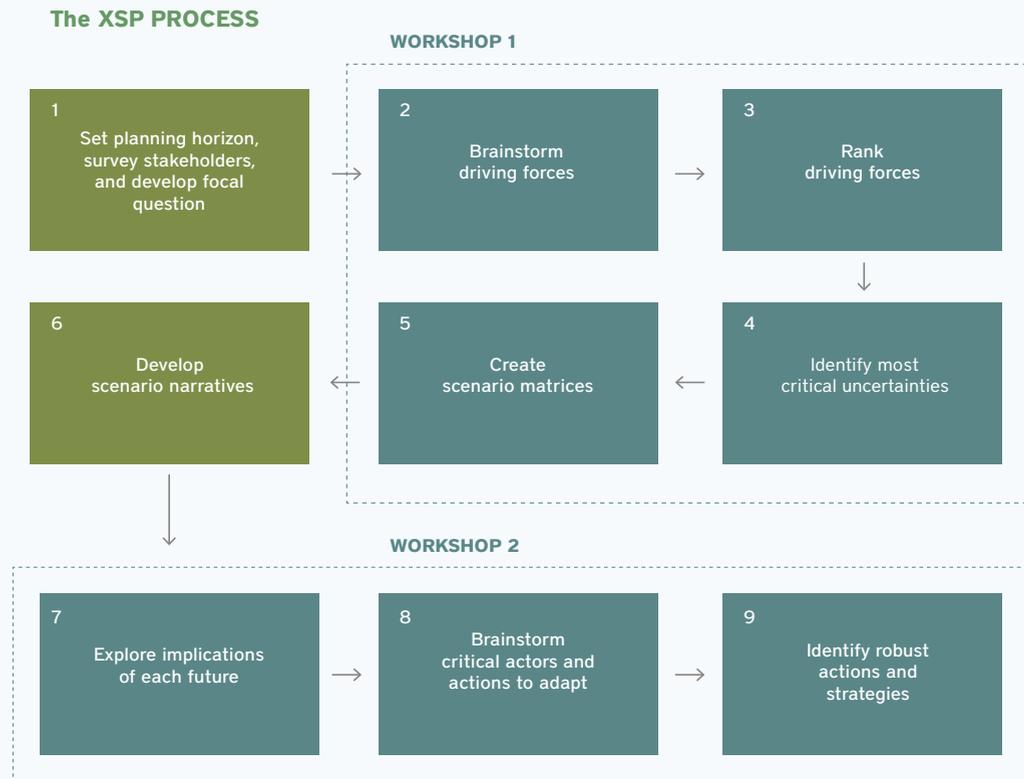


City of Avondale, Arizona, staff share their messaging for rallying around their Growing Water Smart action plan at the Arizona Growing Water Smart Workshop in Phoenix, February 2020. Credit: Dakin Henderson

This chapter provides a step-by-step guide to designing and facilitating an XSP process (figure 1) and discusses best practices and lessons learned from case studies with communities in Colorado that use XSP to adapt to ongoing growth, volatility, and climate change.

Figure 1

The Typical XSP Process of Two Workshops, Framed by Careful Preparation and Agenda Setting



Preparation

A typical XSP process requires a core project team—which should include the sponsoring agency, department, or organization; senior planners; and a formal XSP facilitator—to oversee and manage the process. A larger steering committee composed of key individuals and representatives from stakeholder groups may assume the role of the core project team.

Before the first workshop, this group sets the planning horizon, frames the focal question, and identifies stakeholders. It determines the schedule and location of XSP proceedings and approves the details of each major step, working to maintain team momentum, stakeholder expectations, and overall trust and engagement in the process.

BEST PRACTICES: FACILITATING THE PROCESS

Commit to collaboration.

To create solutions for the future, communities must be willing to commit ample time and resources and to collaborate with relevant departments, agencies, organizations, and stakeholder groups. Those looking to explore and address the root drivers of issues are ready to introduce XSP into their planning process.

Determine how XSP will be used.

XSP can be incorporated into traditional planning and used to refine multiple layers of a planning agenda so that systems are ready, resilient, and prepared to adapt to futures that may unfold. XSP can also be used

for comprehensive visioning or to define specific elements or sections of a plan, such as land use, water, transportation, or economic development, among others. Facilitating or participating in these processes can cause a paradigm shift for daily planning and both personal and professional decision making.

Narrow the focus.

A narrowed focus expedites the process and clarifies stakeholder selection, schedule, and specific actions. Organizers should consider the granularity of detail and spatial distribution desired and compile appropriate data to develop or test plans. An inclusive, qualitative, values-driven dialogue before beginning more complex and technical modeling and analysis avoids wasting time and resources in pursuits that are less resilient and have less resonance for the public.

Scale from local to regional and global solutions.

Working on solutions for one department, organization, or community can aid resilience. Lack of resources and uncertainty regarding the scale of solutions needed to resolve challenges might demand collaboration among a broader set of entities; cities, towns, and counties can achieve efficiencies and economies of scale in this way. If carbon reduction is a way to mitigate climate change, for example, regional approaches likely will have more viability and a larger impact than limiting the scope to one community. If a regional approach is not possible, conducting a local XSP process can establish a precedent that could guide the region toward collaborative action.

Once the leadership team is in place, it establishes a focal question that will frame the project's mission. Time and capacity permitting, project leaders might then convene and interview a working group of stakeholders to incorporate their views to better understand factors relating to the focal question.

Conversation topics to establish the focal question might include the following:

- What keeps us up at night? What do we really need or want to address? What do we need to know to plan and act most efficiently and effectively?
- What interconnected issues do we face, and which of those are priorities?
- What are our core goals? What would be a critical outcome of the process?
- Who are the specific stakeholders we should involve?
 - Who else should be on the steering committee, and who should be in the larger working group? What voices need to be represented in the process?
 - Who should be engaged to help design the process, and how?
 - Which activities (such as interviews, surveys, or focus groups) would produce the type of feedback we need to inform the design of the XSP workshops?
 - Where else in the process should we seek feedback, and from whom?

BEST PRACTICES: CONDUCTING PRE-WORKSHOP INTERVIEWS AND SURVEYS

Conduct pre-workshop interviews with stakeholders and provide an overview of the XSP approach to foster understanding, confidence, and buy-in.

Pre-workshop stakeholder interviews provide context and offer insight into the issues and opinions of various community interests. They can inform the workshop structure and content, indicating common lines of inquiry and gaps in knowledge. Stakeholder interviews can also elicit much of the information needed

to develop scenario narratives, including the context for driving forces of change, reasoning behind the identification of those forces, and the degree to which such forces are certain or uncertain. Facilitators can then clarify and confirm data and findings to reduce the amount of time the workshop must dedicate to identifying drivers. Because discussion is an important way to build relationships, awareness, and consensus, it should not be limited unnecessarily.

Leverage pre-workshop interviews to tailor and expedite the process.

Keep the questions under wraps until the interview to encourage candid responses. Universal participation of stakeholders in the interviews can enhance the effectiveness of the process, but it is often difficult and time consuming to engage all of them individually. The quality of the responses will also vary greatly with experience and command of the subject matter, so interviewing top actors, decision makers, managers, and subject matter experts can provide the most return on time invested. If time is a constraint, focus the workshop on revising and expanding the list of driving forces that facilitators create from interview responses, personal perspectives, and reasoning to build consensus among stakeholders.

Once the team determines a focal question, the working group can use that as a basis for the XSP process to address questions:

- What is certain and uncertain about the future?
- What critical uncertainties determine the most credible, challenging, and plausible range of futures we may encounter?
- Which strategies and actions will work across the range of futures explored?
- How can we individually and collectively put all our preferred actions into place?
- How will we know to pivot, and how might we adapt our strategies as the future unfolds?

BEST PRACTICES: ESTABLISHING A FOCAL QUESTION

Enlist seasoned XSP planning professionals to help frame the focal question.

Groups may have difficulty defining and committing to a single focal question, given all the possibilities and details at hand. Experienced professionals should lead the discussion on the universe of issues and how they interrelate, to expedite the process.

Develop the right focal question to achieve useful results.

Frame the focal question without bias, and create a safe, inclusive place for people to discuss controversial issues. The scope must not be too broad or too narrow. For instance, the Colorado Water and Growth Dialogue XSP process (discussed in more detail in chapter 3) explored the extent to which land use and landscaping practices could close Colorado's projected water gap, but participants identified dozens of strategies outside the bounds of land use and landscaping that would reduce water demand. Participants should be aware that the scale of solutions needed may require more actors and action than originally anticipated. That awareness allows more efficient coordination, collaboration, and decision making.

Scale the process and granularity of the dialogue to the audience and available resources.

Broader focal questions and geographic *scales* tend to result in more complicated processes and vague strategies. Topics and geographies explored in greater *depth*, however, will yield more detailed results. If a project aims to build consensus, capacity, and collaboration, for instance, leaders should design a focal question and a stakeholder group that explore the future from a broader perspective. If issues concern specific spatial distributions, however, leaders might consider using GIS and other technologies to

dig into specifics. The major questions to think about when scaling are what planners need to know and who needs to act on their plans. Working through an internal process with staff can help a community mitigate its carbon emissions, for example, but it will take regional and global collaboration to significantly reduce the local impacts of carbon emissions. XSP can be used to collaborate locally first and then to scale collaborative strategies regionally and globally, and strategies can always be refined later at different scales and granularities within smaller working groups.

After determining the focal question, the core project team designs its first workshop. The team introduces the stakeholder working group to the XSP process and engages technical experts and resources such as literature or videos to provide primers on topics relevant to the focal question. In the case studies detailed in chapter 3, for instance, participants read the primer “Driving Forces of Change in the Intermountain West” published by the Lincoln Institute and Sonoran Institute (Sonoran Institute 2016).

BEST PRACTICES: ENGAGING STAKEHOLDERS

Engage key decision makers and stakeholders. Getting key decision makers like elected officials and department directors actively involved ensures their understanding of and support for action plans, and thus funding and implementation. Project leaders should assemble an interdisciplinary stakeholder group of planners, department leaders, policy makers, and the public but should bear in mind that because staff often defer to supervisors or elected officials, their on-the-ground perspectives may be limited to, albeit representative of, the day-to-day constraints of organizational culture. Including community members may affect the content of the feedback that staff and officials provide, but that is often essential for community buy-in. Gathering representative groups separately to exchange and explore ideas before convening in a plenary workshop may give them more opportunity to contribute, and the plenary session can then provide a reality check and learning opportunities. Inclusion and transparency build trust and buy-in.

Babbitt Center for Land and Water Policy junior fellow Erin Rugland facilitates a Sonoran Institute workshop. Credit: Diego Lomelli Trejo



Invite a diverse set of stakeholders who represent the whole community and its priorities.

The quality of XSP's results is a function of the people in the room. The more balance and inclusion in the room, especially stakeholders who will be affected by policies and plans, the more equity those voices will receive. XSP can be used to convene stakeholders who may have historically been excluded but are fundamental to realizing a plan's success; economic development, for example, is often excluded from land use, water, and transportation planning—but it can make or break any plan. The process also builds relationships, awareness, and adaptive capacity needed for implementing action plans. The stakeholder group will determine how well the resulting plans are informed, supported, and implemented. Outside experts and organizations can present additional perspectives and relevant information; indeed, including such critical stakeholders may further develop the public support needed to garner political will.

Keep stakeholders engaged throughout the entire process.

An XSP process should maintain active engagement of its stakeholders; losing participants between steps in the process can diminish credibility, results, and buy-in. Keeping participation diverse allows different departments or organizations to be productive and challenged at the same time. Splitting up participants taxes the group's cohesion and collaboration. If convening stakeholders for an all-day workshop is not possible, consider separating the work into two half-day workshops. Although face-to-face relationship building and problem solving is unmatched, technology can provide options for virtual stakeholder engagement. When using an app or digital interface to expedite the process and obtain information from people outside the workshop setting, consider convening participants in person at any stage to capture and celebrate the energy created in the workshop.

BEST PRACTICES: CUSTOMIZING THE PROCESS

Accommodate stakeholders.

The XSP process can be optimized and expedited without negative impacts. Well-staffed and well-resourced departments, agencies, and organizations may be able to send staff to multiple all-day workshops, but other stakeholder groups may not be able to do this. In such cases, organizers should consider the location of workshops and travel time for stakeholders and try to accommodate their needs and preferences (see sample agendas in appendix A). The process may also benefit from some work being done outside the workshops. Given the Denveright facilitators' and working group's professional command of the issues, for instance, the typical schedule allowing two months to draft scenario narratives between workshops was reduced to just 10 days. This swift approach reduced the need for additional research with an understanding that the workshop's insights and results would be processed further by staff and consultants as the Denveright plans were developed.

Computer modeling can add complexity and specificity.

If the spatial distribution of resources, land uses, or infrastructure is important to the focal question, such as in the analysis of transportation alternatives, XSP can be used for a qualitative community engagement process as well as for quantitative modeling. The results can inform decisions regarding which scenarios should be modeled and can improve the transparency of the process, thus raising community trust and support for decisions. If modeling is needed, consider the time and resources it will take to design the model using accurate and detailed information. If data, technology, or capacity is lacking, consider collaborating with the county or regional government or local universities to fill the gaps.

Workshop 1

In the first of two workshops, the larger working group investigates the driving forces of change, uncertainty, and disruption related to the focal question. The group exchanges perspectives on conditions, trends, and PESTLED—*political* (e.g., elections, protest movements), *economic* (e.g., the sharing economy, booms and busts), *social* (e.g., lifestyle and activity preferences), *technological* (e.g., autonomous vehicles, artificial intelligence), *legal* (e.g., local, state, federal, or international regulations), *environmental* (e.g., drought, biodiversity, extreme weather), and *demographic* (e.g., migration, aging populations) triggers or game changers.

They then identify root causes of these driving forces to design systemic solutions and avoid merely addressing symptoms. If root causes are unknown or unidentifiable, the group should devise an action plan to identify them, whether through research, community engagement, or other means—but the discussion can continue, taking into account the driving forces as much as possible.

To narrow the project's focus, the group then votes on which key drivers of change to consider, depicted in figure 2. They also define both the critical certainties (what is inevitable and known) and critical uncertainties that could lead to divergent futures. These might be events or actions over which the community has little or no control, or they could be situations that stakeholders could affect through collaborative local action such as advocacy, policy making, or funding changes.

Next, on a chart like the one in figure 3, the working group ranks the driving forces on the basis of level of uncertainty and level of importance to the focal question and to the future. This defines the critical certainties and critical uncertainties inherent in the

key drivers. The critical certainties are set aside for inclusion in the upcoming scenario narratives, and the critical uncertainties are used to differentiate the futures that will be explored.

Participants consider each critical uncertainty on an axis, defining the spectrum of both desirable and undesirable futures that could unfold, as shown in figure 4. The actual future likely will fluctuate along a spectrum; for example, over time a regional economy could grow, stagnate, or decline, and a good plan must be able to respond to all these changing conditions. Discussion of these spectra should allow an exchange of perspectives on what might happen and why in a rich dialogue that captures all stakeholders' concerns and ideas.

Participants then create an uncertainty matrix by crossing two uncertainty axes. The matrix defines the scenario narratives. The axes to cross are selected by exploring each possible pairing of the driving forces to determine whether any critical uncertainties are a function of another. For instance, funding can be a function of political will, but crossing these two to make an uncertainty matrix will not create the distinct futures stakeholders seek. Rather, participants should preserve the root uncertainty (political will) that determines the future and remove any codependent uncertainties (funding). This step results in several uncertainty matrices, each defining four credible, compelling, divergent, and challenging future scenarios, as illustrated in figure 5.

The working group then chooses one matrix of potential futures to explore in the second workshop, defines the characteristics and causes of each future within the matrix, and titles each future for easier reference. This process and dialogue develop a credible framework, or basic story lines, for four scenario narratives, concluding workshop 1.

Figure 2
Voting with Dots to Select the Driving Forces Most Critical to the Focal Question and the Future

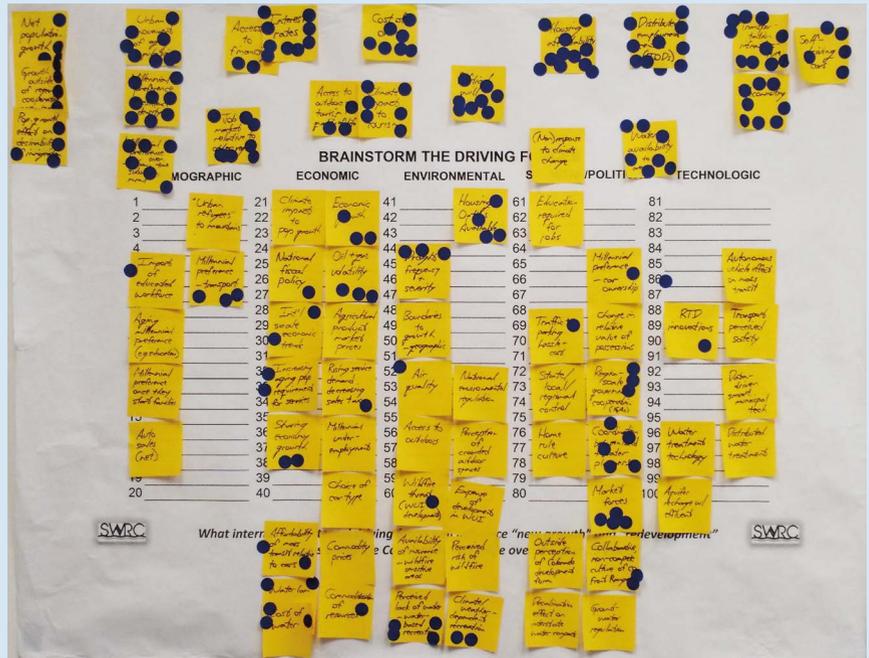


Figure 3
The Ranking the Drivers Template Helps XSP Participants Organize and Prioritize Driving Forces for Scenario Development

Ranking the Drivers

Focal Question: _____

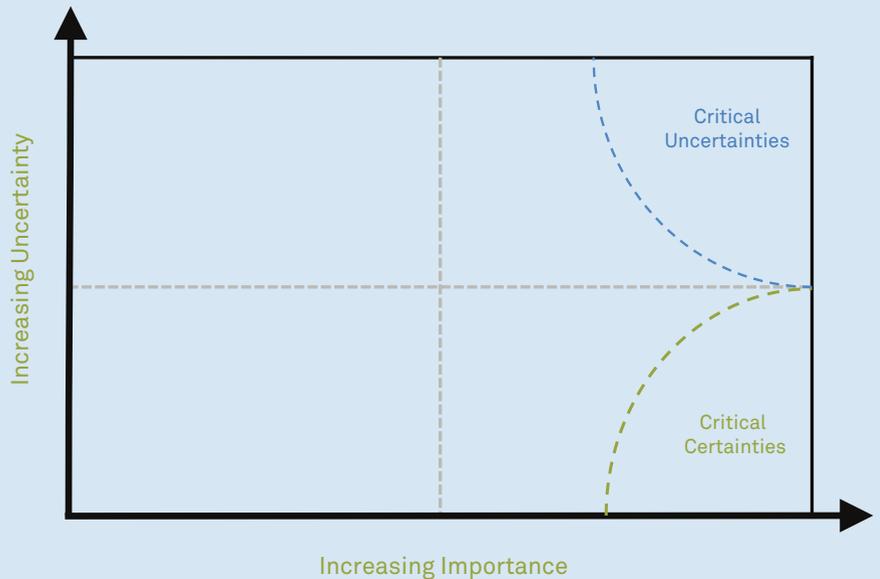
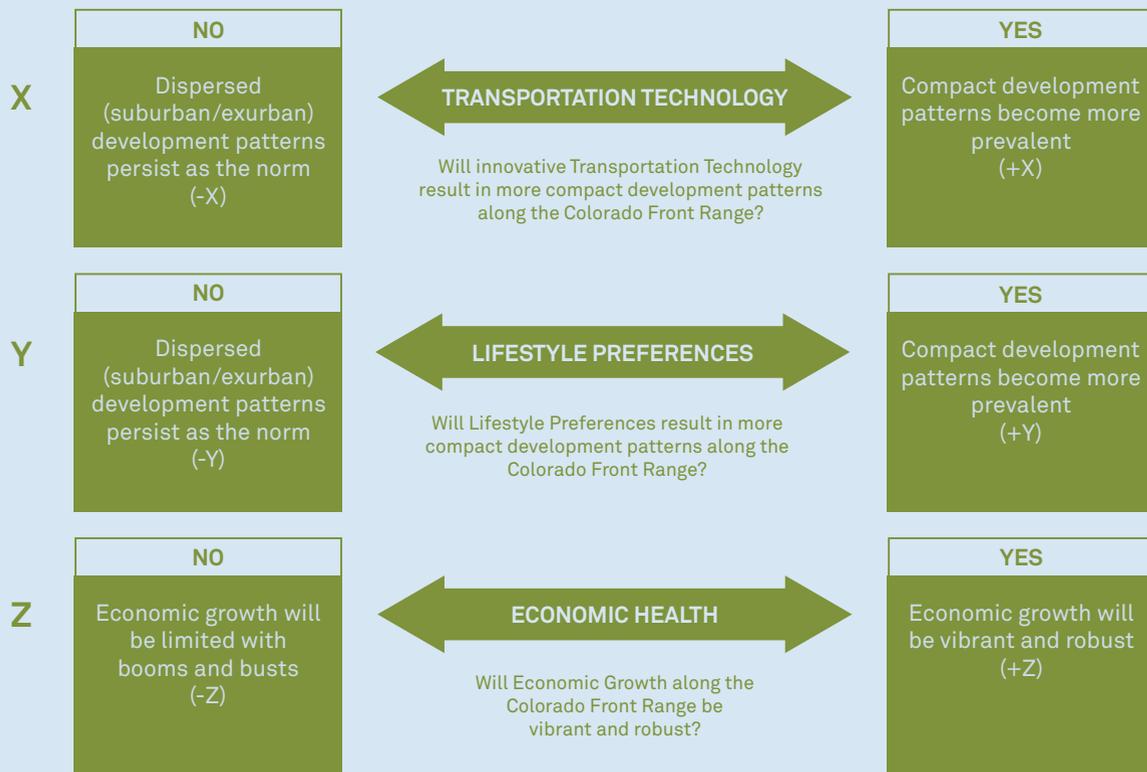


Figure 4

**Examples of How to Consider Critical
Uncertainties on an Axis that Encompasses
the Spectrum of Possible Futures**

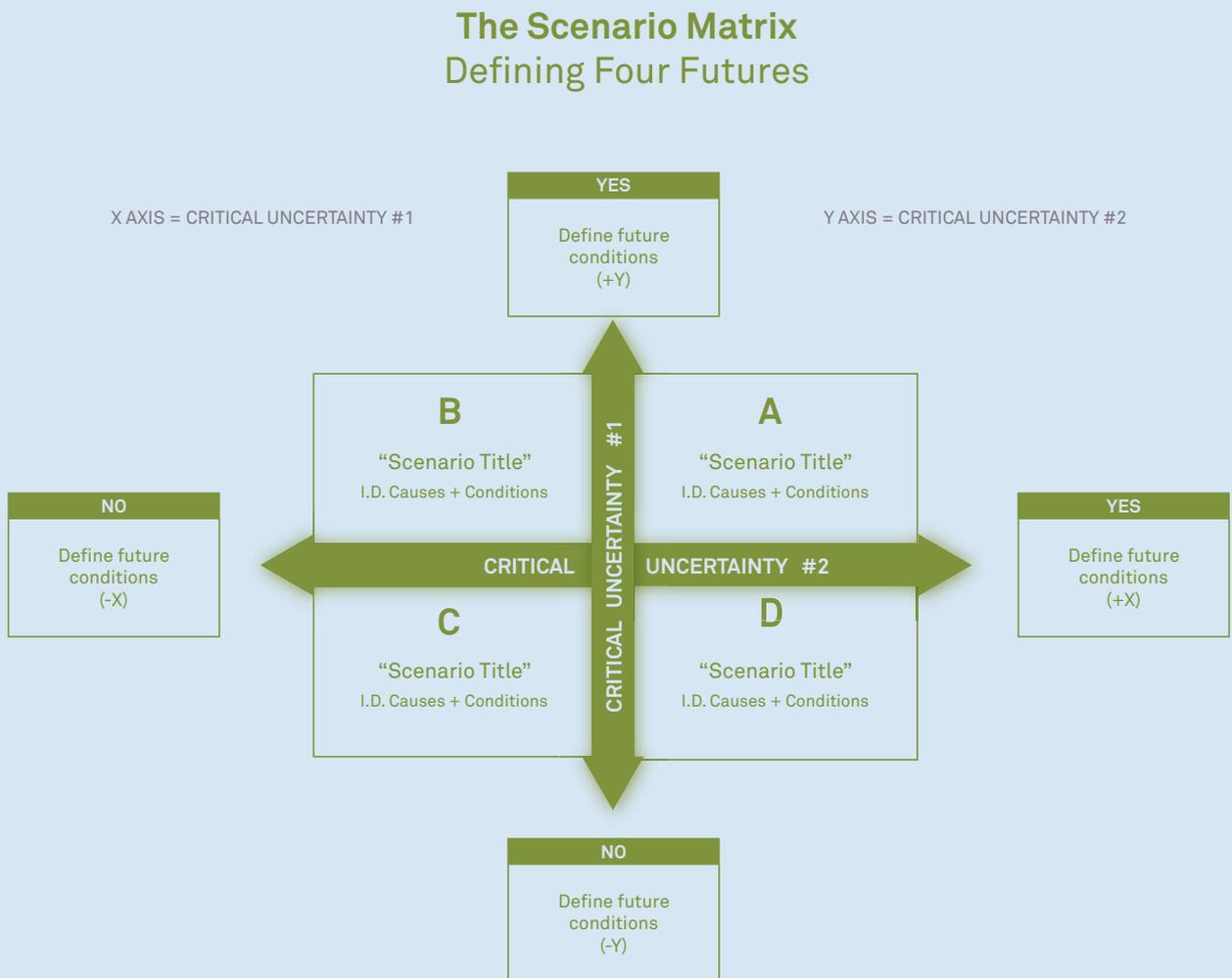
Defining the Uncertainty Axes



Exploring critical uncertainties
and the spectrum of end-states

Figure 5

**Crossing Two Uncertainty Axes
Creates an Uncertainty Matrix That
Sketches Four Possible Futures**



BEST PRACTICES: CONDUCTING WORKSHOP 1

Consider hosting two half-day workshops.

One all-day workshop can be too long for some participants; an alternative schedule of four hours in an afternoon and four more the following morning, for example, might work better. (Sample agendas for each version appear in appendix A.) Workshop 1 can also be reconfigured as needed to focus more on clarifying, revising, and expanding a list of drivers generated from interviews and surveys. It may also be possible to expedite the process if results will be folded into a more fine-grained planning effort.

Consider a workshop wrap-up session with the steering committee.

The typical XSP process might require an extra half-day of working with this smaller group to refine and confirm scenario results before committing to crafting scenario narratives.

Prepare note-taking formats and flip charts before the workshop to keep the process flowing.

Capturing main points on whiteboards and flip charts is essential. Recording or notating the dialogue can prove invaluable for recalling details needed for scenario narratives that will be developed during workshop 2.

Have experts play provocateur.

During the workshops, people with significant relevant experience can play the role of provocateurs in the groups to creatively expand the conversations. Provocateurs can represent perspectives of stakeholders not present for the dialogue or introduce well-known or documented observations that are relevant but have not yet been discussed. The goal here is to round out topics and perspectives to ensure a robust process and the best results.

Add a third axis if time allows and the complexity is not overwhelming.

A third (z) axis can be created to allow for eight futures. A driver like climate change could provide additional plausible futures to explore—perhaps four futures without and four with climate change as a force. But this adds complexity and complicates the process, requiring more time to complete each step. A third axis, therefore, is not recommended in the interest of simplifying and streamlining the XSP process for a one- or two-day workshop.

Develop Scenario Narratives

Following this first workshop, the core project team considers the designated drivers and crafts scenario narratives that describe plausible futures for review and revision by the steering committee. The XSP process typically addresses four scenarios, plus a common-to-all-scenarios narrative, unless the common details can be rolled into each scenario's narrative. The team also designs an agenda for a second workshop, lines up experts to present any needed foundational information, and conducts any additional research needed to fill gaps in knowledge and to develop credible and compelling story lines for the scenarios.

BEST PRACTICES: CRAFTING SCENARIOS

There is no perfect or standard way to craft scenario narratives.

Scenario narratives can take many forms, such as bulleted statements or well-crafted sentences. When facilitating groups that have a professional command of the subject matter, keep the narratives concise, objective, and generally unobjectionable. When working with groups whose members have different perspectives or less command of the subject matter,

try to develop scenarios the whole group can connect to and empathize with to enhance participation, the exchange of perspectives, and consensus building.

Review and comment on scenario narratives before strategizing.

Have a project leader or steering committee review the scenario drafts before workshop 2 to vet the final narratives. This sets the larger group up for successful brainstorming of implications and strategies.

Workshop 2

In the second workshop, participants read and reflect on the implications of each scenario narrative and then create strategies for each potential future. As they explore the narratives, working group members identify actions to address the threats and opportunities for each future, thus developing alternative paths to attain the group's established vision and goals.

Participants can then cross-reference the lists to identify robust strategies, which are applicable to, appropriate for, and common to the entire range of scenarios. Robust strategies avoid undesirable futures while the community begins prompt implementation of no- or low-regret, high-impact solutions.

During or after the workshop, if time permits, the project team guides stakeholders in identifying indicators of potential adaptation points—moments when one future's plausibility dissolves and another begins to look more likely. The group defines a system of indicators and performance metrics to signal such tipping points and then develops contingent strategies for different outcomes. The steering committee leads in the designation of individuals who will be accountable for evaluating, monitoring, and initiating contingency plans and who will direct any next steps after the XSP process concludes.

BEST PRACTICES: CONDUCTING WORKSHOP 2

Build consensus on the credibility of the scenario narratives.

The critical certainties are often used to craft a common-to-all-scenarios narrative, which describes events likely to occur in all futures. Try to reach consensus on this common-to-all-scenarios narrative, and present it in a plenary session so participants can clarify, confirm, or revise the assumptions. Establishing a foundation and launching point that all stakeholders find credible is key.

Develop a system for capturing and sharing implications, strategies, and insights.

Addressing each scenario independently and listing implications is time consuming and can be confusing for facilitators and participants. Implications painted across scenarios with a broad brush may inaccurately imply that a strategy is more robust than it is. To ensure effective time management and clear results, create a system to list and cross-reference implications across scenarios. Spreadsheets are often used to organize and cross-reference the lists of implications and their relevant strategies. Spreadsheets, however, can prevent participants from seeing the lists in their entirety, and thus they may be less engaging. The Denveright process used a whiteboard and information was copied to a flip chart. By the end of the workshop, participants had a long list of strategies and implications with defined final strategic insights. The related implications were scattered throughout the previous step, however, and not listed in one place. A notes template that follows each step of the workshop and provides formatting instructions can help facilitators organize and simplify information shared in the workshops. Audio and video recordings also can be effective ways to capture conversations for later review.

Decide how stakeholders should vote.

Remote voting using smartphone apps or clicker technology can expedite the voting process. Keep in mind, however, that this might eliminate casual, watercooler types of conversations and the deeper thoughts that arise during such discussions. The in-person interaction in workshops also allows participants to react to a consensus as it develops in real time and to vote accordingly. Remote voting can prematurely restrict the pool of critical drivers unless the software can accommodate all the options. Be careful to maintain drivers that will significantly strengthen the resiliency of strategies. The number of drivers considered should be appropriate for the audience, depending on time, command of the issues, and capacity.

Next Steps

To translate the XSP process into action, project leaders should consider holding a wrap-up session after the second workshop. A meeting to refine agreed-on strategies and actions into a final list of recommendations with timelines and personnel assignments can clarify the results—although on-going planning efforts can also do this. Incorporating XSP into a larger planning process that leads to a commitment of resources will help ensure that the efforts and capital invested in the process pay off.

That said, participants must allow adequate time for the project team to prepare actionable strategies, especially given that spreadsheets with many strategies for multiple plausible futures may require significant time to compile, clarify, vet, and clean up before presentation.

In the Colorado case studies discussed in chapter 1 and detailed in chapter 3, the working groups would first have needed more time to flesh out and word-smith all the details of their visions, goals, objectives, and performance metrics and indicators and how they would determine the need for contingent strategies. Indeed, XSP results often require additional refinement before incorporation into a formal plan or official policy that can guide a community into its future.

After refining the results, the project team should prepare a final report summarizing their deliberations, conclusions, and lessons learned. This may be further refined into specific, measurable, achievable, relevant, time-bound, evaluated, and readjusted (SMARTER) goals that have metrics and systems of feedback, evaluation, and accountability (Wanderlust Worker 2020).

The local government, agency, or other convening organization then would be responsible for implementing the new plan, as with any planning process.

CHAPTER 3

XSP in Practice: Case Studies from Colorado



This chapter discusses three exploratory scenario planning projects facilitated in Colorado by the Lincoln Institute of Land Policy and Sonoran Institute’s joint program in 2017 and 2018. Details include context for the XSP process (namely, determining focus, scope, scale, and community readiness), methodology applied, driving forces considered, and outcomes for each project. These case studies illustrate how to apply XSP principles in real-world settings and what future practitioners can learn from others’ experiences.

Chapter 4 has additional U.S. case studies that show XSP in wider application—on regional scales and for issues ranging from smart growth to transportation planning.

Cranes tower over the South Platte River in Denver, a symbol of the booming growth on Colorado’s Front Range. *Credit: Jeremy Stapleton*

Framework for Reviewing Case Studies

The following case studies are practical examples of XSP. This framework was inspired by the joint program's advisory panel of scenario planning professionals, who reviewed the projects to help determine the best practices, lessons learned, and conclusions derived from the cases. Criteria were the following:

1. Context and purpose:

What prompted the XSP process, and why was XSP used?

2. Scope and scale:

What was the range and complexity of topics explored?

How large were the geography and stakeholder groups under consideration?

3. Focal question:

What specific question did the group explore?

4. Methodology:

How was the XSP process executed, and what lessons were learned?

How did XSP inform a larger planning process, or was it a stand-alone initiative?

5. Summary of decisions:

a. Drivers: What forces of change will affect the future?

b. Critical certainties and uncertainties: What knowledge can planners rely on, and what remains unclear?

c. Developing scenarios to guide growth: What formal scenarios did the process explore?

6. Outcomes:

a. Strategies: What can planners do to address conditions in most or all scenarios (that is, what are the robust, low-regret solutions)? What responses apply to just one or two futures (contingent strategies), and what factors would trigger them? How will changing conditions be measured and different strategies be applied?

b. Progress: What did XSP achieve? (For instance, did it create an open dialogue among diverse stakeholders, raise awareness, change or clarify perceptions, cultivate relationships, or catalyze collaboration?)

c. Impact: What were the impacts or results? Did the process impede decision making or lead to on-the-ground change? Were stakeholders ready, and did they have the resources to explore and act on the issues?

Keystone Policy Center: Colorado Water and Growth Dialogue

Regional Watershed Management Strategy (2017)
Front Range, Colorado

CONTEXT AND PURPOSE

Colorado is projected to have a shortage of 250,000 to 700,000 acre-feet of water by 2050 (Colorado Water Conservation Board 2019). Although 80 percent of Coloradans live east of the Rocky Mountains—on the Front Range and along the I-25 corridor—more than 80 percent of the region’s water comes from the Rockies’ Western Slope through transmountain diversions.

This historical practice of diverting water from one watershed to another has long fueled local tensions, and the more recent impacts of rapid growth, development, and climate change—including increasing water scarcity—are rippling across the state and the entire Colorado River Basin. Improving certainty and assurance of water supplies and quality would mitigate fear and anxiety, enhance regional security, and encourage continued investment in sustainably water-secure locales.

Every Colorado community faces this impending shortage, but some are more at risk than others, because levels of resources, capacity, preparedness, and access to priority water rights vary. Thousands of jurisdictions, water companies, private developments,

and other interests compete for water; organizing and mobilizing these actors is a major feat. The state’s legal framework is devoted to the doctrine of prior appropriation and local control, so significant regional action to close the water gap has been challenging but critical. Reflecting on past and present realities and thinking about the future can trigger emotions of negativity, hostility, and entrenchment and lead to stagnation of action, but dialogue and relationship building has instead nurtured a cooperative spirit.

The nonprofit Keystone Policy Center (KPC) led the exploration of whether and to what degree the integration of water and land use planning can help reduce water demand and close the water gap. In collaboration with the Colorado Department of Local Affairs, the Colorado Water Conservation Board, and agencies and stakeholders from across the state, the KPC used XSP and other strategies to build consensus on how to close Colorado’s water gap, to demonstrate the potential of those strategies, and to disseminate an implementation plan. The resulting Colorado Water and Growth Dialogue sought scenarios, strategies, and outcomes that responded to potential focal questions such as the following:

- Which land use planning strategies appear most effective in conserving water?
- How can policy makers and planners be most effective in helping move Coloradans closer to long-term sustainability with respect to water and growth?
- What key actions are needed, and who is responsible for leading them?

In addition to the XSP process, a technical subcommittee researched strategies to integrate land and water planning and built a residential-demand modeling tool to explore how various compositions of land use could lower water footprints and estimate how much water the growing population could use (Horrie 2018, KPC 2018). The KPC also used the 2040 UrbanSim model from the Denver Regional Council of Governments to make projections of land use development as a baseline condition that assumed land and water planning were not integrated. The model provided additional context for determining the density and landscaping practices that would best conserve water in new developments, and the exercise showed how modeling can inform or build on an overall XSP process.

The committee subsequently used customer data from Denver Water and Aurora Water to examine water usage according to the baseline condition. It determined that, beyond building performance, optimal water efficiency is a function of both land use and landscaping. The density that offered the biggest gains in residential water and land use efficiency in the Denver metro region were determined to be three to eight dwelling units per acre (KPC 2018).

Scope and Scale

The scope of the project was to explore how best to steward water resources in Colorado in a time of rapid growth, uncertainty, and a looming water supply gap. The scale was statewide, focused on a population projected to grow from 5.5 million in 2016 to 8.7 million by 2050, with most growth happening east of the Continental Divide. The XSP process involved an interdisciplinary set of stakeholders, including local and regional government officials and staff, water providers, land use planners, developers, economic development interests, environmental organizations, and university researchers.

FOCAL QUESTION

How can changes in urban form and landscaping practices for new growth and redevelopment assist in meeting future urban water demand along the Colorado Front Range?

METHODOLOGY

Participants joined either a steering committee of local, regional, and state agencies or a larger working group of stakeholders drawn from a broad range of disciplines and experiences. The working group met for two full-day workshops; the steering committee additionally held a formal meeting to determine the focal question, two half-day wrap-ups following each of the two workshops, and regularly scheduled meetings to review and refine the process and objectives. In the eight weeks scheduled between the two workshops to develop the scenario narratives, the project team drafted and revised its narratives for the steering committee's review before the second workshop. This was a low-tech effort that involved PowerPoint presentations, flip charts, and whiteboards.

SUMMARY OF DECISIONS

Drivers

Stakeholders identified and ranked a master list of 16 critically important drivers of change:

1. Housing affordability.
2. Cost of oil and gas.
3. Access to outdoors and recreation.
4. Transportation network and technology.

5. Economic opportunity, vibrancy, and volatility.
6. Net population growth.
7. Flexibility in working environment (such as telecommuting).
8. Millennial and senior housing preferences (combined with next item as lifestyle preferences).
9. Millennial and senior transportation preferences (combined with previous item as lifestyle preferences).
10. Access to real estate financing for builders and buyers.
11. Perceived strength of job market.
12. Political will (including balance of local versus regional control).
13. Water availability to outlying areas.
14. Impact of distributed employment centers.
15. Impact of Colorado's Taxpayer Bill of Rights (TABOR) on investments.
16. Attraction of "cool" factor (new urbanism).

Critical Certainties and Uncertainties

In ranking the list of drivers, stakeholders determined four critical certainties:

1. Net population growth.
2. Impact of distributed employment centers and transit-oriented development.
3. Legacy of TABOR and its repercussions.
4. Access to the outdoors and recreational tourism remains a core value.

They next determined three critical uncertainties to help build the scenarios:

1. Innovative transportation network technology.
2. Lifestyle preferences.
3. Economic health.

Developing Scenarios to Guide Growth

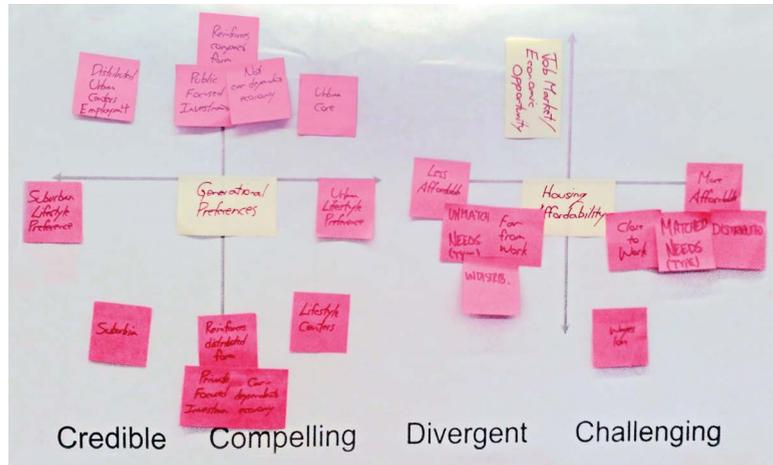
As seen in figure 6, participants in the first workshop identified four credible, compelling, divergent, and challenging futures using the uncertainty matrices discussed in chapter 2.

The working group and steering committee further studied what could drive urban form and landscaping practices and the implications of water demand in different futures. They sought to understand how optimally efficient development patterns could become the norm across the state, ideally with little to no regulatory intervention. The XSP process resulted in the identification of over 100 strategies, actors, messengers, and partnerships that could mitigate the state's water supply gap—and affirmed that no one solution or set of actors could save the day. Rather, many and perhaps most would be needed; after all, redundancy is a principle of preparedness and resilience.

The steering committee ultimately designated two critical uncertainties impacting the focal question: lifestyle preferences (x axis) and economic health (y axis). The committee considered adding a third critical uncertainty—innovative transportation technology—on a z axis but concluded that the potential returns would not warrant the additional effort. Thus, the two drivers, lifestyle preferences and economic health, were placed on perpendicular axes to create end states of four plausible futures, seen in figure 7.

The project team and steering committee developed scenario narratives to describe the conditions these four futures would likely present. The larger working group explored these in workshop 2, and they then identified critical implications for each future and strategies to promote, prevent, or prepare for each implication.

Figure 6
Uncertainty Matrices
Considered in the Colorado
Water and Growth Dialogue's
XSP Process



SCENARIO DESCRIPTIONS

Common to All Scenarios (2040)

Colorado's population has doubled over the last few decades. Most growth has been on the Front Range, and communities compete for ever-scarcer resources. The supersectors that drive and carry the Front Range economy continue to lure people from within and beyond the United States. Communities that diversified and embraced the sharing economy have fared better through economic cycles. Automation has continued to eliminate jobs, and migration is driven by the pursuit of employment and affordable housing.

Scenario A: Polycentric Prosperity

People want to live in and near cities, which results in more compact development patterns. A concentrated, diverse talent pool supports a vibrant and robust economy, led by the financial, medical, technology, and industrial sectors. Strategic land use and siting of manufacturing facilities help reshore and restore jobs on the Front Range, which contributes to a circular economy to mitigate waste and inefficiency. New, rapidly growing urban centers employ thousands, creating a polycentric region in which most people can walk or bike to work and to access daily needs. This mode shift has nurtured public and political will to

transform transportation. Legal reforms allow delivery of more for-sale condos to the market. Numerous financing options offer a ladder for economic mobility, consolidation of wealth, and real estate acquisition for booming industries like marijuana. Property prices are rising, because speculators purchased and converted land to commercial growing facilities or rental housing.

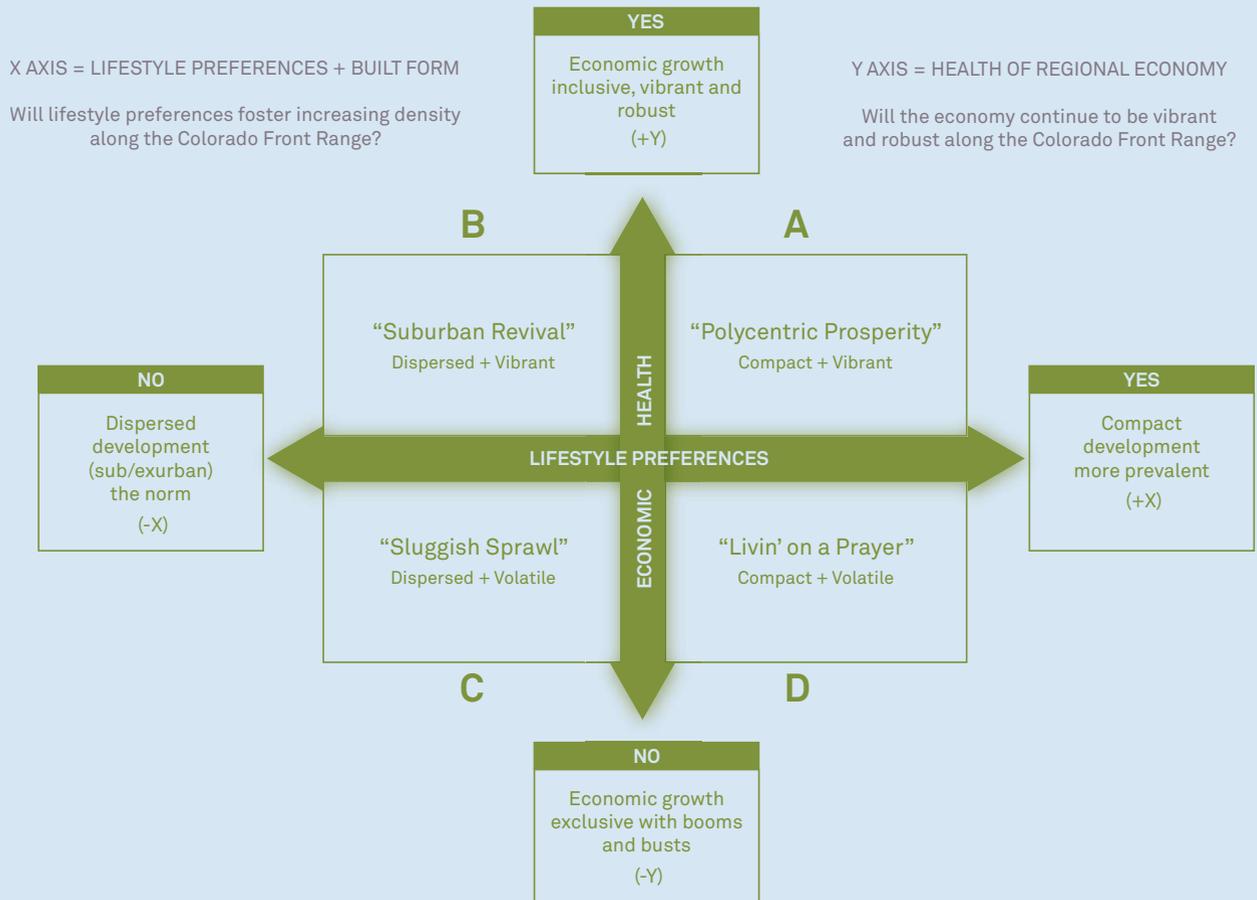
Scenario B: Suburban Revival

The Front Range is less compact than it was in 2016. Millennials and Gen Xers prefer the suburbs for their children, as they begin to take care of their own aging parents and because they are able to work remotely. Suburban areas connected to transit have grown faster than the less accessible urban areas. Many prefer their “backyard resorts” to shared open space and are disenchanted with congestion. Ensuring adequate affordable housing for all ranges of incomes is a challenge, and legal reforms have failed to dampen the negative impacts of construction liability laws. Affordable housing is most available in older, run-down neighborhoods surrounding employment centers or at the fringes of the region not served by mass transit. This requires longer, more expensive commutes for residents, which increases the cost of living and consumes disposable income.

Figure 7

The Two Uncertainty Axes Used to Focus the Colorado Water and Growth Dialogue and the Four Scenarios They Frame

The Scenario Matrix Colorado Water and Growth Dialogue



Scenario C: Sluggish Sprawl

Gas and real estate prices, coupled with fuel economy standards, preserve a “drive till you qualify” culture, in which residents are willing to drive farther and even push the limits of their credit to access more desirable homes. The percentage of total trips on mass transit has not changed much over the last 20 years, and freeways remain the dominant means of commuting. Few financing options offer a ladder out of poverty; home ownership and entrepreneurship rates lag behind top regions of the country. The scale of global growth has made the troughs of economic waves deeper and longer, eroding the diversity of the regional economic base. Drought and wildfires raise crop prices worldwide and challenge water allocation relationships. Water is required for food, oil, and other energy production. Water is reallocated from staple irrigated crops to respond to world demand for meat, dairy, and marijuana. Strategically sited fields of nonirrigated crops help keep feed prices low, and large industrial farms are able to squeeze every efficiency out of the resources they have. Other industries that once powered the economy have moved overseas to access sufficiently or comparably educated but cheaper labor, spurring new growth—and stronger competition for resources. Denver’s economic growth in information technology, bioscience, and financial services has slowed dramatically, and the region remains heavily dependent on a narrow range of sectors: energy, regional health care, aerospace, food and beverage production, and tourism.

Scenario D: Livin’ on a Prayer

Denver and the Front Range have become even more urbanized and compact than they were during the first 25 years of expansion (2016–2041) across the plains from urban cores. The region is now larger, taller, more expensive, and more exclusive. Economic volatility inhibits growth of urban centers in other areas around the region, so the same number of cores exist as in 2016. Federal legislation has forced community banks to close or to sell out to bigger banks, transferring lending and investment decisions to people outside the community. Sustained uncertainty and volatility have made long-term financing opportunities rare. Feigned or unjustified fiscal confidence fans the economic growth that persists; entrepreneurship and business failure rates are some of the highest in the country. Although Colorado has reduced energy consumption, global energy demand supports the extraction of its mineral, oil, and gas resources. Fossil fuel extraction remains controversial, but if conditions allow, capitalists will exploit the Denver-Julesburg Basin—one of the largest reserves of both crude and dry natural gas in the nation. It can be difficult to find and keep living-wage jobs near housing. People look for mobility and a short commute to well-established and cost-prohibitive employment centers in Denver. Some urban areas along the Front Range focus more on residential and entertainment opportunities than on employment; these places with fewer jobs have become havens for prosperous retirees and childless families and suffer less during economic downturns.

OUTCOMES

Robust Strategies

These strategies were developed by the steering committee. The KPC's final report on the XSP process included a short list of strategies tailored to state legislators' interests, and the Sonoran Institute facilitated the development of a more comprehensive list at the workshop itself on July 28, 2016:

1. Find the sweet spot between density and the point of diminishing returns regarding water demand.
2. Create water-wise land use plans.
3. Measure, monitor, and message market data and success stories.
4. Develop and track new metrics categorized by land use, such as water use per square foot.
5. Develop a suite of stewardship incentives, such as tap-fee credits and small lots.
6. Recommend new design guidelines for government-owned buildings, public spaces, and rights of way.
7. Develop model municipal landscaping codes based on best practices.
8. Adopt a "one-water" approach to water resource management that optimizes efficiency and utility through an integrated, sustainable approach.
9. Develop, track, and compare community water budgets to inform policies, programs, plans, and practices.
10. Scale agricultural efficiency through conservation programs and measures.
11. Increase regional collaboration between Front Range and Western Slope communities and their representatives.
12. Develop a Water in the West Welcome Wagon awareness and engagement campaign for new and existing homeowners, residents, developers, and policy makers.
13. Eliminate barriers to permit and increase water-sharing agreements.
14. Adopt a true-cost water pricing policy.
15. Nurture a water-efficient economy founded on efficient industries.
16. Fund implementation of long-range planning strategies via utility revenues.
17. Include designers such as landscape architects and architects in engineering departments.
18. Partner with trained water stewards, including designers, irrigation system installers, maintenance crews, and watershed management groups (KPC 2017).

Progress and Impact

Participants remarked on the value and intriguing novelty of the process, saying they appreciated the new approach to community engaging the community, discussing divisive topics, and making critical decisions. Following the second workshop, the Colorado Water and Growth Dialogue Final Report shared a refined list of recommended strategies with state legislators (KPC 2018).

The conversations and relationships that were started and built on have led to continued organization and mobilization of resources and capacity to integrate water and land use planning.

City and County of Denver: Denveright

General and Specific Plan Updates (2017)
Denver, Colorado

CONTEXT AND PURPOSE

In 2017, the City and County of Denver used an XSP process in the Denveright project, an update of their successful *2002 Blueprint Denver*, an integrated transportation and land use plan. The process also contributed to specific plans to supplement the *Comprehensive Plan 2040*, then in development and subsequently adopted in 2019. Figure 8 distills the priorities of the process.

The pressures of accelerated population growth and changing development patterns defined in *2002 Blueprint Denver*, however, were later complicated by market momentum and dynamics that stressed the supply and affordability of housing and services. A fast-growing city, Denver faces social challenges such as improving the distribution of quality-of-life benefits and addressing the burdens of current and projected growth, economic volatility, and climate change. The city and county share a strong mayoral form of government, a culture and legal framework of local control, and an investment in community-driven planning.

Denveright was thus a community-driven planning process that sought to shape how the city and county would evolve through the concurrent update and development of four specific plans that addressed integrated transportation and land use, pedestrians and trails, parks and recreation, and transit.

The city and county initiated the XSP process at the beginning of the planning project, after selecting consultants but before the staff and consultant teams

had officially started working together. The XSP process ultimately helped unite the team that identified and clarified the shared mission of pursuing equity and accessibility.

Scope and Scale

The scope of the project was to explore how parallel development of the plans could provide greater equity and enhanced quality of life for all residents. Because Denver's city and county boundaries are the same, the scale was countywide, encompassing 155 square miles and a population of 704,621 as of 2017. The process included staff from several government departments, consultants working on the Denveright planning effort, and the chairs of the Denveright citizen task force.

FOCAL QUESTION

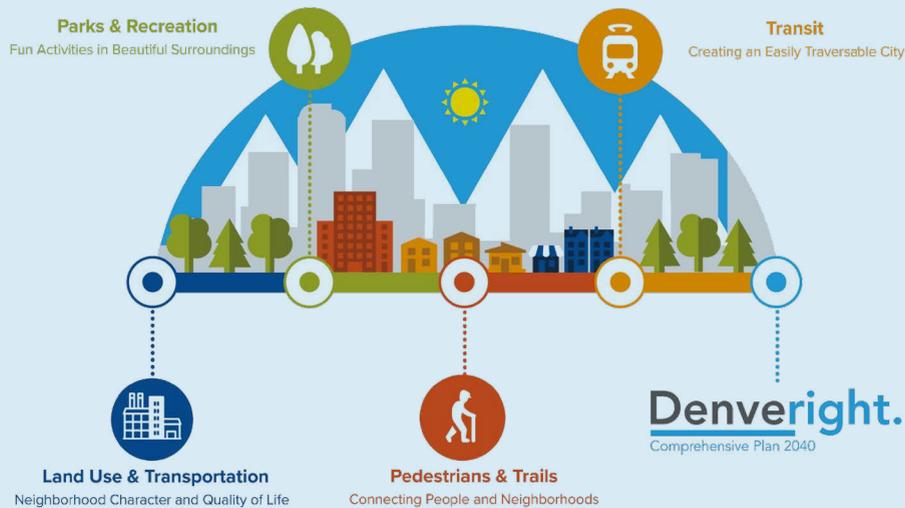
As Denver continues to change and evolve over the next 25 years, how can the city provide greater access to opportunities, services, and amenities for its current and future residents?

METHODOLOGY

The XSP process was applied internally with staff, the consultant team, and the Denveright task force chairs before the project team launched its public engagement. A principal planner managed the process with the aid of two senior planners, operating as a steering committee and as liaisons to the joint program. Two members of the joint program staff and select experts developed and facilitated the workshops with support and participation from the mayor's office, current and former community planning and development directors, and a critical mass of interdisciplinary staff from multiple departments.

Figure 8

The Denverright Project Updated the City's 2002 Integrated Transportation and Land Use Plan and Supplemented a Future Comprehensive Plan



Source: City and County of Denver 2019.

Participants were split into a steering committee and a larger working group. The latter met to determine the focal question and then for two full-day workshops, and the former was available as needed for review and refinement of the process and objectives. All participants had a professional command of the subject matter and were able to process the concepts, scenarios, and implications faster and more comprehensively than a general-public audience might.

This approach departed from the classic XSP methodology but was successful thanks to the collective skill and experience of team members, who provided insights and strategies across a broad range of plausible futures and contributed to the process with a high level of preparedness in planning for the future.

The team's main challenge was qualifying strategies as robust. Typically, groups explore all four futures defined by two driving forces in one uncertainty matrix

and then prioritize the strategies in all the futures that enable the community to adapt and thrive no matter where a specific future falls on the spectrum. However, the Denverright participants' interdisciplinary capacity and desire to explore more than two driving forces on one uncertainty matrix led them to select four scenarios from multiple matrices that they thought were most plausible and that the group had qualified as credible, compelling, divergent, and challenging.

The most cited value of the XSP process is its ability to enable dialogue, exchange, and expansion of perspectives—to ask, what if? and to reflect on the best ideas represented in the range of scenarios. This group decided there was value in exploring scenarios from multiple matrices and looking for the robust strategies to futures defined by a broader range of driving forces; however, they also knew they would be refining the XSP results through a formal public planning process over the next few years.

In another departure from the classic process, the Denveright XSP exercise was conducted on a compressed schedule, allowing just two weeks between workshops instead of the standard minimum of eight weeks. Remote voting apps and Excel spreadsheets were used to narrow and organize lists of implications and strategies, but otherwise this was a relatively low-tech effort that more frequently used PowerPoint presentations, flip charts, and whiteboards.

SUMMARY OF DECISIONS

Drivers

Participants designated key drivers of change—mobility, housing, employment, open space, and recreation—and considered issues including funding priorities, availability of land, political will, quality of mobility choices, real estate market and demand, affordability of housing, access to jobs, diversity of workplace and industry, distribution of new jobs, regional collaboration, net migration, changing market demand, ability to adapt to generational preferences, percentage of reasonable/rational people, and climate change and preparedness. Participants culled the list of drivers using dots placed on flip charts and discussed the reasoning behind their votes—a dialogue critical to engaging the group and building consensus.

Critical Certainties and Uncertainties

Four critical certainties were selected for further consideration:

1. Aging population and net population growth (nearing 4.3 million in Denver Regional Council of Governments projections).
2. Longer, more frequent droughts and other extreme weather events.

3. Continued water supply gap and treatment of water as a commodity.
4. Access to the outdoors and recreational tourism as a core value.

The four critical uncertainties were the following:

1. Development capacity (including entitlements and access to capital).
2. Political will.
3. Transportation mode shift (e.g., changing from driving to using mass transit).
4. Population change.

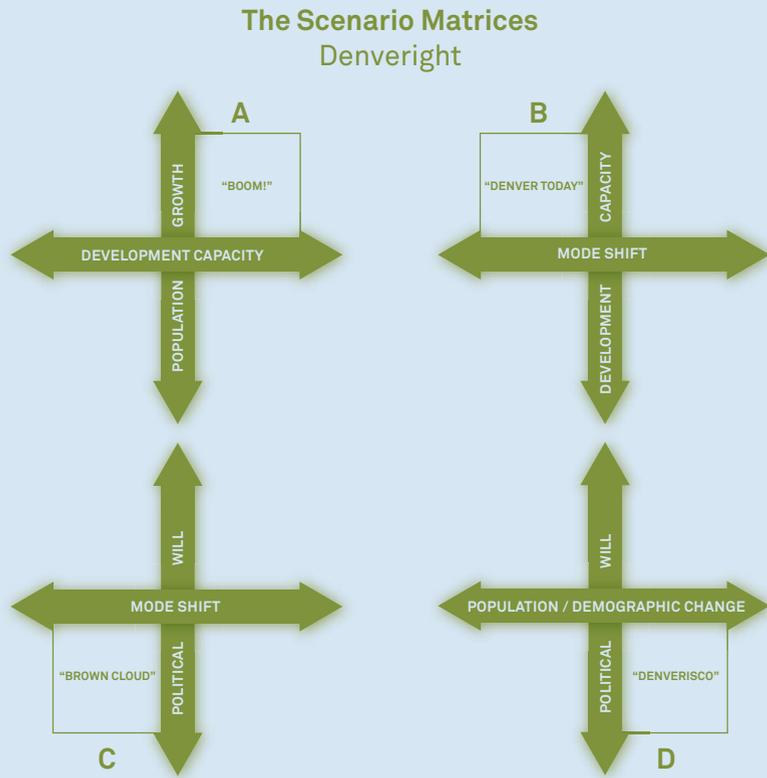
Participants also noted market demand and quantity and prioritization of funding as runners-up.

Developing Scenarios to Guide Growth

The working group decided to further study the implications of political will, net migration, shifts in the percentage of millennials in the population, changes in transportation preferences (mode shift), and development capacity to provide Denver residents equitable access to opportunities, services, and amenities now and in the future. The alternative futures, as summarized by the working group in workshop 1, are seen in figure 9.

In workshop 2, the working group assessed these four scenario narratives and identified their implications. They then listed strategies to address each implication to ensure equitable access to transit, parks, nature, open space, recreational opportunities, high-quality education, living-wage jobs, food, and clean air and water and, ultimately, safe, healthy, affordable, and prosperous communities. Table 1 in appendix B shows the results of this process in greater detail.

Figure 9
**The Uncertainty
 Matrices Used to
 Develop Denver's
 Scenarios**



SCENARIO DESCRIPTIONS

Scenario A: Boom!

Denver has successfully promoted densification and sustainability, but affordability and design quality remain problematic. The city is increasingly unaffordable, and families cannot count on growing and aging in place. The demand for a mode shift in transportation will increase as the net population of millennials increases.

Scenario B: Denver Today

Denver in the future is much like Denver today. Growth is well directed—growth pressures are distributed and infrastructure is not overloaded—but the city lacks necessary transportation infrastructure. Low funding levels and lack of political will result in less access to opportunities, services, and amenities; increased congestion; and a patchwork of inequality and growth.

Denver is not maximizing its developmental potential. Regional transit takes priority over local connectivity, so the need remains for a local transit system to supplement the regional system. Access to parks and open space is unequal because of siting, distribution, transportation, displacement, and so on.

Scenario C: Brown Cloud

Denver's streets are gridlocked and overburdened. The city is filled with smog and congestion that will lead to population decline. There is political consensus that development is bad. Unplanned density occurs in odd places. Auto use is snowballing, and sprawl and transportation infrastructure consume potential park lands, discouraging younger people from coming to the city.

Scenario D: Denverisco

The lack of affordability and social equity, along with a disconnect between people and desired resources, reminds residents of what has been happening in San Francisco. Housing prices are soaring, leading to increased household size. Infrastructure and resources—and decisions on where they are located—are privatized. The city is losing middle-income and low-wage jobs, along with housing for the middle class. Gentrification (involuntary displacement) is increasing; more homeless people are living in parks. There is less access to parks and open spaces. There are more super commuters who take hours to get to work. The suburbs are urbanizing, much as in Oakland, California.

OUTCOMES

Robust Strategies

1. Better articulate the value of planning to the public and provide reasons for why the city is doing what it is doing in order to increase acceptance of the changes the city is making.
2. Increase access to and improve the comfort, convenience, and safety of alternative modes of transportation.
3. Build beyond transit-oriented development to foster life-oriented development.
4. Train people, investing in and nourishing the human capital pipeline (human capital resources inside and outside an organization).
5. Reallocate existing funding to improve transit and develop strategic transit plans.
6. Foster public-private partnerships (PPPs or P3s).
7. Create and update small-area plans, and engage more neighborhoods to empower communities to implement changes in their neighborhoods.
8. Maintain and evolve affordability best practices.
9. Increase value capture.
10. Enhance localized systems of transit by connecting them to the regional system, especially in areas with affordable housing and commercial and retail space.
11. Invest in data and employ predictive analytics to track and improve outcomes.

Progress and Impact

During the focal question meeting early on, participants realized that all plans over the next 20 years had the common theme of a desire for equity and access. The XSP process also helped dissolve departmental silos, dispense with internal politics, sync agendas and decisions of executive and elected officials with staff recommendations, and further professional best practices.

The Denver-based consultancy EPS, the multidisciplinary planning firm MIG, and city planning staff also incorporated aspects of normative scenario planning into the Denveright process. They presented their results in “The Ultimate What If . . . Adventures in Scenario Planning” at a 2017 Colorado Chapter of the American Planning Association state conference (EPS, MIG, Denveright 2017).

Denver adopted the resulting comprehensive plan in April 2019. It emphasizes the issues of equity and access dealt with in the XSP process and seeks to engage the public with zeal similar to that felt in the XSP process.

City of Fort Collins: Climate Adaptation Plan

Municipal Sustainability and Adaptation Plan (2018)
Fort Collins, Colorado

CONTEXT AND PURPOSE

In 2018, the City of Fort Collins hired the Sonoran Institute to facilitate an XSP process to inform its municipal plan for sustainability and adaptation. Fort Collins had experienced major wildfires in its watershed. In 2012 the High Park and Hewlett Canyon fires wreaked havoc, causing the loss of life, property, and quality of water supply after postfire rain and flooding washed ash and debris into the city's main reservoirs. In response, the city developed an early warning system for similar events.

After the Donald Trump administration announced it would withdraw the United States from the Paris climate accord, the city signed the Compact of Mayors and committed to creating an adaptation plan that would prepare the community for climate change. Fort Collins also wanted to update its Municipal Sustainability Strategic Plan to build on existing successes. After hearing about the value of XSP in the Denveright process, city staff decided to apply it to their own efforts to:

- achieve triple-bottom-line sustainability (promoting the planet, prosperity, and people) to mitigate the extent to which municipal operations contribute to climate change, scarcity, and inequity;
- attain preparedness and resilience in adapting operations and services to the uncertainties of the future; and

- lead by example and scale solutions by modeling best practices for the city's residents, local businesses, and neighbors in the region and recognizing the need for global collaboration to fully address climate change.

The XSP process informed the development of the city's first Municipal Sustainability and Adaptation Plan (MSAP), an initiative to prepare for and adapt to plausible future social, environmental, and economic shifts. The results established a framework and a set of principles for the MSAP's strategies and action plans. (See table 2 in appendix B.) The XSP process also reinforced that the plan would be a living document with systems of accountability, metrics, and indicators so that city staff and elected officials would know when and how to adapt infrastructure and operations as the future unfolds.

Scope and Scale

The scope of this project was to explore how the City of Fort Collins could optimize sustainability and resilience in its municipal operations. The scale was limited to internal organizational operations and did not directly address the activities of residents and businesses in Fort Collins. The process included staff from a broad range of departments who had years of experience serving the city, and it was led by two staff members who managed the production of the broader MSAP.

FOCAL QUESTION

How can the City of Fort Collins best manage its resources and adapt its systems to improve performance as a sustainable organization despite uncertainty and the impacts of climate change?

METHODOLOGY

The steering committee consisted of two project managers from the city staff and a facilitation team that developed the focal question. The project managers also organized an internal working group of approximately 30 staff members into smaller systems working groups that could dive deeper into the elements of planning systems that were included in the plan, such as emergency management, energy, transportation, infrastructure and assets, public lands and natural resources, and materials and waste management.

Following an online survey to determine driving forces, participants clarified, revised, and confirmed those drivers in a condensed four-hour workshop 1. Neither department directors nor elected officials participated in the workshop, which thus instead emphasized on-the-ground perspectives from staff—some of whom felt they were finally being heard after decades of advocating for preparedness planning on the scale XSP offered.

After the project facilitation team crafted scenario narratives, workshop 2 was conducted in two four-hour sessions over two days to accommodate other demands on staff time. A consulting member of the facilitation team further refined workshop 2 results and rolled them into the final MSAP.

SUMMARY OF DECISIONS

Drivers

The staff working group identified numerous driving forces, drawn from the perspectives of their respective roles:

1. Municipal fiscal health.
2. Natural disasters.
3. Employee turnover rates.

4. Utility rates.
5. Big data and cybersecurity.
6. Organizational culture.
7. Collaboration.
8. Innovation.
9. Budgeting process.
10. Water scarcity.
11. Staff capacity.
12. Population increases.
13. Aging population.
14. Infrastructure (both cost and capacity).
15. Grant funding and nonprofit support.
16. Resources used by the homeless population.
17. Water utilities.
18. Brick-and-mortar sales revenue.
19. Cost of building materials.
20. Housing cost and proximity to essential goods, services, and jobs.
21. Waste diversion.
22. Local data and metrics.

During one of the XSP workshops, Fort Collins experienced a cyberattack, which highlighted the city's vulnerability and reliance on technology to manage and deliver city services. Another theme was the importance of proximity; as housing costs rise, many first responders cannot afford to live in or near the city they serve. This distance affects first responders' response times and potentially their personal motivations and commitment to the community. Much of the conversation came back to the need to support city staff members so they could be both personally and professionally resilient and able to do their jobs.

Critical Certainties and Uncertainties

After ranking the driving forces, the working group defined three critical certainties:

1. Increasing water scarcity.
2. Higher housing costs.
3. Steady population growth.

They selected two critical uncertainties:

1. Municipal fiscal health.
2. Staff capacity.

The group agreed it was safe to assume that water scarcity would increase and housing costs continue to rise because of steady population growth. The group was uncertain, however, about the municipality's fiscal health and levels of staff capacity. They lacked clarity on the collaboration needed to achieve adaptation, sustainability, and resilience; the cost of infrastructure; the capacity to serve a growing population; the consequences of big data and cybersecurity threats; the evolution of the population; and the kind of development residents and businesses would want in the city.

Developing Scenarios to Guide Growth

Initially, the working group considered three uncertainty axes: staff capacity, municipal fiscal health, and infrastructure cost; however, it eliminated the last because it was seen as a function of municipal fiscal health—meaning that, with appropriate fiscal policies in place, the cost of infrastructure would be covered by available revenues and funding.

The resulting two-axis uncertainty matrix thus established the four credible, compelling, divergent, and challenging futures seen in figure 10. The project team noted that scenarios 1 and 4 would likely begin as temporary situations that, if not well managed, would devolve into scenario 3 or a similarly unhealthy, stressful environment.

A member of the emergency management team with over 30 years of experience described how he had witnessed every one of these scenarios in his tenure with the city. Because change is inevitable, XSP provided Fort Collins the opportunity to adapt to endure or even capitalize on these changes.

SCENARIO DESCRIPTIONS

Scenario 1: Treading Water

This is the most volatile scenario: The city lacks funds for adequate response capacity in its services. Staff could come together to find innovative solutions, but they may feel burned-out and leave. There is fiscal mismanagement, and staff may flee because they do not trust management and they worry about pay-checks bouncing. The community may cut items out of the municipal program, but staff members ultimately maintain a high level of performance.

Scenario 2: Day at the Pool

Reliable, diversified revenue streams rely less on sales tax and more on fees. There are more primary employers and more tourism, as well as efficient allocation of and accountability for municipal resources. City employees can live in the city, and the city's leadership and organization reflect residents' cultural and racial diversity. More and more people who come to live in the city stay longer. Delivery of services is equitable, and delivery of infrastructure like sidewalks does not reflect institutional bias. Staff have the capacity to deal with internal and external services. Internally, city staff can tell their story well and have earned the public's trust.

Scenario 3: Underwater

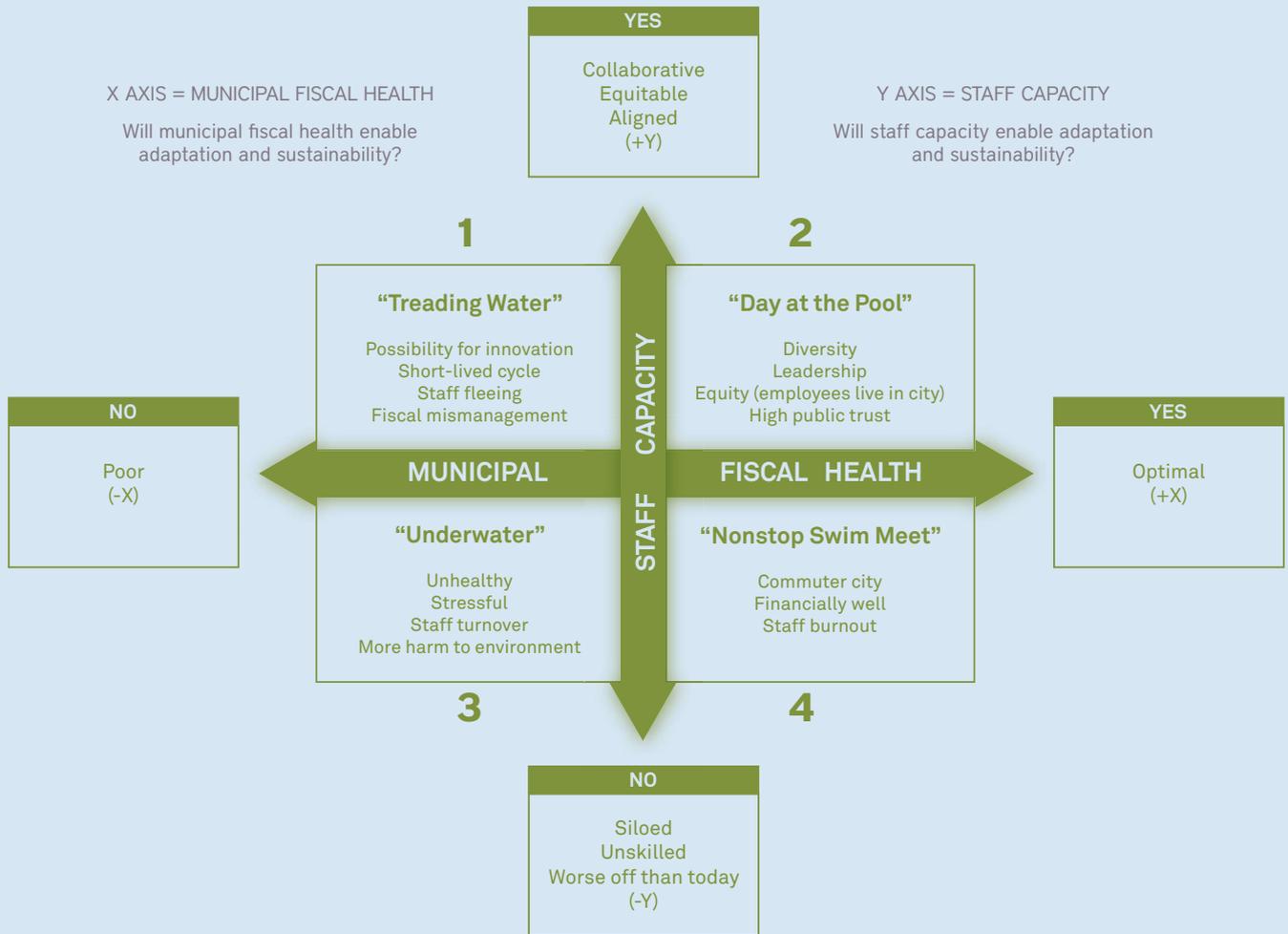
Stress and high staff turnover damage the culture of the organization. Staff end up fighting for resources, the triple bottom line is thrown to the wayside, and the city deals with the past and present rather than plans ahead. Fort Collins becomes an uglier, less desirable place to live and the natural environment degrades. This scenario could be triggered by economic recession, a more conservative city council, climate disruptions, or a big scandal.

Figure 10

The Fort Collins Scenario Matrix

The Scenario Matrix

Fort Collins' Municipal Sustainability and Adaptation Plan



Scenario 4: Nonstop Swim Meet

Departments are still siloed, though they are fiscally healthy. Fort Collins becomes a commuter city because people cannot afford to live there. The city lacks enough staff resources. The community may be doing well, and money is coming in, but residents do not like the public sector. The city has open staff positions but not enough resources—or political will—to sustain those positions or to provide staff resources. The city makes inefficient use of resources, such that it cannot hire for some skill sets and must instead engage consultants to do the same jobs at higher costs.

OUTCOMES

Robust Strategies

Participants identified and classified robust strategies common to all scenarios at workshop 2, which the project team then refined into guiding principles of People and Planet First for the MSAP:

1. Grow a deep bench and a Culture of Preparedness through cross-training, mentorship, and capturing institutional knowledge.
2. Invest in wellness, including residency, affordability, and mental health.
3. Support emergent management systems and the convenience, tools, and guidance they bring.
4. Enhance relationships among members of the city council and public to set expectations, encourage collaboration, and build support and political will.
5. Establish partnerships throughout the region, including with the private sector.
6. Employ a budget process that prioritizes accountability.

These strategies provided a framework for shaping the plans, policies, programs, and relationships needed to

help the city reach its sustainability and adaptation goals. Together, they optimized the triple bottom line of municipal operations and drove the refinement of the tactics, strategies, objectives, and goals adopted in the MSAP (City of Fort Collins 2019a).

Progress and Impact

XSP was a new approach for the city, and its results directly guided the development of the MSAP, in which the city formally addressed climate adaptation and resilience (City of Fort Collins 2019a).

The city's method of budgeting for outcomes is widely used, but staff agreed that the budgeting process itself introduces a lot of uncertainty. Because of the budget's effects on sustaining capacity and momentum, the budgeting process may benefit from revision. Sustainability and resilience can become a function of routine and intuitive decision making. The MSAP emphasizes the need for increased coordination and collaboration among people, departments, and organizations; the procurement, development, and retention of leadership; and the design of accessible, convenient systems of accountability.

The XSP process also highlighted the need to build capacity and further institutionalize goals through specific and strategic plans and prioritized funding implementation. To this end, the XSP project team worked with planners who were concurrently revising the city's comprehensive plan, known as City Plan, to reflect the strategies, goals, and objectives of the MSAP (City of Fort Collins 2019b). Both the MSAP and City Plan were adopted in April 2019.

We do not yet know the effect of these plans, but the evolution of the framing and messaging within them inspires confidence in the city as it adapts and builds its capacity—major goals of its XSP project.

CHAPTER 4

Additional Exploratory Scenario Planning Case Studies



Cotton is a primary crop in Gila County, Arizona. (Mt. Graham seen in the background.) *Credit: Jeremy Stapleton*

This chapter explores several additional case studies to show the range of projects—in geographic location, use of supportive technology, scope, scale, and focus—that can benefit from incorporating XSP. Though diverse, these case studies have key commonalities:

- Each follows a rigorous and explicit process incorporating planning support systems, tools, or models.
- Each includes a very broad base of stakeholders, some with divergent views.
- Each incorporates quantitative inputs and outputs into lengthy, resource-demanding, and complex processes.

University of Arizona Water Resources Research Center: Scenarios for the Upper Gila Watershed

Water Resources Management Planning in the Upper Gila Watershed (2014)
Graham and Greenlee Counties, Arizona

CONTEXT AND PURPOSE

The Gila River's headwaters are in the Mogollon Mountains of New Mexico; from there, the river flows across Arizona and meets the Colorado River near Yuma, Arizona. Communities across both states rely on the Gila River for their water supply, but current trends threaten the future of that reliance. Residential water demand is outpacing reductions in agricultural water demand, and the Upper Gila Watershed is projected to have unmet water demands by 2035 (Banister et al. 2014). The uncertainty and impacts of climate change and plans to divert more water in New Mexico further threaten watershed health and community resilience in Arizona.

Communities like Graham and Greenlee counties in Arizona are concerned about inevitable changes and potential disruptions to their quality of life. To address these concerns, a partnership among the University of Arizona Water Resources Research Center (WRRC), the Gila Watershed Partnership (GWP), and Arizona Cooperative Extension was formed to study the history and current conditions of the watershed. The resulting

"Atlas of the Upper Gila Watershed" laid a foundation for understanding the watershed on the basis of the past and for crafting scenarios to explore the future (Banister et al. 2014).

Beginning in 2014, the WRRC used XSP to understand stakeholders' top concerns about the future of water and to inform the development of a watershed management plan, funded by the U.S. Bureau of Reclamation, that addressed critical questions prompted by the exploratory scenarios and by stakeholders' ongoing concerns. This case study is included for its adaptive approach to managing and conveying the complexity of the scenarios and the unfolding of conditions over the course of several decades. The XSP process relied on cooperation among researchers and local interests, leveraging the expertise of each group and engaging with a broad cross section of water users.

Scope and Scale

The scope of the project was to explore alternatives for closing the projected gap in the Upper Gila Watershed's water supply and to mitigate potential disruption to its environmental, economic, and social systems. The scale was the Upper Gila Watershed, an area of nearly 10 million acres spanning two states and home to about 40,000 residents (Banister et al. 2014). The WRRC worked with the GWP and the Watershed Restoration and Planning Steering Committee to lead and manage the process. The scenario planning process was one element of a three-pronged approach to watershed planning; the other two were a baseline watershed assessment and a water supply and demand study. These all contributed to a watershed management plan for the GWP.

FOCAL QUESTION

In the face of uncertain physically and legally available water supplies, how do we provide reliable long-term water supplies for a resilient community, preserve the rural agricultural lifestyle, and sustain and enhance the health of the Upper Gila River Watershed?

METHODOLOGY

In an innovative example of how XSP can be a confluence of art and science—and how the process can model as well as enable adaptation—the Upper Gila River Watershed XSP deviated significantly from the standard process discussed in previous chapters.

Stakeholder interviews informed a preliminary list of driving forces, which the Watershed Restoration and Planning Steering Committee then clarified and ranked in a full-day scenario planning workshop. A second round of interviews and an independent meeting with farmers and ranchers in the watershed also provided opportunities to verify accounts of issues and dig deeper into persistent questions and repetitive themes.

When workshop facilitators attempted the traditional approach of using a four-quadrant uncertainty matrix to frame scenarios, however, participants quickly rejected the repetition the approach creates. Instead, facilitators selected scenarios based on polling results from the scenario planning workshop that ranked the most important drivers in the watershed, drawing out the major themes and critical uncertainties in tandem. This technique enabled the group to explore scenarios they perceived as having the biggest and most likely threats—for instance, the loss of copper mining and therefore funding for watershed restoration work.

Ashley Hullinger, a research analyst and scenario planning practitioner with the WRRRC, noted that the scenarios would not have been as useful to or informative for participants had they stuck to a traditional matrix approach. The project's use of narratives and graphics conveyed complex information in ways that better engaged its audiences and improved critical thinking and communication. The untraditional approach of this XSP process improved its buy-in potential with ranchers, farmers, mining interests, policy makers, and other stakeholders (Hullinger 2019).

SUMMARY OF DECISIONS

Drivers

Twelve drivers were determined to have significant impacts on the future of the watershed (Mott Lacroix, Hullinger, and Fullerton 2014):

1. Informed populace.
2. Cooperation.
3. Fire.
4. Infrastructure.
5. Drought.
6. Storm intensity.
7. Population growth.
8. Fluctuations in copper prices.
9. Federal involvement (funding and oversight).
10. Water supply availability (groundwater and surface water).
11. Legal availability of the water supply.
12. Commodification of water.

Critical Certainties and Uncertainties

Figure 11 charts the relevance of each driver in each scenario or subscenario. A review of the scientific literature and feedback from stakeholders determined the level of importance of drivers for these scenarios. Some drivers were thought to have far-reaching impacts across the scenarios, but other drivers were more specific to certain scenarios. Drought was considered the only uncertainty that would be critical in all scenarios.

Developing Scenarios to Guide Growth

At the workshop, participants defined a focal question, identified and ranked driving forces of change, and discussed the most critical uncertainties affecting the future of the watershed over the next 30 years. The WRRC then took the key drivers and uncertainties and created scenario narratives, using spider diagrams, as seen in figure 11, to show the level of significance in each scenario. The WRRC gave workshop participants articles on systems thinking to stimulate discussion of the types of holistic solutions being sought.

The WRRC's four scenarios spanned 30 years (from 2015 to 2045) and demonstrated how major uncertainties could influence and change key drivers. Written as stories to help the community think about what the future might look like, the scenarios wove together information from interviews with local stakeholders and research on impacts of elements such as tamarisk beetle defoliation and prolonged drought. The scenarios focused on likely and high-risk events that required extensive planning, given that preparing for normal conditions does not require as much adaptation or capacity building.

Each scenario narrative was organized into 10-year periods to examine the evolving causes and effects of driving forces and strategies deployed in pursuit of their vision. Notably, only after drafting the scenarios did researchers begin studying water supply and demand in the watershed, so these projections were not well integrated into the scenarios (Hullinger 2019).

SCENARIO DESCRIPTIONS

Four scenarios were drafted, but in a continuation of the unique methodology of this project, some included detailed subsections to enable the inquiries that interested the group.

Infographics, a key feature of this case study, were used to help convey key points of the scenarios. In

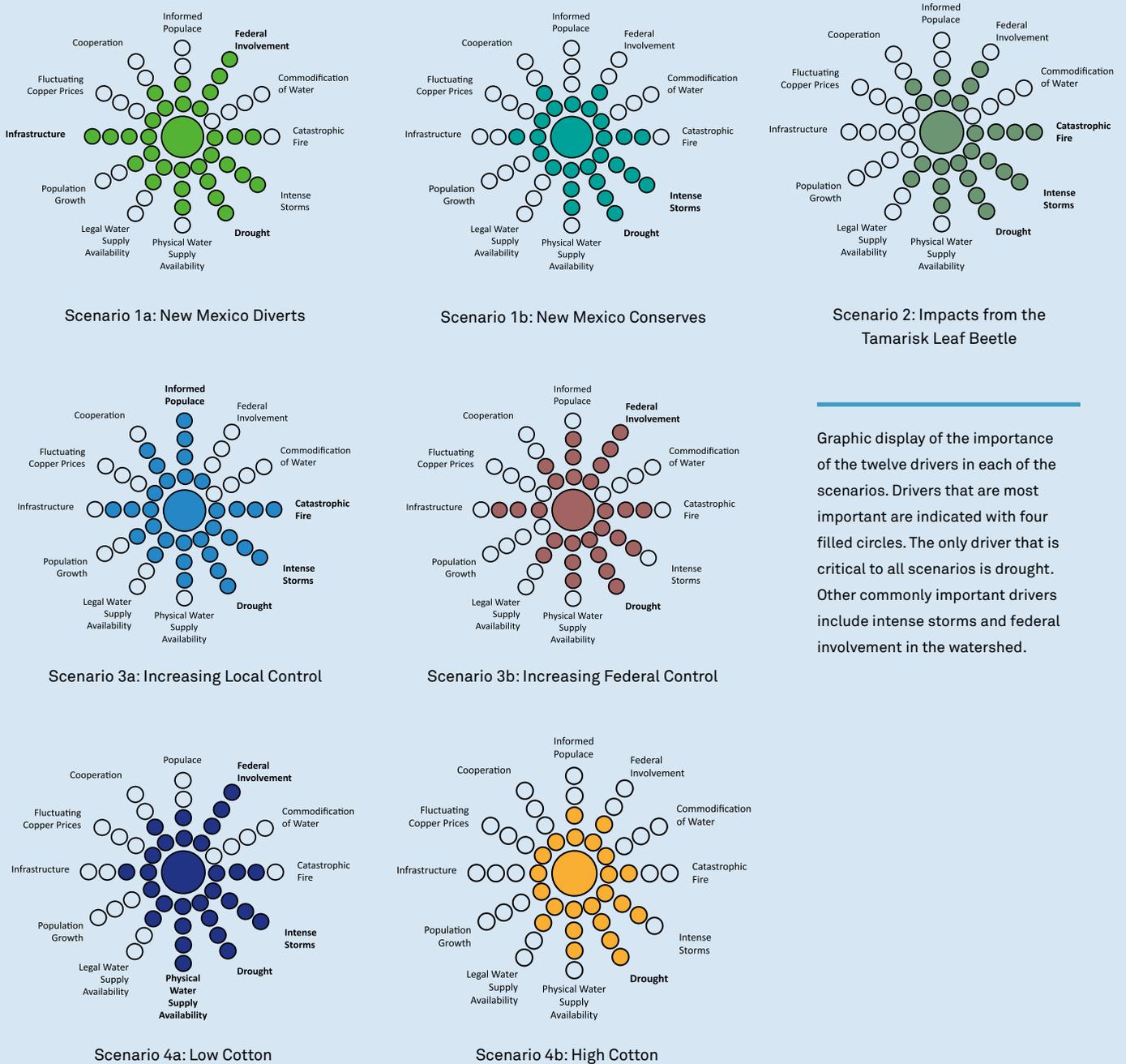
each infographic, the scenario's drivers were listed on the left side, with arrows noting whether a factor had increased or decreased and with dotted lines and arrows that showed how various drivers affected each other. The impacts of each scenario were listed on an infographic's right side; text size indicated the compounding effects of a repeat occurrence (e.g., catastrophic weather events), and an asterisk indicated that a different scenario may impact this one, given the multitude of drivers at play.

To provoke thought and strategy development for these scenarios, facilitators asked prompting questions, such as the following:

1. How can groundwater monitoring be facilitated in the coming years so that complex interactions between pumping, surface flows, and recharge may be better understood?
2. In a future with flooding driven by extreme weather events and functionally impaired riparian areas, what steps should be taken for floodplain management?
3. What incentives would bring Arizona to partner with New Mexico to protect base flows in the Gila?
4. What steps could be taken now to encourage a regional economic partnership (including New Mexico) to promote the growth of recreation, birding, and tourism in the Upper Gila River Watershed?
5. What kinds of coordination and cooperative resource management strategies will be necessary among different entities like the federal government, counties, and tribes to address the downstream impacts of fire and extreme floods?
6. What kinds of drought-adapted crops might be appropriate, assuming market demand, in the event of higher production costs due to drought and decreased water availability?
7. How will joint intergovernmental efforts to remove or manage tamarisk beetles, if any, affect how local governments work cooperatively on other water issues (Mott Lacroix, Hullinger, and Fullerton 2014)?

Figure 11

Graphic Display of the Drivers in Each Scenario for the Upper Gila Watershed



Graphic display of the importance of the twelve drivers in each of the scenarios. Drivers that are most important are indicated with four filled circles. The only driver that is critical to all scenarios is drought. Other commonly important drivers include intense storms and federal involvement in the watershed.

Source: Mott Lacroix, Hullinger, and Fullerton 2014.

SCENARIO 1

To Divert or Not to Divert: The Fate of New Mexico's CAP Allotment

This scenario looks ahead 30 years (from 2015 to 2045) to explore implications of the state's diverting water from the Upper Gila River Watershed and whether New Mexico would build a diversion to use up to 14,000 acre-feet of surface or groundwater from the Gila River system. Under the Arizona Water Settlements Act, New Mexico can divert this water if it pays to exchange that water for Central Arizona Project (CAP) water in Arizona and ensures no harm to downstream water users.

Scenario 1a: New Mexico Diverts

Construction and mining temporarily boost the regional economy but ultimately lead to a series of worsening environmental conditions, including drought, fires, flooding, diminished water quality, and tamarisk beetle infestations. Drought prevented New Mexico from storing its full share of CAP water, so reservoirs stand substantially below capacity, and the lack of reliable storage inhibits growth, development, and even tourism. Rising water costs drive people out of certain areas—although this allows higher-value municipal and industrial uses of an increasingly limited resource. The 10- and 30-year breakdowns of this scenario are depicted in figures 12a and 12b.

Scenario 1b: New Mexico Conserves

Though drought recurs because of less snowfall and earlier peak runoff, the Upper Gila River is a remarkable example of an undammed river in a semiarid environment. Increased eco-recreational tourism helps local economies grow, and groundwater recharging programs have substantially increased cumulative supply. Conservation and restoration efforts have led to resilient plant communities along the river corridor, improving floodplain management and wetland protection. Overall, the watershed's managers are moderately more able than they were in 2015 to mitigate the effects of long-term drought.

SCENARIO 2

Eat and Run: Impacts from the Tamarisk Leaf Beetle

The arrival of the tamarisk leaf beetle in the Upper Gila River watershed and subsequent beetle-induced tamarisk die-offs is a near certainty—but the consequences on the region's future are unknown.

Multiple species of beetle infest a watershed that is increasingly prone to major landscape-scale emergencies: wildfires that threaten air and water quality and increased flooding and debris flows that damage infrastructure and reduce reservoir capacity as mega-drought conditions set in. Cuts to CAP water increase tensions between water users and trigger resident-led conservation initiatives. Public and private groundwater users are paying more and drilling deeper wells. Local governments are swamped by costs of recovery. Mines have been exhausted, which leaves fewer funds available for watershed stewardship projects. A super-species of tamarisk is rumored along the shores of the Upper Gila River. In these circumstances, property values decline, necessitating higher taxes. Higher tax valuation, in turn, circumscribes who can own land along the river and how it is managed, as well as the land protection status along the river.

SCENARIO 3

Mayberry Versus the Beltway: Local to Federal Control

This scenario explores the shifting dynamics among federal, state, and local governments, and how this affects the political atmosphere. The degree to which local, state, and federal resources and agendas are aligned can drive the future. The federal authority, for instance, may be heavily leveraged or virtually absent depending on administrations. The swings seen at the federal level can also be seen at the state and local levels, as demographics reflect new compositions of ages, ethnicities, incomes, and education levels. Regardless, the region must adapt to its reality and

Figure 12a
**The Impacts of the
 New Mexico Diverts
 Scenario After 10 Years**

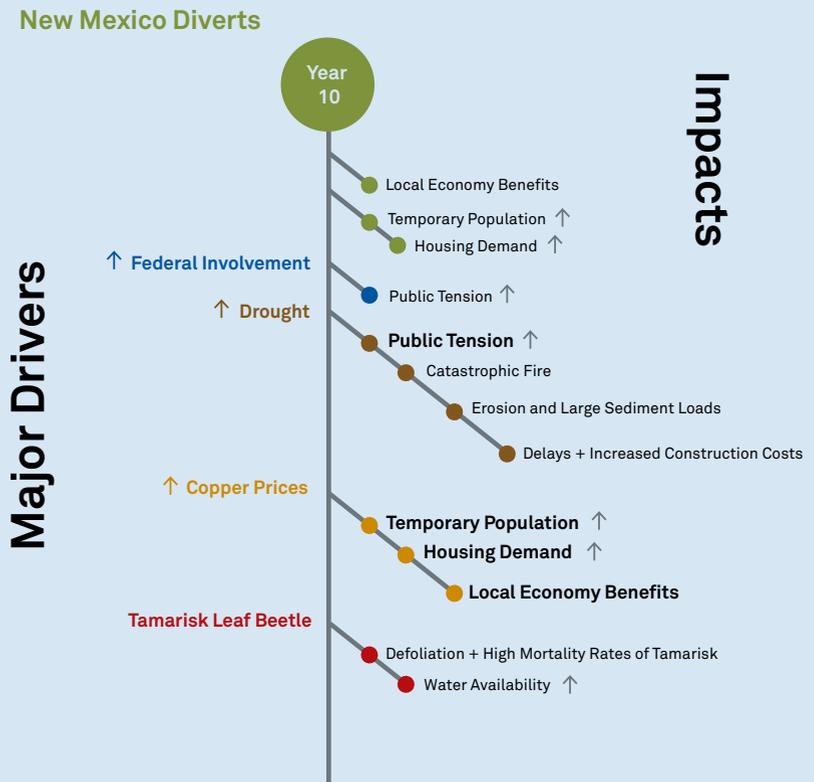


Figure 12b
**The Impacts of the
 New Mexico Diverts
 Scenario After 30 Years**



Source: Mott Lacroix, Hullinger, and Fullerton 2014.

enforce unfunded mandates like the Clean Water Act, Safe Drinking Water Act, and Endangered Species Act. Meanwhile, the federal government controls 46 percent of the land in the Upper Gila Watershed through the Forest Service and Bureau of Land Management, limiting local control of how those lands are managed.

Scenario 3a: Increasing Local Control

Federal administrations limit federal expenditures and reduce regulatory burdens. Partnerships among local governments and religious, nonprofit, and for-profit organizations are tasked with managing the watershed and intensifying drought that wipes out the viability of agriculture in the valley. The nation is in a depression. People want jobs and economic growth, so officials greenlight debt and development projects at will, resulting in sprawl and consumption of habitat. Endangered species are more threatened than ever in the Upper Gila River watershed. Yesterday's quality of life is difficult to attain, motivating a majority of residents to more actively engage in planning and politics. This leads to a water deal with a tribal nation, a regional direct potable reuse system, and revisions to policies and programs that stimulate a new developer- and environment-friendly economic market.

Scenario 3b: Increasing Federal Control

The federal government expands its authority and has coordinating partnerships among federal, state, and local governments to integrate water and land use planning as its top priority. New construction standards, floodplain restrictions, land use plans, and zoning and building codes create tension between competing management agencies and locals who make expensive attempts to fit Midwest- and Northeast-style infrastructure into this southwestern desert setting. Unfunded burdens to enforce new and stricter laws fall on local governments. Local identity

and sense of place have been lost to federal standards for education, health, environmental stewardship, land development, and more. Population is on the decline. Policies meant to preserve the agriculture industry have decimated water supply and quality, which, coupled with climate change, has all but killed the agriculture industry. As that land is retired, pollution and other impacts from agricultural runoff decrease, but the trend of increasingly saline water being applied to saline soils continues. Federal and private funding have brought a desalination plant near completion, but energy demand and therefore cost of this water means 25 percent of the average household income goes to taxes. The issue of the brine by-product remains, delaying operation of the plant until an acceptable storage or dump solution is found.

SCENARIO 4

From Cotton Boll to Dust Bowl: Fluctuation in Cotton Prices

Cotton farming is an exercise in uncertainty. Fuel, energy, and utility costs affect operations. Federal policies like the Farm Bill and regulations like the Clean Water Act affect returns, and pests like the pink worm and boll weevil are a constant threat. Weather, consumer demand, and commodities speculation drive national and international prices. Farmers are, however, forced to accept the market price. In Graham and Greenlee Counties, 14 percent and 48 percent of the population, respectively, were employed by agriculture, forestry, fishing and hunting, and mining industries. Cotton, the primary crop in the region, needs about 2.5 acre-feet of water per acre, or enough for about five households for one year. These scenarios explore what might happen in the Upper Gila Watershed if cotton prices see significant fluctuation over 30 years.

Scenario 4a: Low Cotton Prices on Average

Cotton farmers struggle to stay afloat. Federal incentives lead to fallow fields, forcing ranchers to import feed. Main Street suffers from depressed employment when a storm in China spurs speculation of a 42 percent increase in U.S. cotton prices. Some farmers pre-sell their crop only to endure a bad crop year, see infestation by insects resistant to *Bacillus thuringiensis*, or find the market has additional supply thanks to increased production by Native American tribes that sell cotton below U.S. prices. Drought intensifies. Collaborative funding of storage and distribution infrastructure, fueled by demand for local fruits and vegetables in growing cities, has made the region into a hub for community-supported agriculture. Employment draws new blood to communities and community-supported agriculture becomes profitable, but a surprising rise in cotton prices follows storms that damage fields and diversion dams. Capital is hard to find. The area's agricultural heritage is romanticized, and preservation efforts lead to Buy American and Buy Local campaigns. Yet developers and mining companies have already purchased some of the best agricultural land in the watershed, putting it out of production, and technology has all but eliminated water flows from agriculture returning to the river.

Scenario 4b: High Cotton Prices on Average

It is a golden era for cotton farming in Arizona: The United States is one of few nations in the world still subsidizing and insuring the industry. Floods hit growers in Australia and Southeast Asia, but here, the yield from acreage, workers, and water is optimized through technology. Cotton farmers band together to seek strong representation in the state legislature to ensure their supplies, and U.S. Department of Agriculture funds keep water on cotton fields. Land is being exploited to maximize profits; increasingly saline water barely returns to nature or travels downstream. Buy Organic campaigns and links between cancer and pesticide use spur demand for organic cotton, as do tensions with farmers of genetically modified seeds.

A seemingly unstoppable superweed requires greater application of herbicide, and levels of toxins in the air, soil, and water thus rise, but growers and supporters fight to keep cotton one of the 5 Cs of Arizona (cattle, citrus, climate, copper, and cotton). Migrant workers set up settlements on federal lands, outside unaffordable towns, and local authorities lack capacity and solutions as drought further damages the watershed.

OUTCOMES

Robust Strategies

Formalizing partnerships, funding, and direct integration into operations helps ensure that the vision and action planning from the XSP process can be implemented and attained. The GWP drew on the baseline assessment, scenarios, and water supply and demand budget to inform its watershed management plan. This plan was prepared for the GWP by the WRRC and Stillwater Sciences in 2017 and 2018, with funding from the Walton Family Foundation.

General management recommendations included the following:

- 1. Convene decision makers around watershed issues.** Watershed management is strengthened with the participation of local decision makers, experts, and community members. The GWP is best positioned to convene disparate groups and host critical dialogues about the health of the region to build common understanding of the issues and develop solutions.
- 2. Prioritize areas most vulnerable to fire.** The Upper Gila River Watershed's patchwork of property ownership and land management creates potential hazards for property and wildlife in the region. The GWP will work with landowners and agencies to standardize management practices and develop a multijurisdictional plan for fire mitigation.

3. **Identify infrastructure at risk from natural disasters.** Aging erosion-control structures and engineering dating from the last century have left the Upper Gila River Watershed at risk from flooding and other natural disasters. A concerted effort is necessary to identify and target compromised structures that pose the greatest threat to people, property, and riparian areas.
4. **Cultivate the next generation of watershed stewards.** Youth engagement, found to be highly effective, will serve as a primary method for outreach and education in the communities in the Upper Gila River Watershed.
5. **Support conservation practices and policies.** Boost initiatives to install more efficient infrastructure in homes, fix leaks, and educate on how to save money and conserve water. These types of programs could play a continuing role into the future, particularly in areas where new residential and commercial growth would create increased water demand and where the proposed ordinance is not adopted.
6. **Establish upland management best practices.** Using resources from the Bureau of Land Management and other federal agencies, develop a set of practices customized for the region that address major stressors on upland health and, in turn, determine riparian and watershed health.
7. **Delineate river management stretches.** On the basis of land ownership and aligned management objectives, delineate the management network and stretches of the river corridor to prioritize management action and to identify the responsible entity (Hullinger 2019).

Progress and Impact

This case study demonstrates a series of unique innovations in managing and conveying complex scenarios. It also shows how to analyze and better understand the past as a launching point for future planning. Hullinger, one of the scenarios' authors, notes that awareness of traditional processes must critically accompany adaptations to optimize audience engagement: "Tell stories that get people to pay attention, but in a way people can talk about it. The goal is critical thinking and communication, not just between researchers and stakeholders but among the different stakeholder groups and water-using interests. This process wouldn't have moved forward with just data or just a narrative" (Hullinger 2019).

Agriculture uses about 90 percent of the water in the region, but farmers had not historically been at the table in watershed planning discussions. Because the Upper Gila Watershed XSP process included farmers, ranchers, mining interests, and policy makers working side by side, it countered myths prevalent in the area and resulted in "aha!" moments about policies affecting these groups.

The process also illuminated divisive and longstanding gaps in information, which led the WRRC to build a new resource bridging some of these historical community rifts, "A Guide for Landowners on the Upper Gila River" (Brandau et al. 2017). The guide is one of the most accessed resources on the WRRC's website and is a practical application of the recommendation out of the XSP process to increase public awareness.

Additionally, this XSP process informed an annual watershed forum, held since 2017, that incorporates lessons from the scenarios into a public setting to check the status of key issues in the watershed, such as local and federal land and water planning, climate impacts, farming and ranching, and riparian restoration.

Atlanta Regional Commission: Sharpening Our Focus

Transportation Planning (2016)
Atlanta Metropolitan Area, Georgia

CONTEXT AND PURPOSE

In researching and developing tools to improve and advance innovation in transportation planning, the U.S. Department of Transportation, the Federal Highway Administration (FHWA), and the American Association of State Highway and Transportation Officials developed their second Strategic Highway Research Program (SHRP2) for state departments of transportation, metropolitan planning organizations (MPOs), local and tribal agencies, and FHWA's Federal Lands division. The program provides federal aid to integrate proven research into traditional planning practices through online tools, training, and financial and technical assistance. This body of research includes testing SHRP2 products for continued improvement.

The planning process encompasses a diverse range of topics that must be addressed early on to inform transportation planning, programming, and project decision-making. Topics such as performance measurement, visioning, greenhouse gas emissions, public-private partnerships, and freight planning continue to evolve and require new data and analysis processes. Decision makers, partners, stakeholders, and the public alike need better information on how these topics impact transportation planning, programming, and project development in order to make informed decisions that lead to successful outcomes. (FHWA 2020)

Georgia's Atlanta Regional Commission (ARC) has a two-decade history of projecting future transportation and land use conditions for the region's MPOs, which include parts of 20 counties and 5.6 million people. ARC had previously assessed a variety of normative scenarios in debating investment strategies for a regional plan, adopted in February 2016, outlining a long-range vision for developing world-class infrastructure, a competitive economy, and healthy livable communities—but it needed more specificity and consensus on solutions.

To refine the plan's policies and goals, ARC in 2016 and again in 2017 opted for the XSP approach and three SHRP2 capacity process tools bundles, as detailed in figure 13. ARC's implementation assistance grant from SHRP2 incorporated exploratory approaches into specific key project decisions around its overall vision, prioritizing activities and even the unique needs of freight haulers. ARC initiated this work between Regional Transportation Plan and Transportation Improvement Program update cycles (ARC 2019).

Using the established regional vision as a starting point—and keeping the potential for a dynamic future in mind—ARC undertook its second XSP process to analyze trends that have the potential to disrupt how the Atlanta region lives and travels to chart a course toward the shared goal of winning the future. Secondary goals included identifying a model consensus-based approach to transportation investment, more fully promoting integration of freight considerations through direct outreach to new stakeholders, and tracking progress and impact with enhanced performance measures (ARC 2016b).

The results of the Sharpening Our Focus process laid a foundation on which to launch the 2020 update to the Atlanta region's plan, and they presented a powerful platform for elevating the level of public engagement

Figure 13

How ARC Used SHRP2 Planning Process Bundles to Produce Key Deliverables

How the specific SHRP2 planning process bundles were used is shown below, along with the key deliverables produced by ARC.

<p>CO2</p> <p>Performance Measures for Highway Capacity Decision Making</p>	<p>ARC used this product to expand the list of performance factors used in transportation decision making during long-range planning. Performance measures were tailored to help regional policy makers and others better understand the potential outcomes of planning decisions. By focusing on the practical application of performance metrics, ARC can better articulate the linkages between transportation, communities, and the economy.</p> <p>CO2 Volume 1: Best Practices in Performance Measurement for Transportation Decision Making CO2 Volume 2: Incorporating Performance Measurement into the Planning Process TIP Project Evaluation Framework (<i>supplemental related material; not a core deliverable</i>)</p>
<p>CO8</p> <p>Transportation Visioning for Communities</p>	<p>ARC worked with key partners and member governments to develop a vision for the Atlanta region. ARC integrated new approaches to scenario planning into <i>The Atlanta Region’s Plan</i>. Innovative stakeholder engagement techniques were applied, including regional surveys. Scenario planning used the region’s vision as a starting point for solutions and measuring performance.</p> <p>CO8 Volume 1: Vision, Approach and Stakeholder Engagement Plan CO8 Volume 2: Scenario Development Process CO8 Volume 3: Scenario Testing Procedures and Results CO8 Volume 4: Addressing Uncertainty and Change in the Planning Process</p>
<p>C15</p> <p>Integrating Freight Considerations into Highway Capacity Planning Process</p>	<p>ARC concurrently finalized an update to <i>The Atlanta Region Freight Mobility Plan</i>. This planning endeavor ran in parallel to the long-range planning effort. Use of the C15 product brought freight stakeholders more fully into <i>The Atlanta’s Region’s Plan</i> development process. Collaboration with freight stakeholders was widened to incorporate adjacent MPOs, Georgia DOT, and key stakeholders in the Piedmont Megaregion.</p> <p>C15 Volume 1: Improving the Integration of Freight into the Planning Process Regional Models of Cooperation Peer Exchange Summary Report: Freight Planning and Regional Cooperation in the Piedmont Atlantic Megaregion (<i>supplemental related material; not a core deliverable</i>)</p>

Source: ARC 2016a.

and informed discussion during that update. Although the application of this new visioning approach was relatively small scale, the SHRP2 grant allowed ARC to fully develop messages and scenario descriptions that resonated with a local audience of elected officials, transportation staff, academic experts, and the ARC team.

As the subsequent ARC report noted,

[XSP] was used as a way to sharpen our focus and create more consensus for a shared vision of what “winning the future” looks like in the Atlanta Region. By starting the process of visioning now, we added front-end resources to the next long-range plan update. By the time we adopt the 2020 long-range plan update, we will have a sharper focus on the key drivers that could potentially impact our ability to win the future. Similarly, we will be well-positioned to further enhance our ability to construct a long-range plan that reflects the region’s stated policies and matches clear investment priorities with measurable progress toward our larger goals. (ARC 2016a)

The XSP process thus not only guided planners but also provided inputs for further modeling and for interactive stakeholder engagements (including an online game, a podcast, and a dinner party) to inform the 2020 Regional Transportation Plan (ARC 2020).

Scope and Scale

The scope of this project is to attain a regional vision for the future and to identify performance metrics for adaptation. FHWA was also interested in improving its SHRP2 capacity process tools bundles. The scale was the Atlanta region’s (MPO), with a planning horizon of about 30 years.

FOCAL QUESTION

How can we test the resilience of our planning strategies to hone regional transportation and land use goals?

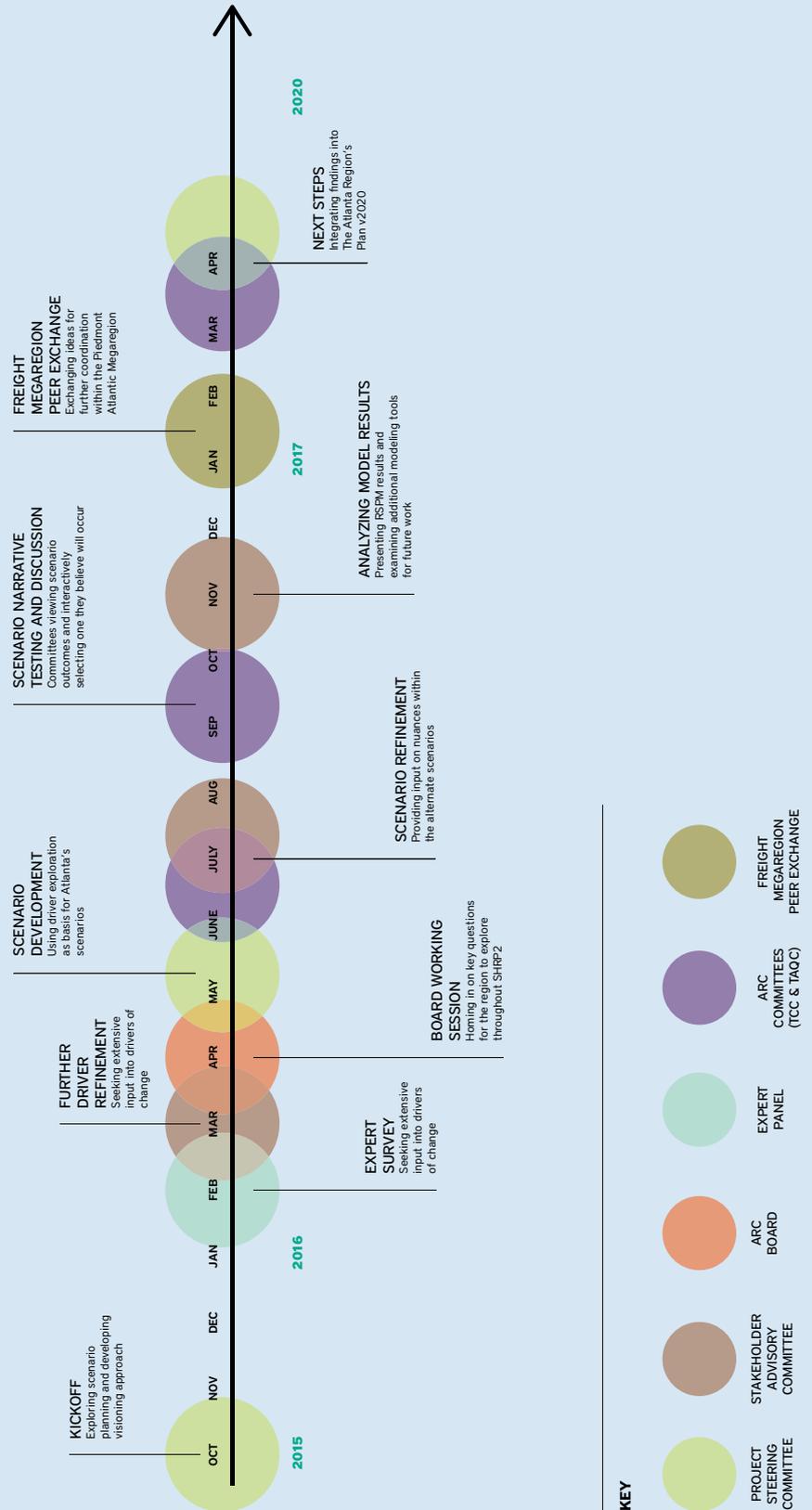
METHODOLOGY

ARC’s process diverged from the traditional framework detailed in chapters 2 and 3. Working over an 18-month timeline (figure 14), a consultant team applied three separate tools in each of three phases to engage stakeholder groups of technical staff, officials, freight haulers, and others. After asking, Where are we now? and What could the future hold? it halted with the approval of a scenario framework.

ARC used the model approach of the Transportation Visioning for Communities (C08; see box) and the FHWA’s PlanWorks guides, including a step-by-step process, case studies, and online tools to generate consensus on visions, solutions, and metrics (ARC 2017). The ARC project team found, however, that they needed a more flexible, less linear approach to contend with the escalating uncertainty and the pace of change.

Rather than defining drivers as certain or uncertain and then using the uncertainties to frame scenarios, the team leaned heavily on the ideas, resources, and tools provided in the National Cooperative Highway Research Program (NCHRP) Report 750 Foresight Series published by the American Association of State Highway and Transportation Officials’ Standing Committee on Research and shown in figure 15. The six reports and an accompanying suite of action-enabling resources cover strategic issues facing transportation and explore related drivers and uncertainties regarding freight, climate change, technology, sustainability, energy, and demographics.

Figure 14
The ARC Planning Process



Source: ARC 2016b.

TRANSPORTATION VISIONING FOR COMMUNITIES (C08)

Contemporary transportation planning processes now range beyond topics of connectivity or design to consider community livability and a host of interrelated issues. Thus, community visioning has become a significant source of input in these processes, guiding appropriate infrastructure decisions that enhance economic competitiveness, environmental stewardship, and community resources while improving transportation project outcomes.

Despite their potential, visioning processes tend to produce high-level, policy-oriented outcomes that often prove difficult to integrate within focused, project-specific planning efforts. As a result, visioning in support of transportation planning has not been uniformly embraced by practitioners and remains an undefined, though increasingly popular, practice across the nation.

In response to this challenge, Transportation Visioning for Communities (C08) has developed a new suite of visioning tools to include a model approach, a step-by-step process, and case studies along with a guide and website to generate consensus and shared outcomes for transportation projects.

FHWA's Implementation Assistance Program receives applications approximately twice a year from individual states' departments of transportation, MPOs, and others deploying SHRP2 solutions. The three primary goals of supplying these tools are to save time, money, and lives by improving how agencies and stakeholders plan, design, build, and operate infrastructure. Benefits pursued include cost-effective designs for faster, longer-lasting solutions; pavement preservation; capacity enhancements; environmental stewardship; incident response; and management of large, complex projects (FHWA 2020).

Figure 15

The NCHRP Report 750 Series Developed Scenario Planning Tools Tailored to a Range of Topics



Source: NAS 2020.

They also used sketch planning tools to help show the impacts of identified drivers, preferring these nimbler tools to more complex models that take a lot of time to produce results. They used the scenario-analysis tool Impacts 2050 to model a range of sociodemographics and impacts on transportation (NAS 2014). Impacts 2050 then generated four predefined scenarios, with population inputs that ARC would use for other modeling.

Stakeholder advisory committee members considered drivers that would result in each of these futures, comparing different outcomes and modifying some assumptions made in the NCHRP Report 750 to better reflect their local context. The scenarios were further defined using technology and calibration, working with Regional Economic Models Inc. (REMI) and the Regional Strategic Planning Model (RSPM), an agile open-source scenario-testing tool that assesses transportation-related impacts (NCHRP 2020).

This process delivered detailed scenario narratives, analysis from the modeling, and an online tool that estimates the likelihood of trends and explores how alternative futures align with user responses. Ultimately, the output from the two models and the narratives will combine to create four distinct alternative futures to inform the 2020 Regional Transportation Plan and its goals.

Participants agreed that this approach marked a new generation of visioning methods:

By introducing a range of alternative futures to our board and stakeholders outside of the formal plan update, there was more opportunity to lay the groundwork for what “winning the future” looks like as an overarching vision for the Atlanta Region. As the next plan update begins, there is an opportunity for more informed dialogue about specific policy goals and their applicability for mitigating or taking

advantage of existing trends and key drivers. This new exploratory planning framework is allowing us to sharpen our focus, while at the same time, broaden the lens to envision planning policies and subsequent transportation investments in a new light. (ARC 2016a)

SUMMARY OF DECISIONS

Drivers

To engage technical stakeholders, ARC relied on a two-round online survey process and an ARC board work session to refine the key drivers. The first online survey was distributed to 60 academics, futurists, and national experts. After further refinement, a second survey was administered to local stakeholders. After comparing and aggregating the feedback, ARC created a final set of nine drivers of change, seen in figure 16.

Critical Certainties and Uncertainties

Rather than having participants define critical certainties and uncertainties, the project team created four plausible events, or outcomes, for each driver and printed them on playing cards; figure 17 displays an example.

Scenarios were analyzed for transportation impacts using several modeling tools. The outputs of the REMI model could not be validated, so ARC staff focused on the RSPM’s variable outputs they found to be the most critical and relatable.

Outcomes and metrics chosen for analysis included

- vehicle miles traveled daily (per capita);
- vehicle hours of delay (per capita);
- annual transit trips (per capita);
- annual walk and bike trips (per capita);
- annual social cost of vehicle travel (per household);
- annual vehicle operating cost (per capita); and
- annual CO₂ emissions (both per capita and overall) (ARC 2016b).

Figure 16

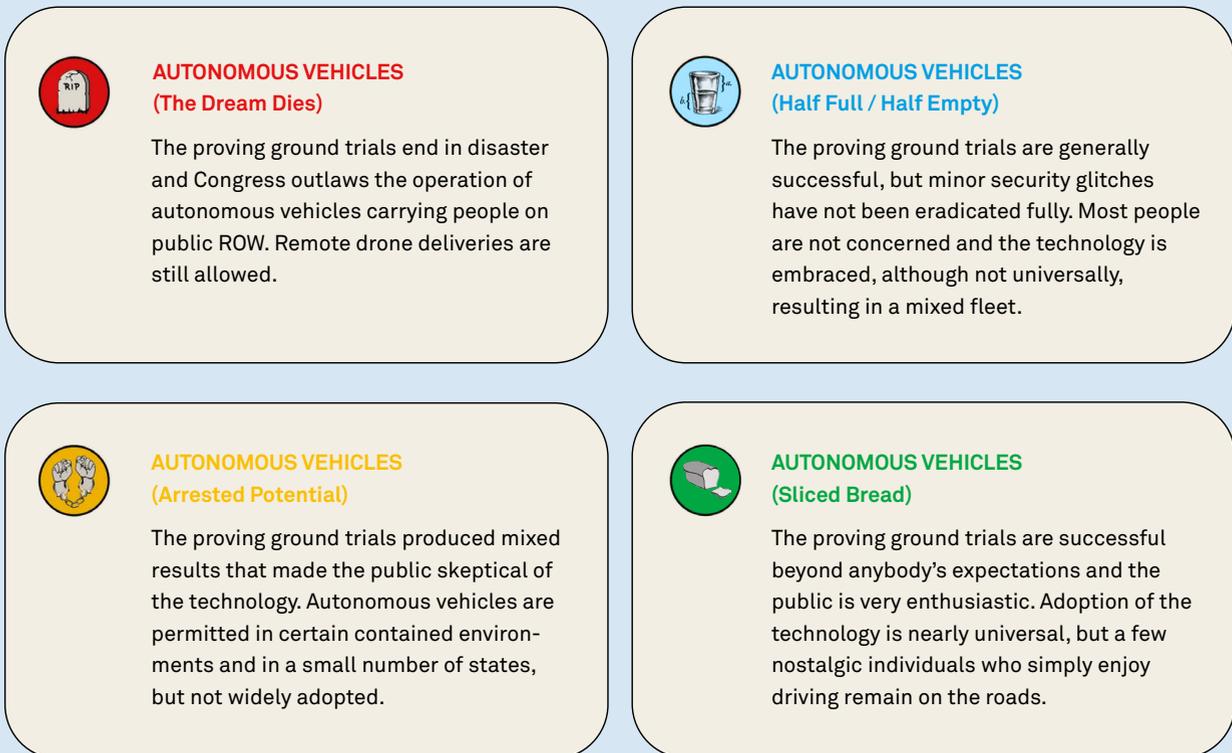
Drivers of Change Identified in the ARC Sharpening Our Focus XSP Process



Source: ARC 2016a.

Figure 17

Plausible Outcomes for the Future of Autonomous Vehicles in the Atlanta Region



Source: ARC 2016b.

The working group was then divided into four groups, one for each scenario (undisclosed to them), and given the card decks. They then selected the cards representing the outcomes they thought best reflected their perspective of the scenario, thus further refining the four scenario narratives. ARC then used graphs and radar diagrams to convey data and implications of each scenario across four key transportation outputs, allowing policy makers to see which futures would perform best.

Developing Scenarios to Guide Growth

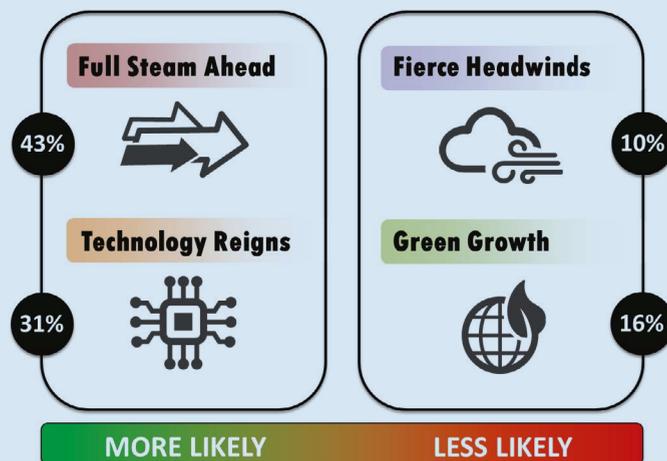
Aggregating the results, as in figure 18, allowed steering committee members to see which of the scenarios the participants ultimately favored and to more broadly understand baseline views about what futures Atlanta region residents expected.

Participants next discussed the causes and effects of desirable and undesirable scenarios and how to reverse engineer robust strategies for a broad range of potential futures. They also sought to better understand indicators and focused on realistic, practical policy activities at the local, regional, and state levels.

Conversations focused on the drivers of change for certain metrics. For example, participants viewed the Green Growth scenario's increased transit, bike, and pedestrian trips as the result of significant investment in new transit infrastructure and adoption of congestion charges. But despite the increased transit ridership also seen in the Fierce Headwinds scenario, high levels of CO₂ emissions per capita emphasized how critical vehicle technology is to improving air quality. The sweeping differences in scenarios highlight the importance of objectively adapting to, weighing, and comparing strategies.

This exercise ensured that committee members were comfortable with the overall phrasing, concepts, and modeling inputs that would be carried into the 2020 Regional Transportation Plan process. The more specificity and knowledge they had, the better the ensuing dialogue about what winning the future might look like in the scenarios. This interactive approach served as a model for the Future Focus ATL website and ARC's on-line game, where community members select how they think the future could unfold and explore scenarios based on those perceptions (ARC 2020).

Figure 18
Sharpening Our Focus
Participants' Aggregated
Expectations of Which
Future Scenarios Were
Most Likely to Occur



Source: ARC 2016a.

SCENARIO DESCRIPTIONS

ARC scenarios emphasized the uncertainty of the future and the importance of testing massive changes across a wide range of possible alternative futures (figure 19).

The scenario narratives developed through this process were further refined for Future Focus ATL. According to the online game, most residents anticipate the future to be Full Steam Ahead (ARC 2020).

Green Growth

The world has gone green in a big way. The development versus environment debate has been settled, and sustainability is at the forefront of public consciousness. With an emphasis on green growth, metro Atlanta's new economic, social, and transportation priorities reflect strong environmental ethics. Once the poster child for resource-intensive development patterns, metro Atlanta is now a model for protecting its natural resources.

Fierce Headwinds

Global instability affects metro Atlanta in myriad ways. Population growth has slowed, the economy is stagnant, and extreme weather events are the new normal. Uncertainty necessitates a new course for metro Atlanta.

Technology Reigns

Once known for its sweet Southern charm, metro Atlanta has changed. Technological advances vastly improve the quality of life for the residents who have the means to take advantage of innovations. Autonomous vehicles, renewable energy, and reliable robots abound. However, the changes have not benefited all, and some of the region's more marginalized communities have been left behind as the digital divide grows and automation replaces jobs for unskilled workers.

Full Steam Ahead

Metro Atlanta has continued to exhibit strong, steady growth. Development patterns are driven by current lifestyle preferences and short-term financial return on investment, but the region is slow to respond to significant long-term shifts in demographics. With a population of 9.2 million, the region has overtaken San Francisco, Washington, and Houston to become the sixth-largest metro area in the country. Trends that were present in the first two decades of the 21st century have continued, though at a moderately accelerated rate (ARC 2020).

OUTCOMES

Robust Strategies

ARC published its Regional Transportation Plan in February 2020, emphasizing adaptation critically informed by performance metrics. Goals include

- equity and equitable outcomes;
- transportation infrastructure resilience;
- livable center and transit-oriented investments;
- greater safety and progress toward zero deaths;
- plans for limited federal funding;
- plans for multimodal freight; and
- performance-based planning and target setting.

The advisory committee also recommended further evaluation and tool development to capture additional metrics on equity, health, the environment, and education. The report further noted, "Whether facing Fierce Headwinds or promoting Green Growth, the region will be stronger by preparing for a variety of outcomes and promoting policies that align with the metrics that regional stakeholders wish to see. While the path may have unexpected obstacles, the vision should remain constant" (ARC 2016b).

Figure 19

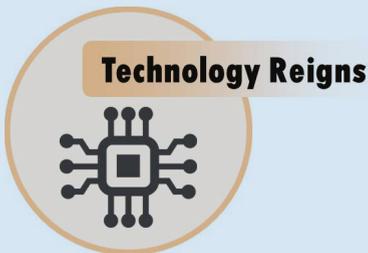
Scenario Narratives Used in Future Focus ATL



Sustainability is at the forefront of public consciousness. With an emphasis on green growth, metro Atlanta’s new economic, social, and transportation priorities reflect strong environmental ethics. Once the poster child for resource-intensive development patterns, metro Atlanta is now a model for protecting its natural resources.



Global instability affects metro Atlanta in myriad ways. Population growth has slowed; the economy is stagnant; extreme weather events are the new normal. Uncertainty necessitates a new course for metro Atlanta.



Technological advances vastly improve the quality of life for the metro Atlanta residents who have the means to take advantage of new innovations. Autonomous vehicles, renewable energy, and reliable robots abound. However, the pace of change has yielded negative consequences for some of the region’s more marginalized communities as the digital divide grows and automation replaces jobs for unskilled workers.



Full Steam Ahead most closely mirrors current forecasts and projections; trends that were present in the first two decades of the 21st century continue at a moderately accelerated pace. Full Steam Ahead is “business as usual.” Development patterns are driven by current lifestyle preferences and short-term financial return on investment, but the region is slow to respond to significant long-term shifts in demographics.

Source: ARC 2016b.

Progress and Impact

With *Sharpening Our Focus*, ARC relied on real-time learning, expert review, and technical analysis to convey the importance of keeping up with global challenges and technological changes on a minute-by-minute, rather than decade-by-decade, basis. In the process, ARC also learned how to energize long-range-planning policy dialogue, improve evaluation and prioritization of projects, and address the uncertainty and change inherent in planning for the future—ideal outcomes of any XSP process. Project leaders further found that more robust scenario planning processes would require better technology that could deliver information on multiple key performance indicators, including transportation and economic, equity, environmental, and health goals (ARC 2016b).

Future Focus ATL, a suite of interactive engagement tools deployed in the 2020 plan update, brought scenario planning to new audiences in new ways and should inspire further modernization of ways to engage stakeholders and the public. ARC asked regional residents to imagine the year 2050 and answer a series of thought-provoking questions on the following platforms and venues:

- **What's Next ATL:** A podcast episode, “Help Plan for our Future,” that explores the nine drivers and explains both the online game and the long-range comprehensive planning process.
- **FutureFocusATL:** An online game in which players choose the future they think most likely by exploring and rating the potential results of each driver, engaging the individuals while informing officials with a survey of public opinion.
- **Civic Dinners:** More intimate, moving, and memorable experiences hosted by ARC and others for people to share stories about challenges and ideas on solutions.
- **Open Houses:** Six immersive, experiential pop-ups around the region to engage stakeholders through interactive gallery exhibits like “Living Infographics,” in which people connect string to represent their commute and desired transportation options, color budget activities, share personal transportation stories, and capture their actions in a photo booth.
- **Teen Improv:** A show in which local teens envision metro Atlanta in 2050, when performers would be middle age, to prompt a structured discussion among adult audience members, bridging generational divides and engaging youth in planning (ARC 2020).

National Center for Smart Growth: Engaging the Future: Baltimore-Washington 2040

Regional Sustainability (2018)
Baltimore, Maryland, and Washington, DC

CONTEXT AND PURPOSE

In April 2018, the University of Maryland’s National Center for Smart Growth released a report outlining four possible future scenarios for the Baltimore-Washington region and how they might impact quality of life across the state. This landmark five-year project, *Prospects for Regional Sustainability Tomorrow (PRESTO)*, reveals how regional responses to large-scale uncertainties—such as autonomous vehicles, high fuel prices, and government regulation—could affect economic, social, and environmental health.

The project represents the center’s first attempt to address the region’s long-term sustainability using advanced modeling and scenario-analysis techniques. This was also the first time the National Center for Smart Growth (NCSG) linked economic, land use, and transportation drivers to environmental and equity outcomes—connecting the dots between commute times and greenhouse gas emissions or housing trends and nutrient loading in watersheds. (“Nutrient loading” refers to nutrients entering the ecosystem from numerous anthropogenic and nonanthropogenic sources, which stresses freshwater and estuarine ecosystems.) The resulting report, *Engaging the Future: Baltimore-Washington 2040*, explores PRESTO’s futures-testing framework and, specifically, its comparison of four plausible futures against a trend-based baseline future, which projects the effects of current plans, policies, and driving forces.

With funding support from the Town Creek Foundation and the National Socio-Economic Synthesis Center, the PRESTO team set out to stimulate a science-based conversation about regional sustainability. They considered the major outside driving forces (external to their region or control) that would shape the future of the region—including the price of energy, the rate of technological development, and the level of government intervention in land use policies—and used an advanced set of data and analytics tools to develop the scenarios to determine which policies in all potential futures were robust for advancing a sustainable development strategy for the region.

The National Center for Smart Growth director, Dr. Gerrit-Jan Knaap, noted that taking a megaregional approach allowed the center “to go beyond microscale issues such as walkable neighborhoods, transit-oriented development and opportunistic land preservation to larger scale systemic issues such as transportation technology, energy prices, and regional development patterns” (Sharma 2018). With no other organization in the region addressing such issues at a multistate-level scale, project leaders were eager to make an impact (NCSG 2018).

Scope and Scale

The scope of this project was to model indicators of sustainability to explore the most efficient, effective, and robust strategies to improve the region’s performance. The 26 indicators included access to opportunity, air emissions (including greenhouse gases), economic productivity, energy consumption, housing, land use and nutrient loading into water bodies, population, and transportation.

The scale was the greater Baltimore-Washington region, projected to be home to about nine million people by 2040 and shown in figure 20 (NCSG 2014).

FOCAL QUESTION

What can and should be done to achieve a more sustainable future by 2040 for the Baltimore-Washington region?

METHODOLOGY

The National Center for Smart Growth process relied on the formation of a scientific advisory committee and held four meetings, some divided into two parts, illustrated in figure 21: first, build consensus on recommendations and decisions; second, prepare for interim work and the following meetings.

The scientific advisory committee examined the forces critical to driving regional sustainability and their potential outcomes. The team then developed four divergent scenarios for the future of the region and iteratively tested and refined them using an integrated modeling suite that connected economic, land use, and transportation drivers to environmental and equity outcomes. The modeling was a key feature of the center's approach.

At the model's core were the Maryland Statewide Transportation Model (MSTM) and Simple Integrated Land Use Orchestrator (Technical University Munich

2018). Funded by the Maryland State Highway Administration and developed between 2010 and 2013 with the engineering and design firm Parsons Brinckerhoff, the MSTM built on the foundations of the Washington and Baltimore MPOs' data. This was the first model to integrate two major metropolitan areas into a single comprehensive travel model. Simple Integrated Land Use Orchestrator is a simple yet powerful land use model fully integrated with a travel demand model to represent the land use and transportation feedback cycle; that is, "locations of households and jobs are used as trip ends to generate travel demand data, and accessibilities of the travel demand model influence relocation decisions" (Technical University Munich 2018).

Both the Maryland Statewide Transportation Model and Simple Integrated Land Use Orchestrator simulate the feedback between the use of the transportation network and household location decisions. To extend the regional travel and land use models, the National Center for Smart Growth coupled them with land cover, nutrient loading, and mobile and building emissions models.

As researchers evolve their model suite, they will connect an Integrated Transport and Health Impact Modeling Tool to the transportation and emissions model to reveal the effects on health of the region's transportation decisions.

Figure 20

Map of the Baltimore-Washington Region, with the Extensive NCSG Travel Demand Model Superimposed on It, Incorporating a Larger Geography To Capture the Effects of Travel To and From Adjacent States

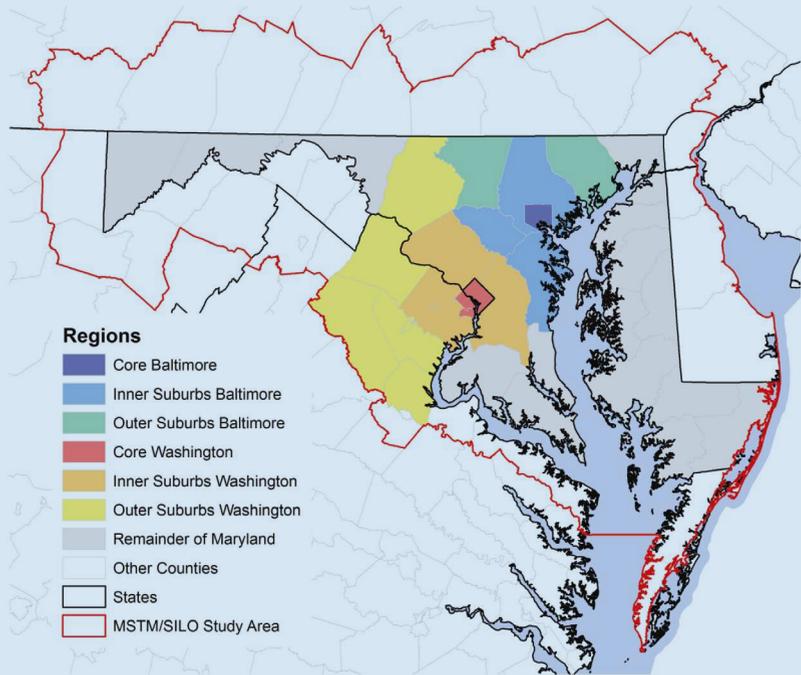
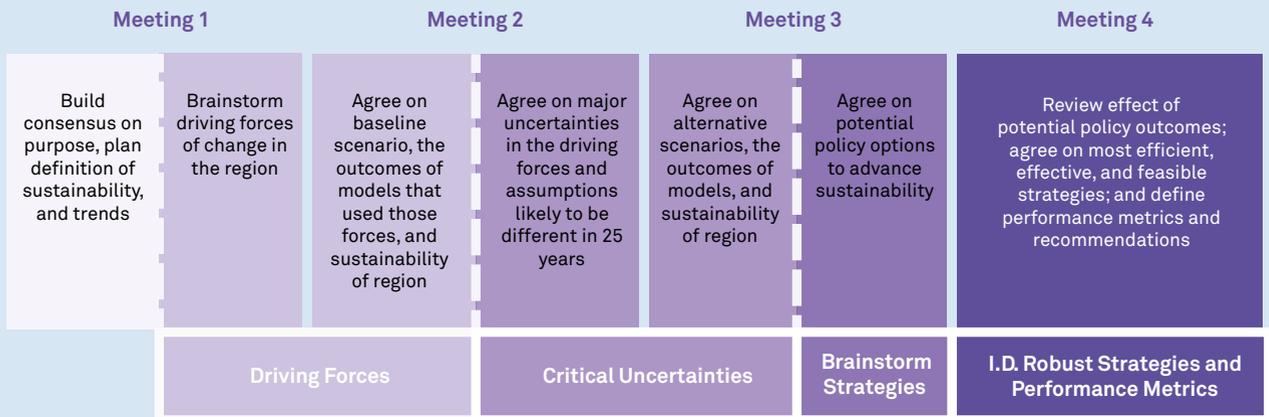


Figure 21

The Step-By-Step Process Used in PRESTO



Sources: NCSG 2014.

SUMMARY OF DECISIONS

Drivers

This process leaned on modeling a range of outcomes, focusing on 15 primary indicators, to compare the four scenarios against the baseline, as shown in figure 22. Inputs included rates and locations of employment; building renovation; development capacity; vehicle technology, capacity, and operating expenses; and nutrient loading in watersheds.

Critical Certainties and Uncertainties

This project's unique XSP process did not explicitly identify critical certainties or uncertainties, but its modeling resulted in scenarios that hinged on uncertainties pertaining to automation, deregulation, scarcity (of jobs, water, housing, personal protective equipment (PPEs), access, etc.), and sustainability technology. Several workshops with expert stakeholders identified driving forces and their interrelationships. This provided the raw material to develop the three-by-three matrix that structured the scenarios.

Developing Scenarios to Guide Growth

Using current trends, PRESTO presented a baseline scenario in which the region was projected to grow by 616,000 households and 1,451,000 jobs from 2015 to 2040. An additional 312,000 households were projected to locate outside the region, with many workers commuting into the region. Nearly 45 percent of employment growth would occur in the inner suburbs, driven by expansion of education, health care, and scientific and technical services. Household growth followed, with 54 percent growth in the inner suburbs. Growth continued to occur in existing corridors until the development of the inner suburbs was at capacity, pushing growth toward the city cores and the outer counties.

Two of the most tangible impacts of continued regional growth would be increased housing prices and worsened congestion. In the baseline scenario, housing prices increased substantially throughout the inner suburbs, particularly in those with strong growth restrictions. As those jurisdictions exhausted locations for growth, prices would rise in adjacent suburbs. Despite large increases in rail ridership, vehicle miles and hours traveled would increase substantially. Worsening traffic congestion, particularly on the beltways and the highways connecting Baltimore and Washington, would nearly quadruple the hours of delay. The baseline did assume a modest adoption of electric vehicles, but emissions from gas-powered vehicles nonetheless increased 24 percent, and nitrous oxide and volatile organic compounds increased even more.

SCENARIO DESCRIPTIONS

PRESTO's baseline, or expected future, projected the outcomes of current plans, policies, trends, and driving forces. The alternative scenarios were defined by the key drivers as either stronger (+) or weaker (-) relative to the baseline, as shown in figure 23.

Revenge of the Nerds: High-Level Automation

The region is dominated by low fuel prices, new technology, and relaxed government regulation. Transit use declines, and the popular adoption of autonomous vehicles increases highway capacity and dramatically reduces congestion compared with the baseline—but vehicle miles traveled also increase, as do greenhouse gas emissions and air pollution. Increased mobility and relaxed development regulations cause an exodus from city suburbs into more rural areas, consuming more farmland and forests.

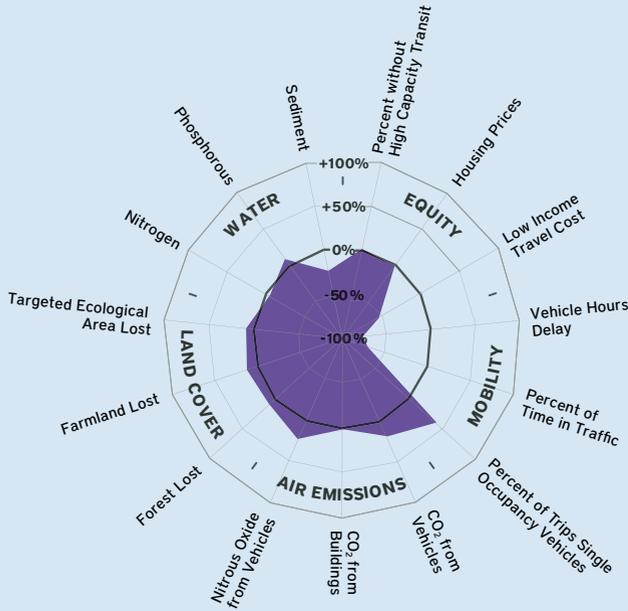
Figure 22

**The Scenarios Used in PRESTO,
Differing from the Baseline Model
of the Future**

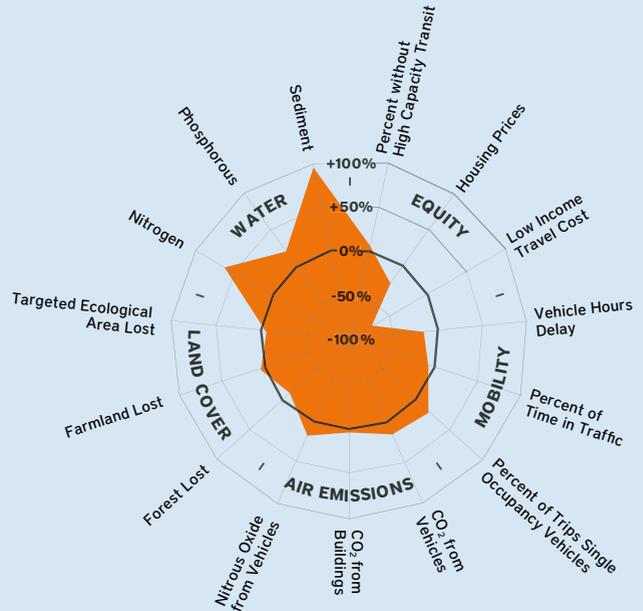
Source: NCSG 2018.

Scenario Footprints

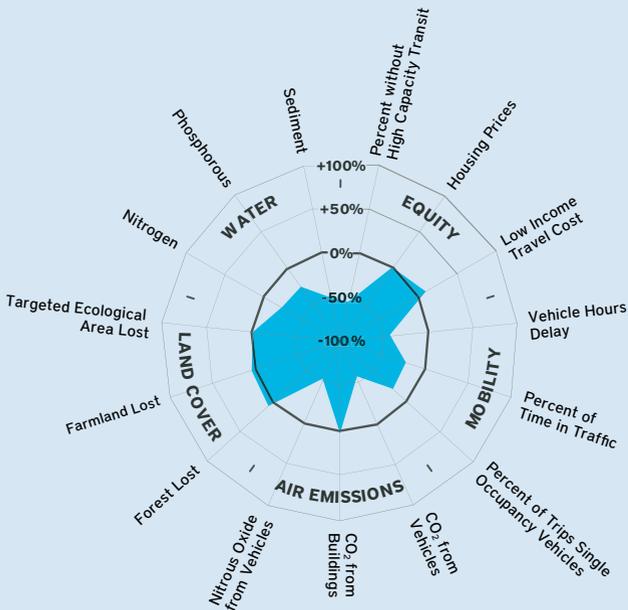
The four diagrams show fifteen selected key impacts as percentage differences from the baseline, which is represented by the darker zero percentage line. This line separates the “plus” or greater impact of any given indicator from the “minus” or lesser impact. As an overall shape, the smaller the footprint of the scenario, the less its impacts. The shifts in percentage within and between scenarios is relatively modest visually, despite strongly contrasting assumptions, which testifies to the difficulty of moving the needle on impacts in a large, mature urban region.



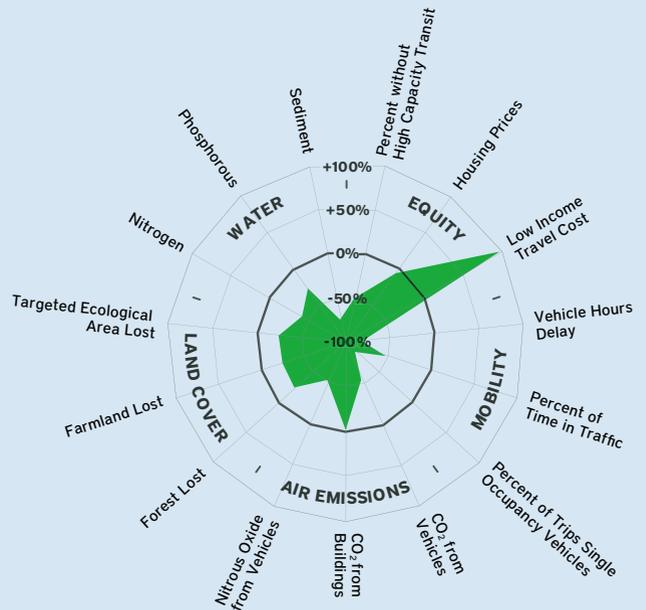
REVENGE OF THE NERDS (RON)



FREE-FOR-ALL (FFA)

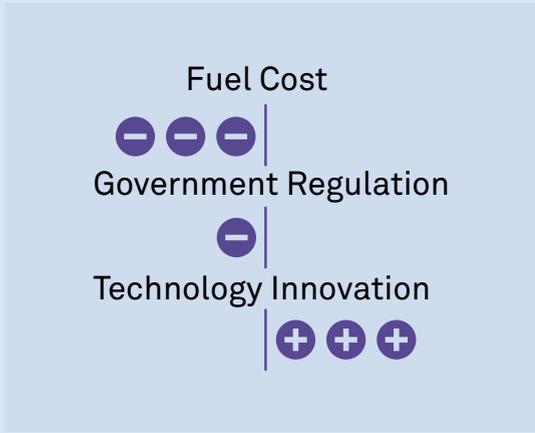


BLUE PLANET (BP)

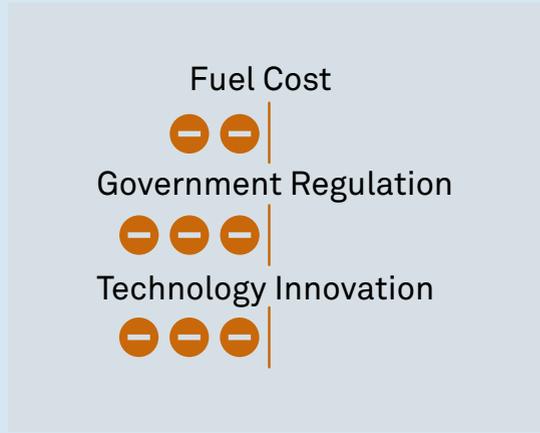


LAST CALL AT THE OASIS (LCO)

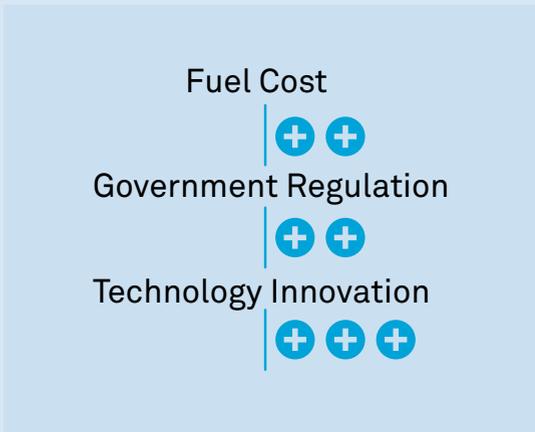
Figure 23
 The Scenario Used in PRESTO with
 Varying Uncertainties



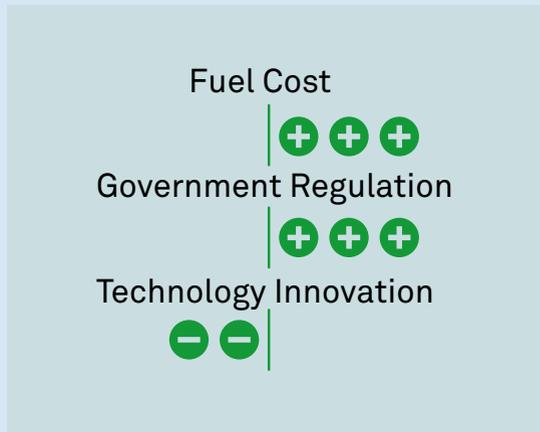
REVENGE OF THE NERDS (RON)



FREE-FOR-ALL (FFA)



BLUE PLANET (BP)



LAST CALL AT THE OASIS (LCO)

Source: NCSG 2018.

Blue Planet: High-Tech Sustainability

The most sustainable scenario features high fuel prices, which reduces auto use, congestion, and associated emissions and pollutants. That spurs investments in transit, rapid adoption of zero-emission vehicles, and growth in green technologies. New jobs and housing colocate, and local governments increase housing capacity and affordability in the inner suburbs. Surprisingly, this scenario also increases the loss of forest as growth leapfrogs the agricultural preserves.

Free-for-All: Deregulation

Looser government regulation—coupled with lower fuel prices, significant increases in road capacity with the adoption of an autonomous vehicle fleet, and much less restrictive controls on development—results in suburban development that encroaches into farms and forests. This scenario sees an increase in housing affordability, air pollution, and nutrient loads. Transit ridership falls while greenhouse gas emissions and other forms of air pollution rise.

Last Call at the Oasis: Scarcity

Increased fuel costs and tighter development regulations have dramatic impacts on location decisions for housing, businesses, employment, and public space. This directly affects travel behavior. High transportation costs lead to core and inner-suburban development, less automobile travel, and more rail transit ridership. This scenario has the least adverse environmental impacts. Fewer vehicle miles traveled means less pollution from automobiles and lower clustered growth. Slow economic growth, tighter land supplies in outer suburbs, and increased capacity in the inner suburbs combine to reduce housing costs, except in downzoned rural areas.

OUTCOMES

Robust Strategies

Though researchers note the limitations of the model and the need for sensitivity testing and refinement, participants affirmed that (1) the future is uncertain; (2) the effects of policy, plans, and unforeseen circumstances could result in a range of outcomes, both preferable and undesirable; and (3) measuring the impact of decisions will be key to improving performance over time. How and where development occurs in the region really matters, and an integrated and interdisciplinary approach will be critical to hone and roll out innovative technologies that scale solutions.

Implications for further study and action thus included increasing development capacity in inner suburbs, adopting autonomous vehicles, investing in highway and transit (notably in the core), protecting forest and farmlands to control nutrient loading, transitioning to a clean energy grid to improve air quality, and increasing energy efficiency of both new and old buildings.

Progress and Impact

When the next phase of model integration is completed, the team will connect the Integrated Transport and Health Impact Modeling Tool to the transportation and emissions model in order to understand the health impacts of transportation. Additionally, the Chesapeake Bay Land Change Model will be connected to the Chesapeake Bay Model to determine the impact of land cover changes (wildlands to crops, crops to housing, rural to urban, etc.) on the health of the Chesapeake Bay and its tributaries.

In terms of influence, PRESTO's findings were covered extensively by the *Washington Post* and have been widely disseminated, including in academic journals (Knaap et al. 2020).

CHAPTER 5

Conclusion



Credit: clark_fang/iStock/Getty Images Plus

This guide shows the important role XSP can play in community and regional planning. In a time when climate, economic, and political challenges disrupt natural and social environments and change the quality of life in many communities, planners and community leaders can use XSP to prepare for and adapt to an uncertain future.

Findings

As the case studies in this guide illustrate, XSP offers an adaptable process for effective planning in assorted settings with varied goals and outcomes. However, as the use of XSP grows, practitioners have learned several lessons in considering the process writ large.

The Atlanta Regional Commission's Sharpening Our Focus process distilled the following:

- **Incorporating many voices makes the planning process transparent, feasible, inclusive, and effective.** In any planning process, multiple jurisdictions, stakeholder groups, and even individuals are extremely interested, and all deserve to have a say in their future. Setting up a big tent to give voice to diverse opinions and experiences acknowledges the importance of inclusion and transparency that matches the project priorities to the region's values and vision.
- **Developing conflict resolution methods at the start of the process saves time and avoids frustration.** Conflicting opinions are inevitable when dealing with diverse stakeholders on controversial issues. Establishing procedures early on to encourage positive, open, and transparent dialogue allows a project team to remain unified and focused on progress.
- **Every scenario has the potential to disrupt how a region thinks about health, equity, the environment, transportation, and other forces of change.** Most scenario design tools focus primarily on specific drivers. To create a full vision of the future, however, additional tools that use the same inputs (for the sake of consistency) should be developed and utilized. Gaps in available modeling technology need to be addressed in order to execute more robust scenario planning processes. The more comprehensive a scenario is, the more useful it will be to consider these gaps.
- **Evolving technology and rapid demographic changes demand an adaptive planning process like XSP.** Though the scenario development process often looks at the long term, predicting the future 30-plus years from now is exceedingly difficult. Rather than aspiring to plan for twenty or thirty years, future planning efforts are more likely to gain traction with elected officials and the public if they focus on the shorter term (five to ten years) to ensure that projects are relevant and implementable. This approach aligns with the notion of achieving incremental successes to reach a long-term vision (ARC 2016b).

Recommendations

This guide contains suggestions for how planners can use the XSP approach and each of its components most effectively.

- **Determine how XSP will be used.** Whether it is incorporated into traditional planning and used to refine multiple layers of a planning agenda or is undertaken as a standalone planning tool, XSP may be used for comprehensive visioning or to define specific elements of a plan for land use, water, transportation, economic development, and other purposes. Using it with deliberate intent ensures that the process will be smooth and effective for all involved.
- **Commit to collaboration.** Communities must be willing to devote ample time and resources and to collaborate with relevant departments, agencies, organizations, and stakeholder groups. Those looking to explore and address root drivers and causes of critical issues are ready to introduce XSP into their planning process.
- **Engage key decision makers and stakeholders to elicit both “grass tops” and grassroots perspectives.** From the outset, actively engage elected officials and department directors to help ensure that action plans are understood, supported, funded, and implemented. Assemble a diverse, interdisciplinary stakeholder group of planners, department leaders, policy makers, and others to engender community buy-in and future collaboration.
- **Invite a diverse set of stakeholders to ensure that the process, scenarios, and strategies fully represent the community and its priorities.** The quality of XSP’s results is a function of the people in the room, and any working group should strive for balance and equity among these voices. If the issues at hand affect specific groups, include them in the process. Public officials and government agency staff can then develop the relationships, awareness, solutions, and adaptive capacity needed to implement action plans.
- **Adapt elements of the process to accommodate and target all stakeholders.** When working with groups with many perspectives or less command of the subject matter, develop scenarios that the whole group can connect to and empathize with to enhance participation, the exchange of perspectives, and consensus building.
- **Determine the appropriate level of technology.** Many XSP processes benefit from modeling software and other technologies, whereas others need little more than note-taking that captures main points on whiteboards and flip charts. Gauging the best tools for a specific case can save time, money, and energy, especially in scenario development. Planners conducting an XSP process that addresses specific spatial considerations or organizational resilience should consider using GIS or computer modeling for greater accuracy. Collaborating with the county or regional government or local universities may bridge gaps in data, technology, or skills and capacity.
- **Have seasoned XSP planning professionals lead the framing of the focal question.** Inexperienced groups can have difficulty defining and committing to a focal question, given the many possibilities and the challenges of wordsmithing by committee. Have seasoned professionals lead the discussion on the universe of issues and how they interrelate to expedite the process and bring useful perspective to the framing of the focal question.

- **Scale from local to regional and global solutions.** Working on one department, organization, or community can aid in developing solutions that, for example, build resilience to address climate change. But a lack of time and money and the scale of solutions needed to address certain challenges can demand collaboration on a regional or global scale. Working at those bigger scales requires clarifying the role a local jurisdiction can play in a regional or global solution. Cities, towns, and counties may achieve efficiencies and economies of scale by collaborating on regional solutions to problems such as carbon reduction through an XSP process, which can then be better leveraged for global impact.
- **Build consensus on the credibility of the scenario narratives.** There is no perfect or standard method for crafting XSP narratives. Critical certainties are often used to develop a common-to-all-scenarios narrative that describes events likely to occur in all futures. Reaching consensus on a common-to-all-scenarios narrative establishes a common set of assumptions—a foundation and launching point that all stakeholders can find credible before they revise and strategize.
- **Develop a system for capturing and sharing all scenario implications, strategies, and insights.** Create a system to list and cross-reference implications across scenarios to support effective time management and encourage clear results. A notes template that follows each step of the workshop can help facilitators convey the workshop content, the final implications and strategies, and the dialogue that occurred. Audio and video recordings can capture conversations and help audience members process the experience.
- **Measure metrics that matter.** Establish how to measure progress, performance, and key thresholds in ways that signal when to adapt strategies and that effectively frame discussions and decisions going forward. These metrics and indicators should be people-centered, showing how changes tracked improve lives and make plans, funding, and implementation possible. In order to tell the complete story of proximity, access, or equity, Denver, for example, measures how many people are within a five-minute walk to open space—not merely the acres of open space in the city. Track specific metrics consistently to evaluate progress and performance over many years, and as conditions, understanding, and capacity change, so should the metrics used to observe them.
- **Cultivate capacity, innovation, and collaboration to optimize the use and availability of data and technology.** Performance management is historically under-resourced; however, today's most proactive governments are funding and establishing offices for data and performance analytics and are hiring chief performance officers to orchestrate and build capacity across departments and agencies. Resources like Data-Smart City Solutions from Harvard Kennedy School's Ash Center for Democratic Governance and Innovation (Gardner and Goldsmith 2020) and the What Works Cities Certification from Bloomberg Philanthropies can inspire more innovative approaches (Fuchs 2018).

Appendix A

Sample Workshop Agendas

As described in chapter 2 and illustrated in chapters 3 and 4, many XSP processes take similar form. This section contains several models for four- and eight-hour iterations of the first and second workshops used in the Lincoln Institute of Land Policy and Sonoran Institute's joint program model. Practitioners should consider which versions best fit their audience and the available time before modifying.

SAMPLE AGENDA A: XSP WORKSHOP 1 (EIGHT-HOUR MODEL)

- 8:00 a.m. **Check-In** (15 minutes)
- Invite participants to check in early and start on time.
 - Provide coffee, tea, water, and healthy food throughout the day.
- 8:15 a.m. **Welcome and Introductions** (30 minutes)
- Introduce participants and process.
 - Set expectations and share schedule (including breaks).
 - Ask for continuous and active participation.
- 8:45 a.m. **Guest Speaker Presentations** (60 minutes)
- Establish a shared launching point with short, informative presentations.
 - Address information gaps or common inquiries in pre-workshop engagement efforts.
 - **TIP:** Depending on the issue at hand, a state demographer, federal agency representative, or environmental scientist may be a good candidate.

- 9:45 a.m. **Plan for Today and Rules of Engagement** (30 minutes)

- Detail how the XSP process and the day's events will work, with emphasis on the steps to be completed in this workshop and why.
- Establish expectations, including tone, participation, and outcomes.
- Note any results or conclusions from pre-workshop engagement activities.
- **TIP:** Allow discussion at this stage to help participants feel heard and understand each other's perspectives.

- 10:15 a.m. **Break** (10 minutes)

- 10:25 a.m. **Step 1: Brainstorm the Driving Forces** (75 minutes)

- Review the focal question.
- Compile and discuss as many root and driving forces as possible.
- Prompt considerations of political, economic, demographic, social, technological, legal, environmental, and other factors.
- Vote on whether to reduce the overall list to 10 or fewer driving forces.
- **TIP:** If the participant group is large, consider dividing it into subgroups of 10 or 15 people each to keep people engaged during the brainstorming effort.

- 11:40 a.m. **Step 2: Rank the Driving Forces** (20 minutes)

- Using the chart from figure 3 assess each of the top 10 drivers on the basis of their importance to the future (x axis) and their certainty of outcome (y axis).
- Note critical certainties in the bottom-right corner of the chart.
- Note critical uncertainties in the upper-right corner of the chart.

- 12:00 p.m. **Lunch** (60 minutes)
- Allow participants to catch up on outside work.
 - Encourage informal walk-and-talks and relationship development.
 - **TIP:** Take a “brain break” with a healthy meal to help participants focus on mission-oriented discussions and keep energy flowing later on in the day.
- 1:00 p.m. **Step 3: Develop Uncertainty Axes** (60 minutes)
- Determine the spectrum of possible end states for each critical uncertainty.
 - **TIP:** The actual future could fall anywhere on this spectrum within the planning horizon. For instance, if economic health is a critical uncertainty, perhaps the left end of the spectrum is volatile growth exclusive to some, but the right end is steady, stable, inclusive growth.
- 2:00 p.m. **Break** (15 minutes)
- 2:15 p.m. **Step 4: Develop Preliminary Scenario Matrices** (90 minutes)
- Create various combinations of uncertainty matrices and eliminate codependent combinations.
 - Review preliminary matrices, modeled on figure 5, and the potential futures they portray.
 - **TIP:** “Codependent combinations” consist of drivers and end states that correlate with, contradict, or repeat each other. Avoid such combinations to allow the project team to present more credible and sufficiently divergent futures.
- 3:45 p.m. **Step 5: Select Focus Scenarios** (15 minutes)
- Vote to select a final scenario matrix or set of scenarios for the project team to develop into descriptive narratives.
 - **TIP:** When participants are especially knowledgeable about the subject matter (as in the Denveright case, which involved seasoned urban planners and other professionals), select diverse scenarios that foster more in-depth conversations about a broader range of futures.
- 4:00 p.m. **Step 6: Sketch Focus Scenarios** (40 minutes)
- Discuss selected scenarios, including how they could develop, what actors could be involved, and how those affected might perceive them.
 - Draft titles for each scenario to capture the context and distinguish among them.
 - **TIP:** Popular approaches for titling scenarios in memorable, distinctive, and useful ways include pop culture references, word plays on weather, or literary references.
- 4:40 p.m. **Final Report** (20 minutes)
- Review the sketch scenarios and discuss next steps.
 - Prepare participants for any review period or other opportunity for input before the next workshop.
 - Set expectations for workshop 2.
- 5:00 p.m. **Adjourn**
- **TIP:** Consider hosting a reception to solidify interpersonal relationships and commitment to the process.

SAMPLE AGENDA B: WORKSHOP 2 (EIGHT-HOUR MODEL)

- 8:30 a.m. **Check-In** (30 minutes)
- 9:00 a.m. **Welcome and Introductions** (15 minutes)
- 9:15 a.m. **Plan for Today and Rules of Engagement**
(15 minutes)
- Review workshop 1 results and interstitial activities.
 - Review each scenario narrative.
 - Establish expectations for workshop 2.
- 9:30 a.m. **Step 7: Explore and Derive Implications**
(90 minutes)
- Consider a scenario in detail (as a group, individually, or some combination thereof) and clarify elements as needed, spending about 10 minutes on each scenario.
 - Brainstorm the critical implications of each scenario to create a master list of implications, taking any planning issues, environments, and horizons into account. Spend about 10 minutes on each scenario.
 - Prompt participants with questions, as a group and individually: What is happening? Why? How does this affect the attainment of your vision or goals? How does it affect your ability to do your job or play your role? What are the opportunities and threats of the scenario?
 - **TIP:** Implications for each future should be assigned individually so they can be cross-referenced for similarities and applicability to multiple futures.
- 11:00 a.m. **Vote and Break** (20 minutes)
- Choose the implications most critical to promoting the future scenario (A) the group wants most.
 - Display this master list of implications for the group to reference.
- 11:20 a.m. **Step 8: Brainstorm Strategies for Scenario A** (45 minutes)
- Review scenario A and discuss related threats and opportunities.
 - Brainstorm strategies to address threats and opportunities effectively.
 - Refine strategies into a prioritized master list for the scenario.
 - **TIP:** Consider what strengths, weaknesses, opportunities, or threats (SWOT) might affect the group's ability to reach its goals.
- 12:05 p.m. **Lunch Break** (55 minutes)
- 1:00 p.m. **Vote** (10 minutes)
- Prepare to display lists of implications for the next three scenarios (B, C, and D).
- 1:10 p.m. **Brainstorm Strategies for Scenario B**
(45 minutes)
- 1:55 p.m. **Break** (5 minutes)
- 2:00 p.m. **Brainstorm Strategies for Scenario C**
(45 minutes)
- 2:45 p.m. **Brainstorm Strategies for Scenario D**
(45 minutes)

SAMPLE AGENDA C: WORKSHOP 1 (FOUR-HOUR MODEL)

3:30 p.m.	Break (15 minutes) <ul style="list-style-type: none">• Display strategies brainstormed for all scenarios.	12:00 p.m.	Check-In (5 minutes)
3:45 p.m.	Hunting for Strategic Insights (45 minutes) <ul style="list-style-type: none">• Review the lists of strategies for all scenarios side-by-side, seeking “aha!” moments and noting where strategies overlap or diverge.• Identify robust strategies that apply to each scenario and any strategies that otherwise avoid an undesirable future, must begin immediately, or are no-regret or low-regret, high-impact solutions.• Identify contingent strategies and indicators of potential adaptation points if time permits.• TIP: Technology can constrain the process; using fewer technical approaches and, for example, displaying lists on flip charts often prove to be most engaging.	12:05 p.m.	Welcome and Introductions (10 minutes)
4:30 p.m.	Adjourn and Next Steps <ul style="list-style-type: none">• TIP: Let participants know what to expect next, including the project team’s final report and potential future plans, to keep them engaged in the process’s outcomes.	12:15 p.m.	Plan for Today and Rules of Engagement (25 minutes)
		12:40 p.m.	Step 1: Brainstorm the Driving Forces (60 minutes)
		1:40 p.m.	Step 2: Rank the Driving Forces (30 minutes)
		2:10 p.m.	Step 3: Develop Uncertainty Axes (30 minutes)
		2:40 p.m.	Step 4: Develop Preliminary Scenario Matrices (50 minutes)
		3:30 p.m.	Step 5: Sketch Focus Scenarios (20 minutes)
		3:50 p.m.	Final Report (10 minutes)
		4:00 p.m.	Adjourn

SAMPLE AGENDA D: WORKSHOP 2, DAY 1 (TWO-DAY, FOUR-HOUR MODEL)

- 12:00 p.m. **Check-In, Welcome, and Introductions** (15 minutes)
- 12:15 p.m. **Plan for Today and Rules of Engagement** (20 minutes)
- 12:35 p.m. **Strategy Development Primer** (25 minutes)
- Discuss current trends, drivers, and headlines that may help to vision the futures and explore strategies.
- 1:00 p.m. **Explore the Common-to-All-Scenarios Narrative** (30 minutes)
- Consider the common-to-all or baseline scenario narrative in detail (as a group, individually, or some combination thereof). Spend about 10 minutes to clarify details as needed.
 - Confirm the scenario's credibility and revise details to gain consensus.
- 1:30 p.m. **Explore Scenario A** (60 minutes)
- Consider scenario A, spending about 10 minutes to clarify details and relevance as needed.
 - Brainstorm the critical implications of scenario A to create a master list of implications. Spend about 10 minutes to compile it.
 - Brainstorm strategies to address each implication for the remainder of the hour.
- 2:30 p.m. **Break** (10 minutes)
- 2:40 p.m. **Explore Scenario B** (60 minutes)
- 3:40 p.m. **Wrap-Up and Questions** (20 minutes)
- 4:00 p.m. **Adjourn**

SAMPLE AGENDA E: WORKSHOP 2, DAY 2 (TWO-DAY, FOUR-HOUR MODEL)

- 12:00 p.m. **Check-In, Welcome, and Introductions** (5 minutes)
- 12:05 p.m. **Plan for Today** (20 minutes)
- Provide a brief recap of day 1.
 - Clarify questions about the process.
 - Discuss the plan for the remainder of workshop 2 and the post-workshop process.
- 12:25 p.m. **Explore Scenario C** (60 minutes)
- 1:25 p.m. **Break** (10 minutes)
- 1:35 p.m. **Explore Scenario D** (60 minutes)
- 2:35 p.m. **Contingencies, Indicators, and Metrics** (40 minutes)
- Identify contingent strategies and indicators of potential adaptation points.
- 3:15 p.m. **Hunting for Strategic Insights** (30 minutes)
- 3:45 p.m. **Wrap-Up, Questions, and Evaluation** (15 minutes)
- 4:00 p.m. **Adjourn**

Appendix B

Detailed Case Study Results (Chapter 3)

Spreadsheets can capture and organize the chaos of tracking implications and strategies across the plausible futures. Detailed results in spreadsheet form of the case studies discussed in chapter 3 follow.

Table 1

Strategies from Denveright: City and County of Denver

ID	Strategy
1	Better articulate the value of planning to the public and provide reasons as to why the city is doing what it is doing to increase acceptance of city changes and professional recommendations.
2	Increase access to and improve comfort, convenience, and safety of alternative modes of transportation.
3	Build beyond transit-oriented development to foster life-oriented development, bringing not only transit nearer houses but also jobs and services to mitigate trips and vehicle miles traveled.
4	Train people and invest in and nourish our human capital pipeline.
5	Reallocate existing funding to improve transit; develop strategic transit plans.
6	Foster public-private partnerships.
7	Create and update small-area plans, and engage more neighborhoods; empower communities to implement changes in their neighborhoods.
8	Maintain and evolve affordability best practices.
9	Increase value capture.
10	Connect local systems of transit to the regional system, especially in areas with affordable housing.
11	Invest in data and use predictive analytics to track and improve outcomes.
12	Be explicit about street hierarchy; prioritize the transit system, bikes, and pedestrians over balancing all modes.
13	Educate people on the value and true costs of infrastructure, such as life-cycle costs, externalities, and opportunity costs.
14	Encourage small local businesses; support diversity and the scalability of businesses.
15	Reform Colorado's Taxpayer Bill of Rights.
16	Establish local government's role in managing autonomous vehicles.
17	Incentivize, compel, or fund affordability solutions.
18	Adopt, track, and improve performance metrics to optimize return on investment.
19	Raise the bar on site design for optimal performance (indoor and outdoor resource efficiency).
20	Foster a family-oriented city by increasing the number of housing types available and moving toward family-oriented amenities.
21	Increase transparency of decisions and data to build confidence and support crowd-sourced solutions.
22	Better communicate how taxes are spent.
23	Identify capacity of infrastructure; add people where there is extra capacity.
24	Increase complete neighborhoods with complete modal networks.
25	Reclassify or devolve certain Colorado Department of Transportation roads.
26	Preserve openness of community; reduce barriers to entry.
27	Increase funding.
28	Preserve land for middle-skilled jobs and people without four-year degrees.

					Strategic Insights		
Scenario				"Aha!" Moment	Start NOW!	Avoids an Unacceptable Future	
A	B	C	D				
Robust Strategies (apply to all scenarios)							
Contingent Strategies							

Table 2

Strategies from Municipal Sustainability and Adaptation Plan: Fort Collins, Colorado

ID	Strategy
1	Institutionalize a systems thinking approach to stop the cycle of cascading events.
2	Evaluate and invest in infrastructure to mitigate maintenance costs.
3	Train community and government on Emergency Management. Preparedness Plan
4	Create plans that are resourced with adequate staff and funding.
5	Build a culture of stewardship through public-private partnerships.
6	Create design standards that are appropriate for a sustainable level of service.
7	Collect revenue from online commerce.
8	Focus on regional solutions.
9	Educate the public about personal responsibility. Do your part!
10	Incorporate climate science and projections into CIP and plans.
11	Create or update climate adaptation plan.
12	Create a culture for employee wellness and mental health days.
13	Create methods to hold consultants accountable.
14	Promote adaptive-design buildings that can endure environmental conditions and support changes in use.
15	Encourage council to value staff roles, not just respond to complaints.
16	Mitigate budget competition; assess two-year budget cycle.
17	Build an adaptive and agile work force.
18	Support a culture of preparedness.
19	Train 100 percent of all staff in FC LEAN management practices.
20	Define roles and responsibilities to maintain institutional knowledge.
21	Crosstrain employees

								Strategic Insights		
Scenario				"Aha!" Moment	Start NOW!	Avoids an Unacceptable Future				
1	2	3	4							
<div style="border: 2px dashed black; padding: 10px; text-align: center;"> Robust Strategies (apply to all scenarios) </div>										

Glossary

common to all: Conditions that are in all scenarios and are derived from critical certainties, collective cognitive history, and relevant trends.

core project team: Key members of the XSP team; for example, Denverright's project manager selected members of the working group closest to the project to help guide the facilitation team.

credible, compelling, divergent, and challenging: Characteristics that engage participants in credible, thoughtful, and compelling dialogue to create plausible scenarios that differ enough from each other in context to provide alternative or divergent perspectives. They are challenging because they heighten awareness and understanding of the problem, resources, and potential strategies needed to reach goals.

critical certainties: Driving forces that are both essential to the focal question and sure to prevail despite uncertainties.

critical implications: Conditions suggested in scenarios that significantly affect the focal question.

critical uncertainties: Driving forces that are both essential to the focal question and highly uncertain over the planning horizon.

driving forces, drivers: Influences or causes of certainties, uncertainties, and scenario conditions.

exploratory scenario planning (XSP): A form of scenario planning that uses multiple plausible scenarios to develop broader strategy, action, and policy coordination to achieve goals despite uncertainties in the planning environment.

facilitator: A process leader who conducts the workshop plenary and breakout sessions.

focal question: Frames the boundaries and goals of the XSP process, and uncovers the root drivers of the issues and scenarios at hand.

note taker: Captures the conversation for later reference in clarifying details and informing the scenario narratives.

root driving force, root driver: Causes or results in a specified condition; it may also generate other drivers.

scenario narratives: Describe conditions in plausible futures, which are used in workshop 2 to derive implications and relevant strategies.

steering committee: A group of highly engaged stakeholders, selected from the overall working group, that guides and oversees the development and execution of the XSP process.

templates: Exhibits used in workshops to help cue participants and elicit their responses.

uncertainty axis: A critical uncertainty and the two end states that may transpire in a plausible future; combining two or more uncertainty axes creates an uncertainty matrix.

working group: The entire collection of participants undertaking the XSP process.

workshop wrap-up: A third workshop, if needed, convening the project steering committee or core team and facilitators to refine and confirm the conclusions drawn from a workshop.

XSP workshop 1: The working group's first convening; identifies and ranks the driving forces, identifies the most critical uncertainties, and creates the uncertainty matrix that informs scenario narratives.

XSP workshop 2: The working group's second convening; explores the implications of each future portrayed in the scenario narratives, creates a set of actions that address the emerging needs of each future, and identifies actions and strategies common to multiple futures.

References

- ARC (Atlanta Regional Commission). 2016a. "Planning Process Bundle Case Study: Broadening the Roles of Performance Measurement, Visioning and Freight in the Atlanta Region's Planning Process." <https://cdn.atlantaregional.org/wp-content/uploads/case-study-summary.pdf>.
- . 2016b. "Winning the Future, Sharpening Our Focus. SHRP2 Element C08 (Volume 2), Scenario Development Process." (August). <https://cdn.atlantaregional.org/wp-content/uploads/scenario-development-process.pdf>.
- . 2017. "Winning the Future, Sharpening Our Focus. SHRP2 Element C08 (Volume 4), Addressing Uncertainty and Change in the Planning Process." (April). <https://cdn.atlantaregional.org/wp-content/uploads/addressing-uncertainty.pdf>.
- . 2019. "The Atlanta Region's Plan." <https://atlantaregionsplan.org>.
- . 2020. "Future Focus ATL." <https://futurefocusatl.org/#/>.
- Banister, Katie, David Chan, Jessica M. Driscoll, Christopher Fullerton, Aaron Lien, and Kelly Mott Lacroix. 2014. "Atlas of the Upper Gila Watershed." Tucson: University of Arizona Water Resources Research Center. (January). https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/programs/AzEWNA/pdf/Atlas_web_final.pdf.
- Bentham, Jeremy. 2017. "Navigating an Uncertain Future." Shell International. Video. <https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/what-are-scenarios.html>.
- Brandau, Bill, Ashley Hullinger, Bailey Kennet, Alex Kebitzky, and Grant Weinkam. 2017. "A Guide for Landowners on the Upper Gila River." Tucson: University of Arizona Water Resources Research Center. (May). <https://wrrc.arizona.edu/guide-landowners-upper-gila-river>.
- Carbonell, Armando. 2016. "Thinking about the Unthinkable." Filmed November 6, 2016, TEDxBeaconStreet, Brookline, MA. Video, 13:07. <https://tedxbeaconstreet.com/videos/thinking-about-the-unthinkable>.
- City and County of Denver. 2019. "Denver Comprehensive Plan 2040." https://www.denvergov.org/content/dam/denvergov/Portals/Denverright/documents/comp-plan/Denver_Comprehensive_Plan_2040.pdf.
- City of Fort Collins. 2019a. "2019 Municipal Sustainability and Adaptation Plan." <https://www.fcgov.com/sustainability/files/2019-sustainabilityandadaptationplan.pdf>.
- . 2019b. "Fort Collins City Plan: Planning Our Future. Together." <https://ourcity.fcgov.com/560/documents/4764>.
- Colorado Water Conservation Board. 2019. "Colorado Water Plan Technical Update." <https://www.colorado.gov/pacific/cowaterplan/analysis-and-technical-update>.
- EPS, MIG, and Denveright. 2017. "The Ultimate What If . . . Adventures in Scenario Planning." www.apacolorado.org/sites/default/files/sites/all/themes/apa_colorado/images/editor/The%20Ultimate%20What%20If%20-%20Adventures%20in%20Scenario%20Planning.pdf.
- FHWA (Federal Highway Administration). 2017. "Next Generation Scenario Planning: A Transportation Practitioner's Guide." https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/publications/next_gen/.
- . 2020. "Techniques and Resources for Increased Collaboration in Transportation Planning, Programming, Project Development, and Decision Making." https://www.fhwa.dot.gov/goshrp2/Solutions/Capacity/C02_C08_C09_C12_C15/Planning_Process_Bundle.
- Fuchs, Danny. 2018. "Measure What Matters: 5 Best Practices from Performance Management Leaders." <https://opengov.com/article/measure-what-matters-5-best-practices-from-performance-management-leaders>.
- Gardner, Betsy, and Stephen Goldsmith. 2020. "Prioritizing Public Value in the Changing Mobility Landscape." <https://ash.harvard.edu/publications/prioritizing-public-value-changing-mobility-landscape>.
- Gillow-Wiles, Miriam. Phone interview by Jeremy Stapleton, January 5, 2018.
- Horrie, Mitch. 2018. "Residential Land Use and Water Demand Tool." Keystone Policy Center. www.keystone.org/wp-content/uploads/2018/10/Residential-Land-Use-and-Water-Demand-Tool.xlsm.
- Hullinger, Ashley. Phone interview by Jeremy Stapleton, April 5, 2019.

Knaap, Gerrit-Jan, Daniel Engelberg, Uri Avin, Sevgi Erdogan, Fred Ducca, Timothy F. Welch, Nicholas Finio, Rolf Moeckel, and Harutyun Shahumyan. 2020. "Modeling Sustainability Scenarios in the Baltimore-Washington (DC) Region." *Journal of the American Planning Association* 86, no. 2 (2020): 250–263. <https://doi.org/10.1080/01944363.2019.1680311>.

KPC (Keystone Policy Center). 2017. "Final Report: Visioning and Planning Tools | Exploratory Scenario Planning, XSP Demonstration Project with the Keystone Policy Center." www.keystone.org/wp-content/uploads/2018/06/XSP_Final-Report_CO-WaterGrowthDialogue_06.01.17.pdf.

———. 2018. "Colorado Water and Growth Dialogue Final Report." www.keystone.org/wp-content/uploads/2018/10/CO-Water-and-Growth-Dialogue-Final-Report_September-2018.pdf.

Mott Lacroix, Kelly, Ashley Hullinger, and Christopher Fullerton. 2014. "Scenarios for the Upper Gila Watershed." Tucson: University of Arizona Water Resources Research Center. (October). https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/RAPIDS/PDF/Scenarios_UGW.pdf.

Mow, Jeffrey. 2015. "Managing Complexity and Uncertainty in the Face of Climate Change." Filmed July 15, 2015, Whitefish, MT. TEDx Talks video, 18:45. <https://www.youtube.com/watch?v=1lky5MAIsXI>.

NAS (National Academies of Sciences, Engineering, and Medicine). 2014. *Strategic Issues Facing Transportation, Volume 6: The Effects of Socio-Demographics on Future Travel Demand*. Washington, DC: National Academies Press. <https://doi.org/10.17226/22321>.

———. 2020. "NCHRP Foresight Report 750 Series reports." Washington, DC: National Academies Press. www.trb.org/NCHRP/NCHRPForesightSeries.aspx?sourced=NCHRP.

NCHRP (National Cooperative Highway Research Program). 2020. "Vision Eval." <https://visioneval.org/users/2018/01/01/3-rspm.html>.

NCSG (National Center for Smart Growth). 2014. "PRESTO Plan for Regional Sustainability Tomorrow." Paper presented at the Scientific Advisory Committee, Meeting 2. www.umdsmartgrowth.org/wp-content/uploads/2017/05/prestopresentation2.pdf.

———. 2018. "Engaging the Future: Baltimore-Washington 2040." (April). www.umdsmartgrowth.org/wp-content/uploads/2018/04/39317-UMD-Printing-Presto-Long-report-FINAL-1.pdf.

RAND Corporation. 2019. <https://www.rand.org/blog/rand-review/2019/02/resilience-and-adaptation-strategies-can-address-the.html>.

Schwartz, Peter. 1991. *The Art of the Long View: Planning for the Future in an Uncertain World*. New York: Doubleday.

Sharma, Harshith. 2018. "Baltimore-Washington, 2040: New Report Shows That Planning for Future Uncertainties Is Key to a Thriving Region." www.umdsmartgrowth.org/news/baltimore-washington-2040-new-report-shows-that-planning-for-future-uncertainties-is-key-to-a-thriving-region/.

Shell Global. 2019. "What Are Shell Scenarios?" <https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/what-are-scenarios.html>.

Sonoran Institute and Lincoln Institute of Land Policy. 2016. "Driving Forces of Change in the Intermountain West." https://resilientwest.org/wp-content/uploads/Driving-Forces-of-Change-in-the-Intermountain-West-030416_FINAL.pdf.

Technical University Munich. 2018. "Simple Integrated Land Use Orchestrator." <http://silo.zone/>.

Wanderlust Worker. 2020. "Setting S.M.A.R.T.E.R. Goals: 7 Steps to Achieving Any Goal." <https://www.wanderlustworker.com/setting-s-m-a-r-t-e-r-goals-7-steps-to-achieving-any-goal>.

Water Resources Research Center. "Scenario Planning in the Upper Gila Watershed." <https://wrrc.arizona.edu/scenario-planning-upper-gila-watershed>.

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