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APPENDIX A

Adopting a Visionary Perspective

ADOPTING A VISIONARY PERSPECTIVE

Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

INTRODUCTION

Purpose

The purpose of this paper is to identify effective practices for leaders seeking to build a long-term vision. A key organizing principle is a "moonshot," which typically is a process focusing on a complex problem to set bold goals and develop a breakthrough approach.

APPROACH

The practices identified in this paper are drawn from the following sources:

- Presentations to the Project Panel by futurists and leaders of long-range visioning activities:

    – Tony Carvajal, President, Carvajal Consulting and Management; Executive Vice President, Florida TaxWatch; former Executive Vice President, Florida Chamber of Commerce..

    – Brian Collins, founder and President, The Brainstorm Institute; former Walt Disney Imagineer.

    – Lee Moreau, founder, Other Tomorrows; visiting lecturer, Massachusetts Institute of Technology.

- Personal interviews by members of the project with leaders of other long-range visioning activities:

    – Century Commission for a Sustainable Florida.

    – Commission for the Future of Transportation in the Commonwealth.

    – Envision Utah.

    – myregion.org.

- Synthesis of visioning and scenario planning initiatives conducted by the research team.

- Review of literature conducted by the research team.

- Research team member experience participating in long-range visioning initiatives.

Section 2.0 summarizes the effective practices. Section 3.0 provides additional background and examples. Section 4.0 describes how the research plan and Vision Retreat will support these practices.

NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

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SUMMARY OF EFFECTIVE PRACTICES

PRACTICE	DESCRIPTION
1. BRING THE RIGHT PEOPLE TO THE TABLE	Start with a broad set of participants from the public, private, and civic sectors.
	Include thought leaders and provocateurs to encourage out-of-the-box thinking.
	Include emerging leaders, younger professionals, or students to get input from the next generation.
	Include groups traditionally not engaged in planning activities to understand their perspective and challenge longstanding practices.
2. ASK THE RIGHT QUESTIONS	Start with broad questions to expand perspectives and gather ideas: "Why?"; "What if?", "Can we?", and "What could we become?"
	Later shift to specific questions to narrow focus and prepare for implementation: "What now?", "How could we?", and "What would it take?"
3. DIAGNOSE YOUR SITUATION	**Look around:** Document customer values and preferences to identify the focal points of a vision and the vocabulary that will resonate.
	Look back: Understand the trends and events that have shaped the past and present and identify lessons from prior periods of change.
	Look forward: Analyze a broad set of trends to identify patterns of human behaviors, attitudes, and broader environmental forces; sort trends by impact, degree of certainty, and need for action. Use scenarios to explore how trends interact to form a potential future.
	Look outside: Use examples from other regions, nations, or industries to take a fresh look at our situation.
4. SET BOLD GOALS	Set aspirational visions and goals – instead of thinking 10% better, as how we can be 10x better.
	Do not settle for incremental progress; ask "Why not us?"; "Could we go further?"; or "Who would we be leaving behind?"
	Build a picture of your desired end state – where we want to be in 10, or 20, or 50 years.
5. IDENTIFY BREAKTHROUGH IDEAS	"Plan *from* the future" – use backcasting to identify the actions we need today or in the near future to move toward the vision.
	Start with breakthrough and disruptive ideas – ask "why not?" Hold discussion of implementation until later.
	Focus on being bold, not simply on being big. Dozens of smaller, bold actions can add up to more impact than a single large one.
	Create a culture of risk-taking; when risks do not work out, fail forward and move on to the next opportunity.
6. COMMUNICATE BOLDLY	Use evocative language and storytelling to inspire action.
	Communicate how the vision impacts daily lives of our customers and the role of every employee and partner in accomplishing the vision.

BACKGROUND AND EXAMPLES

1. Bring the Right People to the Table

Effective visioning requires diverse perspectives – particularly when planning for the future of a region or for a public service like transportation. Starting with a broad set of participants from the public, private, and civic sectors will help build the broadest potential context for the vision and expand the perspectives of decision makers and technical staff who are charged with implementing the vision. Particular emphasis is needed to bring in thought leaders and provocateurs to encourage out-of-the-box thinking; emerging leaders, younger professionals, or students who might be involved in realizing the vision; and groups who traditionally are not engaged in long-range planning activities. This broad perspective is critical at all levels – from community engagement to the teams tasked with defining and implementing the vision.

EXAMPLES

Your Vision, Your Utah was led by Envision Utah, guided by 400 experts in eight action teams, and informed by the largest public outreach campaign in Utah history, which gathered input from nearly 53,000 Utahns.

GoogleX forms small strike teams of three to five younger and newer employees and gives them four to six weeks to observe, ask questions, and come up with recommendations without limitations.

Source: *Envision Utah*

The North Dakota Department of Transportation (DOT) coordinated with the largest school district to survey high school youth about its vision, priorities, and needs for the future. Student priorities differed from broader public input and helped identify new ways of to the process.

The Florida DOT sponsored a university competition to develop concepts for designing transportation corridors of the future, with the top teams invited to present their ideas to FDOT's executive team.

2. Ask the Right Questions

Visioning processes should start with questions as broad as possible: "Why?", "What if?", "Can we?", and "What could we become?" Early activities should focus on defining the possibilities and expanding the worldview of participants. Early activities also should focus on challenging long-held assumptions.

Later stages of visioning processes must narrow the list of ideas and prepare for implementation, so the focus should shift to questions like "What now?", "How could we?", and "What would it take?" These are appropriate questions but should be held until in later in the process to allow the broadest potential thinking to guide the initial process.

EXAMPLES

The Century Commission for a Sustainable Florida, charged by the Governor and Legislature to create a statewide vision, began by asking its members two questions: "What is the Florida you would like to leave for your children and grandchildren?" And, "What is the Florida that you fear?"

GoogleX sets a standard of asking the question "Why?" five times to get to the heart of every problem.

3. Diagnose Your Situation

Visioning processes are informed – but not limited – by a healthy, objective assessment of the current situation and future challenges facing a region or industry. This is assessment should blend four major perspectives:

A Look Around. Visioning processes are most effective when rooted in an understanding of what matters most to the **customers** of a business or industry – or the public that is served by policy and investment decisions. This understanding should go deeper than simply documenting behavior – it should delve into what people value and how they make decisions. For example, few people value transportation for the travel experience; they value transportation because it provides access to jobs, education, health care, social, and recreational activities. Engaging customers to understand their hopes, fears, and preferences helps identify the focal points of a vision, as well as the vocabulary that will make the vision resonate.

EXAMPLE

Envision Utah began by conducting research to understand the values and priorities of Utahns as well as the language needed to connect these values and priorities to the topics that would be addressed in the vision. The research showed Utahns treasure three primary sets of values: a safe and secure environment; economic opportunity and affordable cost of living; and scenic beauty and outdoor recreation. The action teams then created a set of scenarios for each topic in the vision. Each scenario represented a different set of outcomes for the future and a different package of strategies to reach those outcomes. Utahns were invited to choose their preferred scenario, and Envision Utah and the

SAFE AND SECURE ENVIRONMENT

PEACE OF MIND/ PERSONAL SECURITY

FEEL SAFE/BETTER SENSE OF COMMUNITY

GOOD PLACE TO RAISE CHILDREN/ SPEND TIME WITH FAMILY AND FRIENDS

PEOPLE AND FAMILY FRIENDLY/ SHARED VALUES

"I want friendly neighbors who are good people. This creates a safe environment to raise children and spend time with my family and friends, contributing to an overall sense of community, peace of mind, and personal security."

Source: *Envision Utah*

action teams used that public input to create the *Your Utah, Your Future* vision. The process ensured public support for the vision – not only was it tied to Utahns' core values, but it reflected public input and was communicated with language that was meaningful to Utahns as identified in the values research.

A Look Back. Developing a vision can be informed by a look back at how a region or industry has evolved during the past 10 to 50 years. The intent is not to measure historic growth or changes and project those patterns to continue. Rather, it is to understand the broad trends and milestone events that have set the stage for where a region or industry is today, celebrate the progress already made, and identify lessons from prior periods of change.

A Look Ahead. Effective visioning processes use **trends** to stimulate but not limit thinking. In a visioning process, trends should go beyond available historic data and forecasts that are used in long-range planning. Trends should reflect patterns of human behaviors, methods, and attitudes or broader demographic, economic, and environmental forces. Trends sharpen our perception of the forces changing our world and the potential uncertainties, changes, and disruptions that we may encounter. Trends should have a grounding in data but also consider emerging possibilities that may not be quantifiable. One value of focusing on trends is that encourages participants to describe what might be their previously formed assumptions and consider whether those will hold in the future.

Trends can be organized and sorted based on duration and magnitude (e.g., as tides, waves, or ripples); direction and pace (e.g., accelerating, maintaining, or plateauing/reversing); degree of impact; or degree of uncertainty. Trends also can be

sorted into those that require immediate action, that may require future action, or that should be watched and further studied. Some prior transportation-oriented visions may have been limited by starting with a relatively narrow focus on the relationship between transportation, land use, and the environment and the assumption that demographic trends are relatively constant. A broader set of trends such as potential changes in customer behavior, the economy, and technology can set the stage for a more robust vision.

Visioning processes often use **scenarios** to explore what the future could look like and how best to prepare for it. Scenarios can help explore how trends interact and inspire out-of-the-box thinking. Scenarios also can inform policy and investment decisions and ensure that plans are "future proof" by considering a range of potential future conditions rather than just continuation of current trends. Scenarios should be framed to address the questions of interest; simpler scenarios illustrating tradeoffs often are of greater value than more complex scenarios addressing a long list of trends.

EXAMPLE

The Commission for the Future of Transportation in the Commonwealth used a two-by-two matrix to explore how two drivers – technology adoption and jobs-and-housing distribution – could reshape transportation in Massachusetts.

Source: Commission on the Future of Transportation in the Commonwealth

Look Outside. Effective visioning processes often augment standard performance measures/indicators or typical comparisons to peer states or regions to elevate and expand thinking about the future. A nontraditional indicator or an out of the box comparison might seed conversation about new strategies.
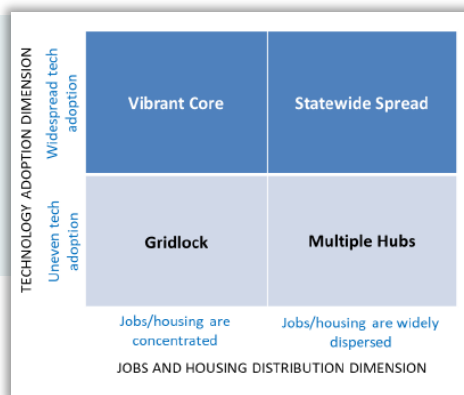
EXAMPLE

Florida 2030 supported its vision of growing Florida into a top 10 global economy by comparing Florida to other nations in or near the top 10, such as Canada. The Florida Chamber Foundation also flipped maps of the state to encourage thinking about Florida not as the end of the line in the United States, but the center of east/west and north/south trade lanes.

Source: Florida Chamber Foundation

4. Set Bold Goals

Visioning is different from long-range planning or forecasting; the focus is where we want to be, not on how we project our current condition to change. A visioning process should build a picture of our desired end state – where an industry or region wants to be in 10, or 20, or 50 years. Effective visioning processes embolden leaders to set bold, aspirational goals for the future rather than settling for incremental progress. Participants should be reminded that their ability to set bold goals will never be as great as it is at the start of a visioning process. Instead of rejecting an idea as impossible, ask "Why not us?"; instead of settling for incremental change, ask "Could we go further?" or "Who would we be leaving behind?"

EXAMPLE

GoogleX encourages teams to adopt "moonshot" thinking with an emphasis on identifying ideas that lead to 10X improvement rather than 10% improvement.

5. Identify Breakthrough Ideas

Once bold goals are set, the vision process could consider the choices that need to be made today (or in the near-term) to begin moving toward that desired future – planning from the future or backcasting to identify interim milestones. This approach recasts a short or medium-term plan as a step toward the long-term vision, rather than making the vision an extension of current plans.

Discussion of how to achieve the vision should start with breakthrough and disruptive ideas that are not limited by current rules, processes, or resources. Rather than dismissing new approaches as too difficult or not possible, participants should ask "How can we make it happen?" A key focus should be on how new technologies and partnerships make new approaches possible.

Visioning should focus on being bold, not simply on being big. Ultimately, dozens of smaller, bold actions can add up to more impact than a single large one. Visioning also should create a culture of innovation and risk-taking; instead of being cautious, teams should try new approaches. When risks do not work out, they should fail forward and move on to the next opportunity.

EXAMPLE

Florida 2030 began by setting a bold vision of growing Florida into a top 10 global economy, creating a path to prosperity for all zip codes in Florida, and positioning Florida among the top states for attracting and retaining talent and visitors. Florida 2030 leaders routinely asked the questions, "Why not?" or 'Who would we be leaving behind?" This perspective led to a shared commitment that 100% of students would read and perform math at or above grade level; 100% of residents would have access to high-speed broadband connectivity and access to public and private mobility services; and 100% of children by the year 2030 would have a pathway out of poverty. The process then stepped back to set targets and interim strategies for each system – from education to transportation to governance – to help accomplish this overarching vision.
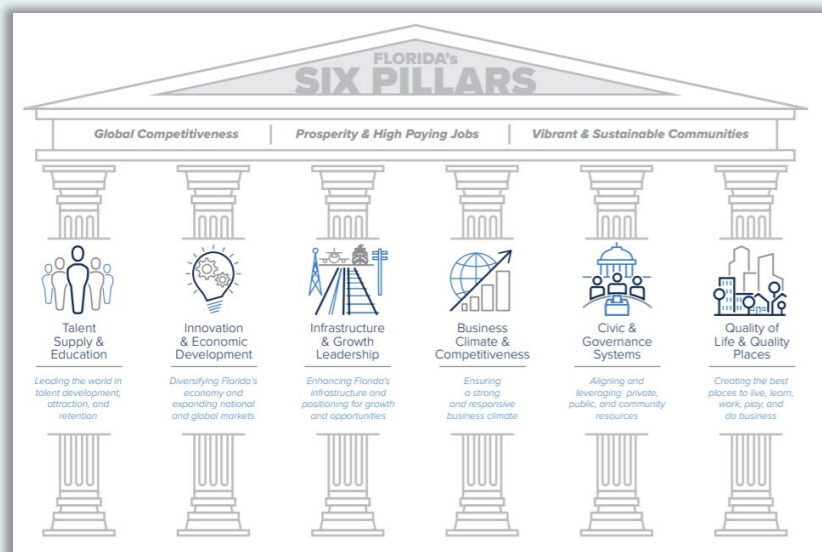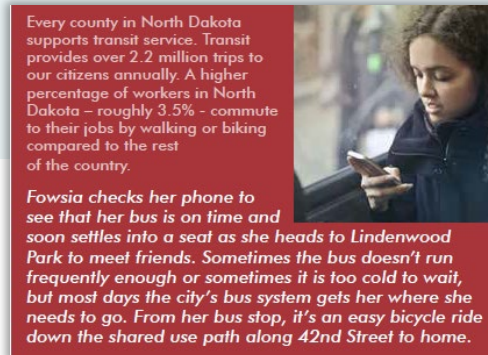

Source: Florida Chamber Foundation

6. Communicate Boldly

Leaders of visioning processes communicate boldly, using evocative language to inspire action. They communicate how the vision impacts daily lives of their customers – and they communicate how every employee and team member can contribute toward the vision. Visioning processes often use storytelling to inspire new and creative thinking about the future. Data, indicators, and projections are helpful, but stories of what people might experience in the future often set the stage for the most creative thinking.

EXAMPLES

Envision Utah communicated Utah's vision in bold language that tied back to the values identified through surveys.

North Dakota's long-range transportation plan included stories of how people and goods could travel in the future to help connect the plan to everyday lives.

Every county in North Dakota supports transit service. Transit provides over 2.2 million trips to our citizens annually. A higher percentage of workers in North Dakota – roughly 3.5% - commute to their jobs by walking or biking compared to the rest of the country.

Fowsia checks her phone to see that her bus is on time and soon settles into a seat as she heads to Lindenwood Park to meet friends. Sometimes the bus doesn't run frequently enough or sometimes it is too cold to wait, but most days the city's bus system gets her where she needs to go. From her bus stop, it's an easy bicycle ride down the shared use path along 42nd Street to home.

Source: *North Dakota Department of Transportation*

UTAHNS ENVISION A FUTURE IN WHICH THEIR STATE AND COMMUNITIES ARE:

Safe, secure, and resilient.

Prosperous.

Neighborly, fair, and caring.

Healthy, beautiful, and clean.

Source: *Envision Utah*

APPLICATION OF EFFECTIVE PRACTICES FOR THIS PROJECT

The research identified six effective long-range visioning practices, summarized below. These practices are being applied to the research plan and Vision Retreat.

PRACTICE	APPLICATION
1. BRING THE RIGHT PEOPLE TO THE TABLE	Conduct broad set of thought leader/subject matter leader interviews. Target emerging leaders at state DOTs for input. Recruit diverse mix of participants to the Vision Retreat. Broaden participation in the process beyond the Vision Retreat.
2. ASK THE RIGHT QUESTIONS	Develop thoughtful questions for interviews and Vision Retreat exercises; start with emphasis on "What if?"/"Could we?"
3. DIAGNOSE YOUR SITUATION	**Look Around:** • Conduct scan of available values/public opinion surveys as pre-read for Vision Retreat. • Include values-oriented questions in Vision Retreat. **Look Back:** • Develop "eras of transportation" paper as background read for the Vision Retreat. • Include "look back" question in interviews and as an exercise in the Vision Retreat. **Look Ahead:** • Conduct broad scan of trends across multiple areas; produce factsheet as pre-read for Vision Retreat. • Include expert panel to discuss key trends and implications at Vision Retreat. • Include exercise at Vision Retreat to sort and identify potentially significant trends/combinations of trends. • Conduct synthesis of prior scenario planning efforts related to transportation/related topics as pre-read for Vision Retreat. • Develop scenario frameworks to engage participants at Vision Retreat. **Look Outside:** • Use examples from other nations or industries to support the discussion.
4. SET BOLD GOALS	Encourage Vision Retreat participants to set aspirational goals.
5. IDENTIFY BREAKTHROUGH IDEAS	Focus Vision Retreat discussion on vision and goals, not implementation. Capture breakthrough ideas in conversation. Adopt perspective of planning *from* the future – ask participants to set goals for 2035 and then back up from those goals.
6. COMMUNICATE BOLDLY	Identify 1-2 good stories of change as part of the Vision Retreat agenda. (e.g., Spaceport; Disney) Communicate scenarios and ultimate vision through effective storytelling and visuals.

APPENDIX B

Eras in the Development of the US Surface Transportation System

ERAS IN THE DEVELOPMENT OF THE US SURFACE TRANSPORTATION SYSTEM

The historic development of the U.S. surface transportation system can be characterized by four distinct "eras." These eras can be defined in terms of a combination of public sector infrastructure investment and policy interacting with private enterprise developments in technology and services and changing community values. Each of the four eras includes distinct "waves" reflecting evolving finance strategies, policy targets, program focus, and governance models.

The first two eras involved the concept of *creating road and highway infrastructure* to accommodate the development of "automobility," including a national network with an appropriate system of governance. The third era involved *adjusting a maturing surface transportation system* to accommodate a broader range of transportation needs, values, and uses (modes). The fourth (and current) era reflects *adapting the existing surface transportation system* to new technologies and a broader, long-term view of the role of surface transportation and social integration – opening the potential for consideration of new and expanded missions for the nation's surface transportation system including how it integrates with other modes.

AUTOMOBILITY—1890-1956

Source: Getty Images..

1890-1915: The New Power Wave

In the late 19th century, the popularity of the bicycle powered the call for paved roads. Together with the expansion of electric streetcars and interurban railroads in the 1890s and the invention of the electric elevator, urban areas expanded and central business districts densified. The ground was prepared for the widespread adoption of the gas-powered automobile. Especially after the development of the assembly line in 1913, now-affordable vehicles provided a new level of mobility. But cars were often stuck in the mud.

1915-1956: The Automobility Wave

As the car population surpassed that of the horse by 1925, local governments and states undertook basic road building programs. Early state and local road building efforts were uneven, disparate, and often disconnected. World War I logistics problems provoked a modest federal program focused on post roads and farm to market links (the Federal Highway Act of 1921). Meanwhile, progressive states developed parkways for recreational driving and used tolls to support roads, bridges, and tunnels.

BUILDING THE NATIONAL HIGHWAY NETWORK—1956-1975

Source: Library of Congress.

1956-1965: The National Network Wave

The explosion of the post-World War II economy, including increasing suburbanization, led to increased American household dependence on the automobile. In addition, wartime defense logistical problems revealed the need to create a truly national highway network. The concept of a standardized, interconnected, interstate freeway network had been the subject of several studies, culminating in a plan for an Interstate Highway System, constructed by states and supported by fuel taxes placed in a Federal Highway Trust Fund that would pay for 90 percent of the costs. Federal legislation also required the designation of metropolitan planning organizations for any urbanized area with population greater than 50,000.

1965-1975: The Reform Wave

Most of the original 41,000-mile Interstate Highway System was completed in a decade. However, the single-minded focus on roadways connecting regions – and adding connections into densely populated city centers themselves – involved a series of negative consequences. These included disruption and displacement of urban (often minority) neighborhoods and other negative impacts on natural, environmental, and historic resources, as well as neglect of non-highway modes. Coming as it did in a period of rising civil rights and environmental consciousness, a "freeway revolt" took place, leading to significant changes in highway policy and processes, including more inclusive and systematic planning, requirements to consider community and environmental impacts, and inclusion of other modes. The response to this experience was embodied in a range of new federal laws and regulations regarding highway development, such as the National Environmental Policy Act (NEPA) – as well as the formation of a new, multimodal, U.S. Department of Transportation.

REDEFINING A MULTIMODAL SYSTEM—1975-2005

1975-1990: The Multimodal Wave

Source: Getty Images.
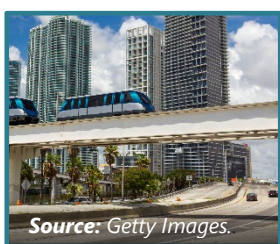
The preoccupation with completing of the Interstate Highway System – with both its positive and negative impacts – revealed a need for a new and more comprehensive approach to transportation policy and planning. In urban areas, modes other than roadways were significantly under-resourced. The establishment of the Urban Mass Transportation Administration provided federal funding for transit and institutionalized multimodal planning, while corresponding highway legislation provided for expanded roles for metropolitan planning organizations and local governments – as well as greater modal funding flexibility.

1990-2005: The "TEA" Wave

The 1990s saw a major shift in program emphasis from systems development to systems maintenance and operational efficiency. It also introduced greater emphasis on tailoring improvements to local needs – a "new federalism." An aging highway network and increasing congestion led to an increased focus on improved asset, safety, and operational management. At the same time, the sequence of federal legislation and regulations (ISTEA, TEA-21, SAFETEA-LU) further shifted decision-making to the state and metropolitan level, and provided greater flexibility for aligning programs with the geography of regional economies, commuting patterns, and social reality.

ASPIRATION MEETS REALITY—2005-PRESENT

2005-2015: The New Technology Wave

Source: Getty Images.

This era saw a continuation of the general trend in devolution of funding and program responsibilities to the state and local level. It was marked by increasing emphasis on management for performance and sustainability, as well as innovation in finance and project delivery – responding to the drawdown in the Highway Trust Fund. As the same time, a new emphasis was placed on developing the potential of intelligent vehicles and highways themselves – and on a more integrated freight and intermodal network, recognizing the key role of new forms of public/private sector cooperation.

2015–Present: The Sustainability and Equity Wave

A focus on using expanded resources to respond to the COVID-19 pandemic, the global economic shock, and the backlog of preservation and investment needs across all modes characterizes the current federal and state policy and program environment. The Infrastructure Investment and Jobs Act is a key milestone in this wave. At the same time, there is a recognition of the need for a sustainable and resilient response to climate challenges – in terms of both system and vehicle technology development – as well as greater emphasis on how transportation decisions can support diversity, equity, and inclusion. These trends are coupled with an evolving understanding of the need for equitable and diverse institutional arrangements and a recognition of expanded multi-modal mobility needs.
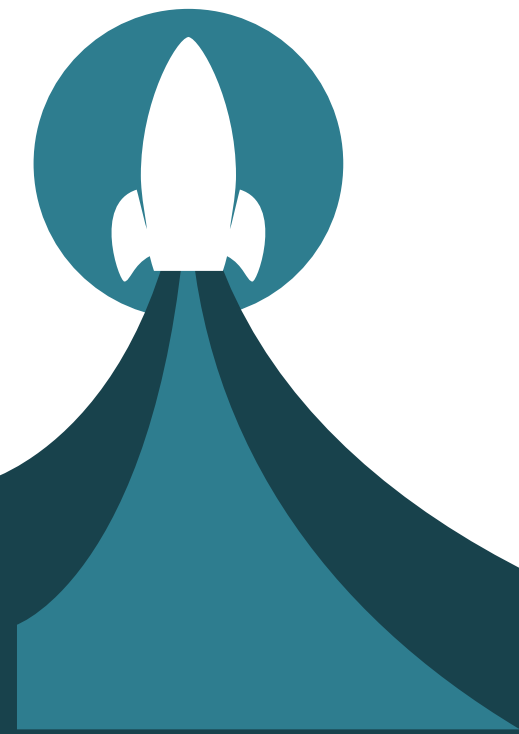
APPENDIX C

Trends Factsheets

TRENDS FACTSHEETS

Although the pace of growth is slowing, the U.S. population is expected to continue to outpace most major industrialized nations due to strong immigration. The U.S. will achieve several major demographic turning points during the next decade as its population becomes older and more diverse.

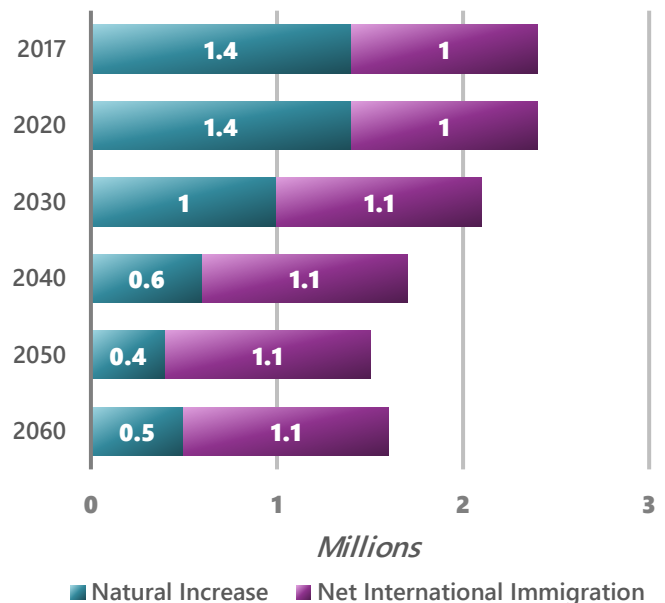## 400 MILLION AMERICANS BY 2060, BUT THE PACE OF GROWTH SLOWS

Population (in Millions) *Percent Change*
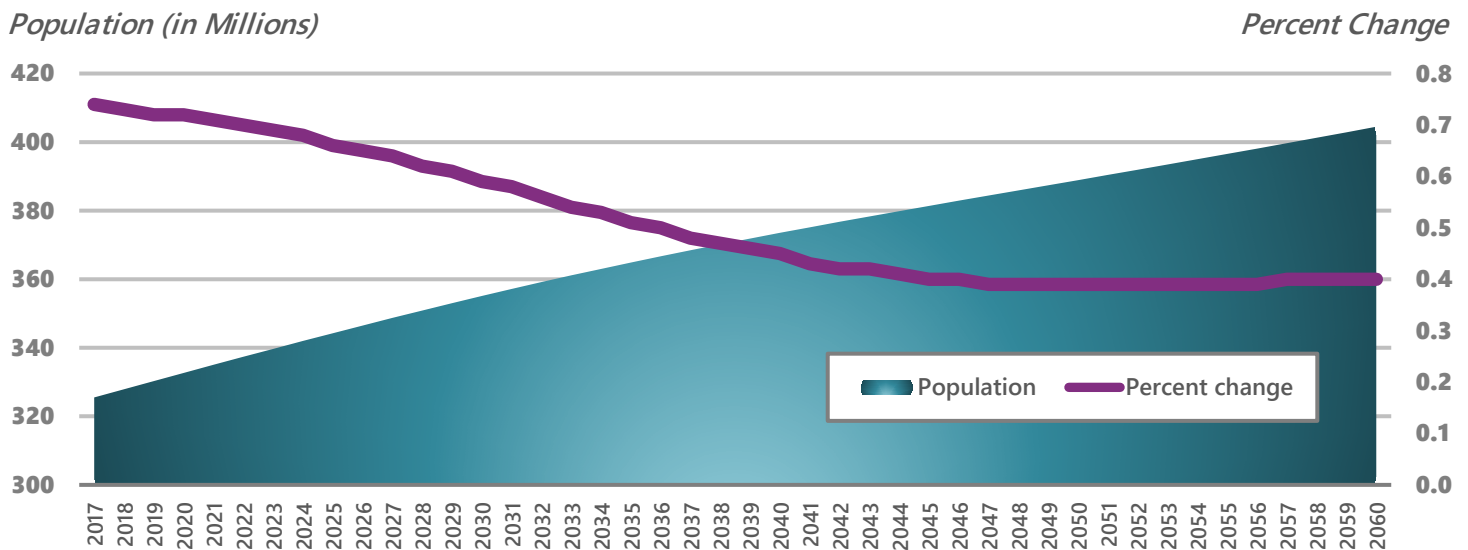
Source: *U.S. Census Bureau, 2017 National Population Projections. Minor adjustments anticipated in next forecast based on final 2020 Census data.*

MILLENNIALS NOW LARGEST U.S. GENERATION
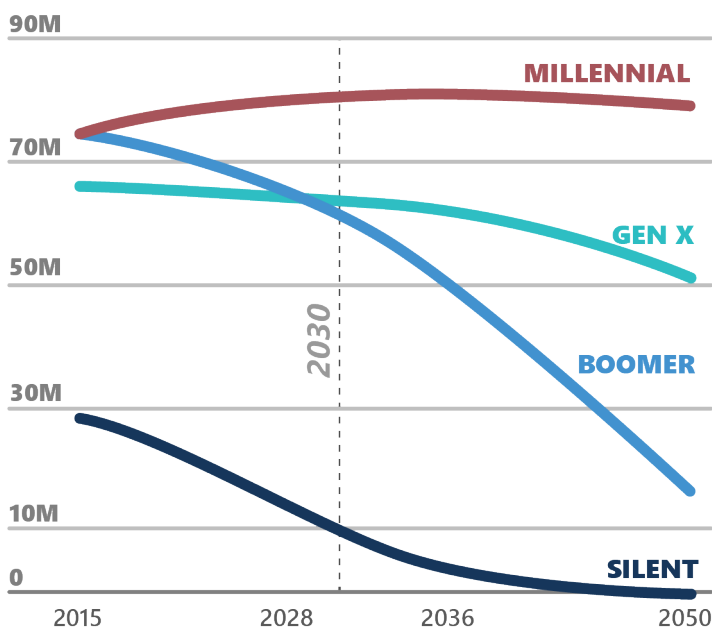
Source: *Pew Research Center, 2020. GenZ generation not yet officially defined.*

IMMIGRATION MAY EXCEED NATURAL INCREASE BY 2030

Year	Natural Increase	Net International Immigration
2017	1.4	1
2020	1.4	1
2030	1	1.1
2040	0.6	1.1
2050	0.4	1.1
2060	0.5	1.1

Millions

■ Natural Increase ■ Net International Immigration

Source: *U.S. Census Bureau, 2017 National Population Projections.*

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

SIGNPOSTS

The U.S. is likely to exceed 400 million residents by 2060, with international migration driving growth at a level ahead of most major industrialized nations (*U.S. Census, Population Projections 2020 to 2060)*. Uncertainty over immigration policies and the potential for significant relocation from Caribbean and other island nations experiencing significant climate impacts suggests a wide range of potential growth rates.

Nearly 70 million Americans are projected to be foreign-born by 2060. By 2028, the percentage of the U.S. population that is foreign born is projected to be higher than anytime since 1850 (*U.S. Census, Population Projections 2020 to 2060*).

The number of non-Hispanic White residents is expected to shrink beyond 2030, offset by strong growth in multi-racial, Asian, and Hispanic populations (*U.S. Census, Population Projections 2020 to 2060*).

9.3% of Americans moved in 2020, the lowest rate in post-World War II history (*U.S. Census, American Community Survey, 2021).*

By 2034, adults over the age of 65 are projected to outnumber children under 18 for the first time in U.S. history; about 2 out of 3 older adults could outlive their ability to drive by an average of 7 to 10 years *(U.S. Census Bureau, 2019; AAA, 2018).*

U.S. life expectancy at birth declined 1.5 years in 2020 – this represented the largest one-year decline since World War II and was due to excess deaths associated with the COVID-19 pandemic (*Centers for Disease Control National Center for Health Statistics, 2021*).

12.7%
of Americans have
ONE OR MORE DISABILITIES

8.2%
of Americans have
LIMITED ENGLISH PROFICIENCY

More than
2 OUT OF 5
Americans over 20
ARE CONSIDERED TO BE OBESE

More than
3 OUT OF 5
Americans have
ONE OR MORE CHRONIC HEALTH CONDITIONS

Source: U.S Census Bureau, American Community Survey, 2019.

Source: Centers for Disease Control, 2018.

WHAT COULD THE FUTURE LOOK LIKE?

How can our economy, communities, and infrastructure accommodate at least 100 million additional residents?

Will immigration significantly increase growth beyond current projections – or could economic or political disruptions cause immigration rates to slow significantly?

How do we meet the unique needs of aging Americans as well as persons with disabilities and chronic health conditions?

How will the emerging GenZ residents prefer to live, work, and travel?

For the past few decades economic growth and prosperity has not been evenly spread across the United States. Access to jobs, health care, education, and other services is an important element of providing economic opportunity for all.

U.S. HOUSEHOLD NET WORTH AND DEBT ARE AT RECORD LEVELS

Net Worth in $Trillions

Debt in $Trillions

■ Mortgage   ■ Credit Card/Revolving   ■ Auto Loan   ■ Student Loan   ■ Other
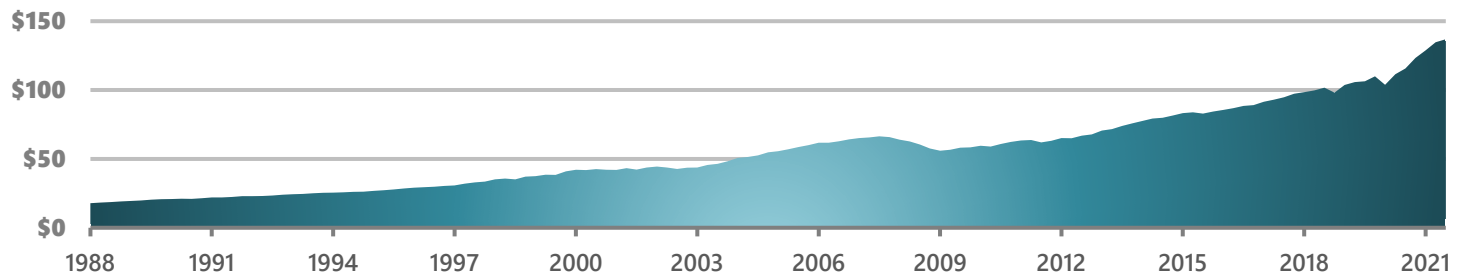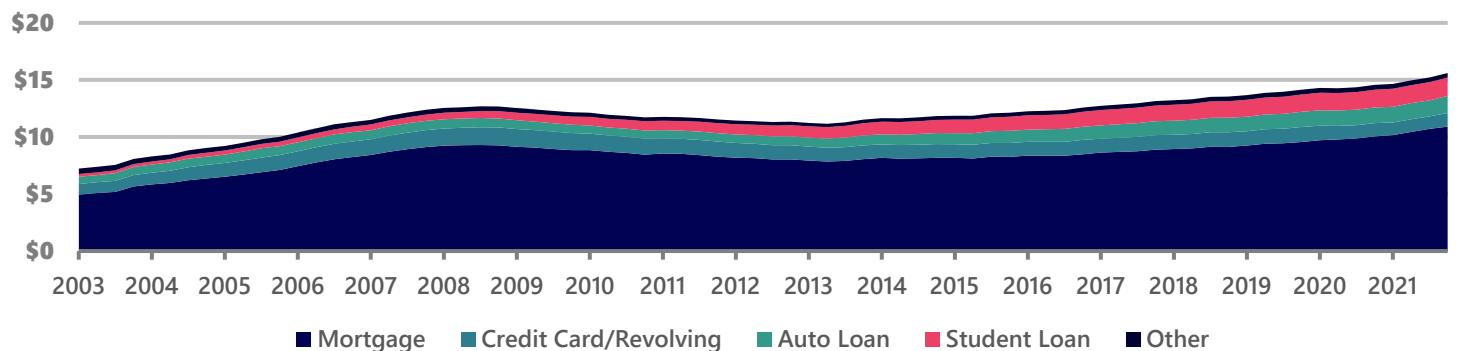
Source: *Federal Reserve Bank.*

42% OF U.S. HOUSEHOLDS CANNOT AFFORD BASIC COSTS

13% *earn incomes* **below the poverty line.**

29% *are* **asset limited, income constrained and employed (ALICE).**

The average US household spends **16% of total expenditures on transportation** – *the second highest household expense after housing. This share is* **20% for rural households.**

Source: *United for ALICE, 2021, using 2018 data; Bureau of Labor Statistics, 2020.*

Percent Below ALICE Threshold

31%   51%
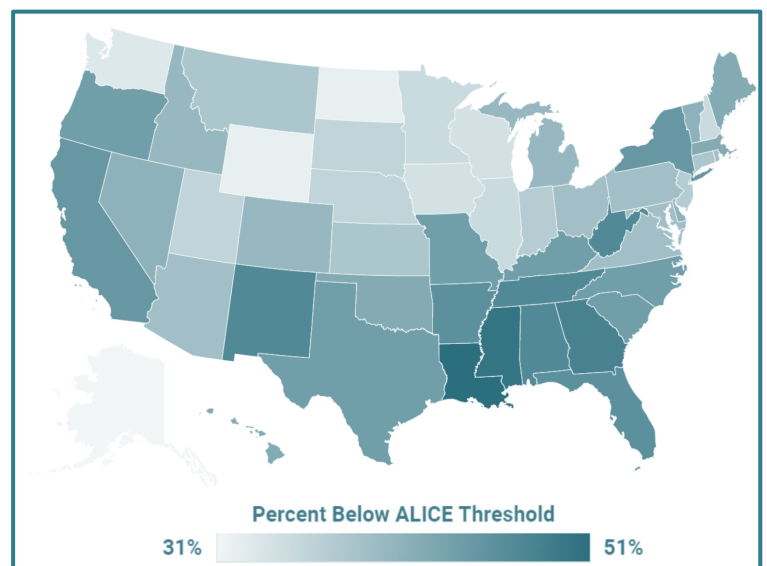
SIGNPOSTS

More than 68% of U.S. residents think today's children will be financially worse off as adults than their parents, up from 60% in 2019 *(Pew Research Center, 2021)*.

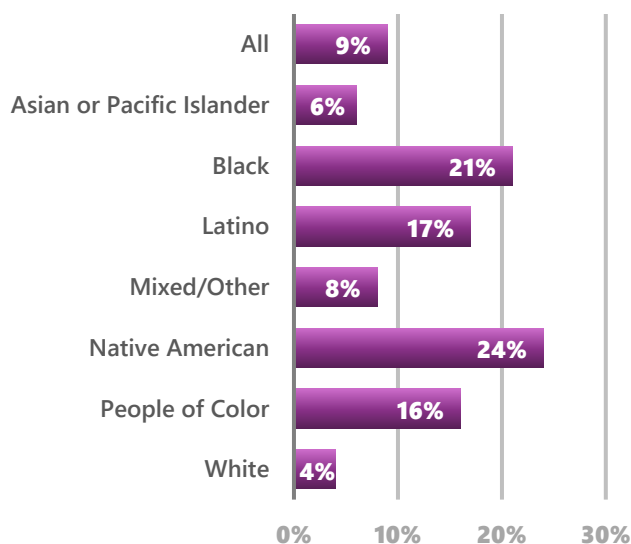More than 1 in 4 adults report being unable to pay their monthly bills or being one $400 financial setback away from being unable to pay them in full *(Federal Reserve Bank, 2020)*.

21% of homeowners and 46% of renters spend more than 30% of their income on housing costs. Lower-income households with 50-80% of area median income can afford a home in only 20 of the nation's largest 100 metropolitan areas *(Harvard University Joint Center for Housing Studies, 2020-2021)*.

$30 trillion in assets is expected to change hands over the next few 20 to 30 years as the Baby Boomer generation transfers wealth to its heirs in North America – the largest intergenerational transfer of wealth in history *(Accenture, 2012)*.

PERCENT LIVING IN HIGH-POVERTY NEIGHBORHOODS BY RACE/ETHNICITY

Category	Percent
All	9%
Asian or Pacific Islander	6%
Black	21%
Latino	17%
Mixed/Other	8%
Native American	24%
People of Color	16%
White	4%

Source: American Community Survey and Geolytics, Inc., 2019.

88M
Americans live in areas with a **SHORTAGE OF PRIMARY HEALTHCARE PROFESSIONALS**

Source: Health Resources and Services Administration, 2021.

More than
42M
Americans **DO NOT HAVE ACCESS TO BROADBAND INTERNET**

Source: Broadband Now, 2021.

8.6%
of U.S. Households have **NO VEHICLE AVAILABLE**

Source: U.S. Census Bureau, American Community Survey, 2019.

19M
live in low-income, low-access-to-food areas that are **MORE THAN 1 MILE FROM A GROCERY STORE IN URBAN AREAS OR MORE THAN 10 MILES IN RURAL AREAS**

Source: U.S. Department of Agriculture, 2019.

WHAT COULD THE FUTURE LOOK LIKE?

Will the next wave of economic growth reduce or further increase historic income disparities?

What roles could the changing nature of work and expanding of technology play in enhancing access to opportunity?

How could changing preferences for where to live and work – as well as growing risks from extreme weather and climate change – impact different socioeconomic groups?

How can we provide better access to jobs, health care, education, and other services, particularly for people living in historically disadvantaged areas?

The COVID-19 pandemic accelerated changes in the nature of work. Americans increasingly will work in different ways, at more places, and in more varied kinds of jobs. Job growth is shifting to cognitive and non-routine activities in a wide range of industries – and automation and other emerging technologies are anticipated to replace some jobs and create new ones in many industries.

LABOR FORCE PARTICIPATION DECLINING

% of Population Ages 16 & Over
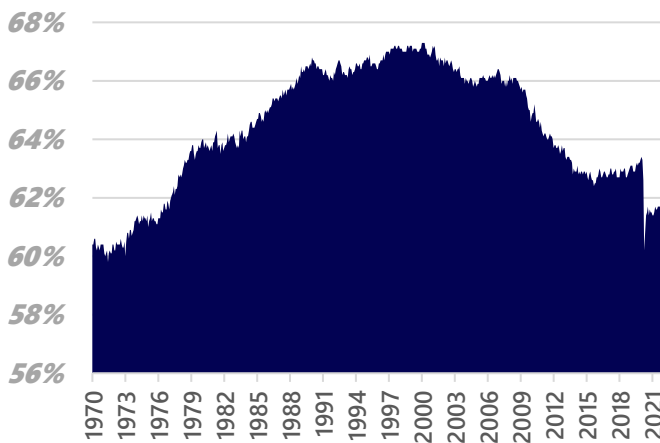
Source: *U.S. Bureau of Labor Statistics, 2021.*

MORE JOBS LOOKING FOR PEOPLE THAN PEOPLE LOOKING FOR JOBS

Categories (top to bottom): Education & health services, Professional & business services, Leisure & hospitality, Wholesale & retail trade, Manufacturing, Transportation & utilities, Financial activities, Other services, Construction, Information

Legend: ■ Unemployed ■ Job Openings

X-axis: 0, 1,250, 2,500 — *Thousands*
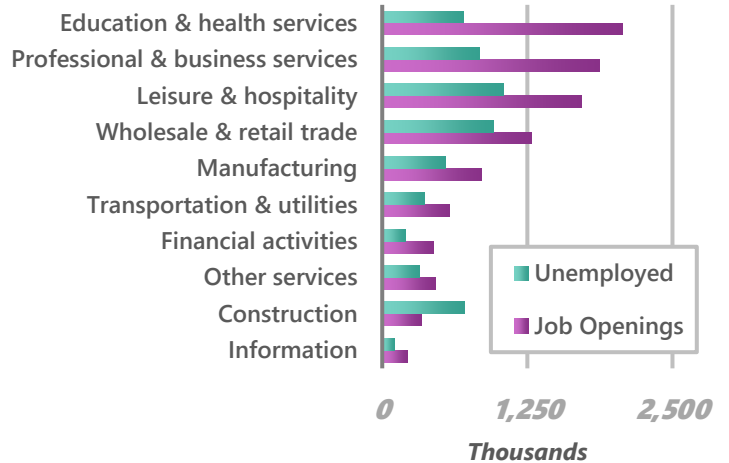
Source: *U..S. Bureau of Labor Statistics, 2021.*

JOB GROWTH SHIFTING TO COGNITIVE AND NON-ROUTINE ACTIVITIES, WITH GROWING WAGE GAPS

Millions

Legend: Cognitive, Non-Routine — Cognitive, Routine — Manual, Non-Routine — Manual, Routine
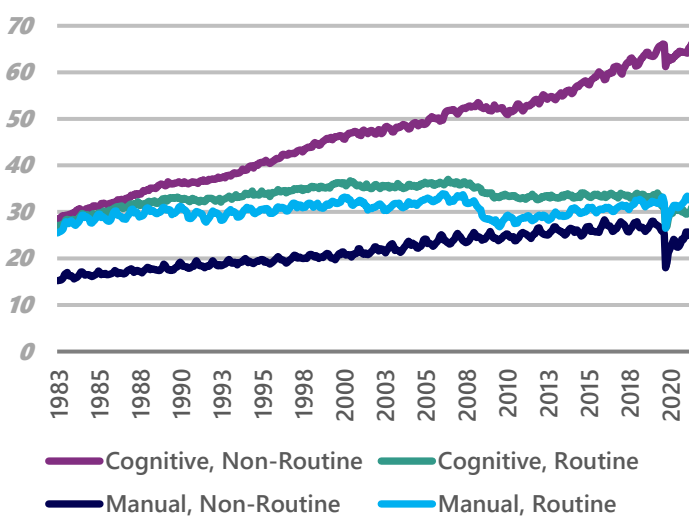
Source: *Federal Reserve Bank of St. Louis analysis of Bureau of Labor Statistics occupational data.*

Low-Wage Middle-Wage High-Wage

Job Growth, 1990-2020
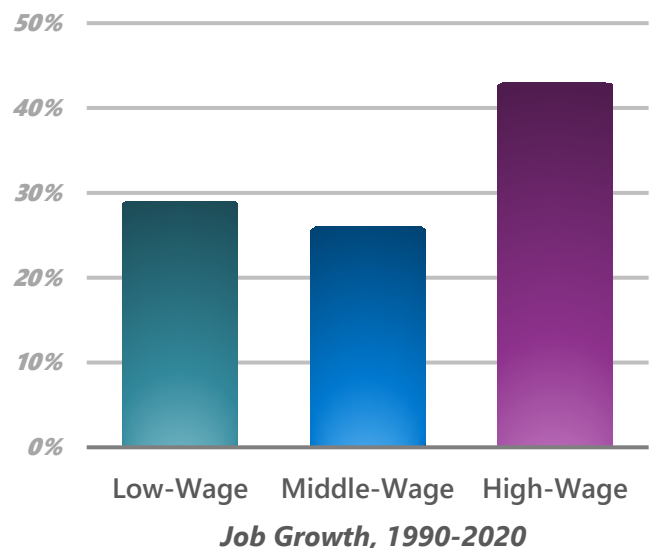
Source: *U..S. Bureau of Labor Statistics, Woods & Poole Economics, National Equity Atlas.*

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

SIGNPOSTS

16% of employees had a work schedule that varied based on their employer's needs in 2020; 10% of employees had a schedule that varied at their own request (*Federal Reserve Bank, 2020*).

Prior to the pandemic, 68% of employees reported working in the office 5 days a week; during the pandemic, less than 24% did (*University of California Davis*).

Up to 85% of jobs by 2030 could be in industries or occupations that do not exist today (*Institute of the Future, 2017*).

21 new jobs by 2030 could range from data detectives to quantum machine learning analysts to chief trust officers (*Cognizant Center for the Future of Work, 2019*).

MORE PEOPLE WORKING FROM HOME...

5.7%
2019

34%
2020

■ Telework   ■ Other

Source: U.S. Census Bureau.

MORE PEOPLE IN THE GIG ECONOMY...
% of U.S. Workers doing Freelance Work by Generation

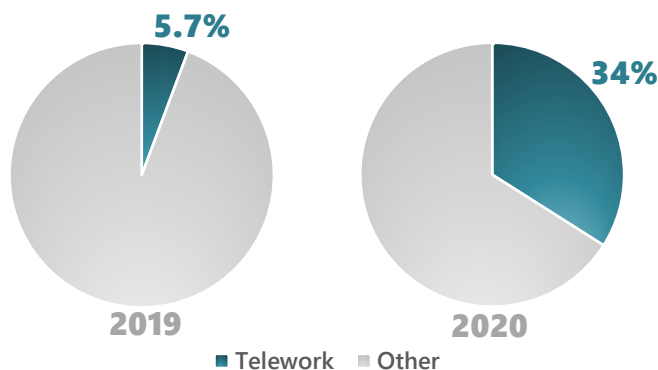| Generation	%
Gen Z (18-22)	50%
Millennials (23-38)	44%
Gen X (39-54)	30%
Boomers (55+)	26%
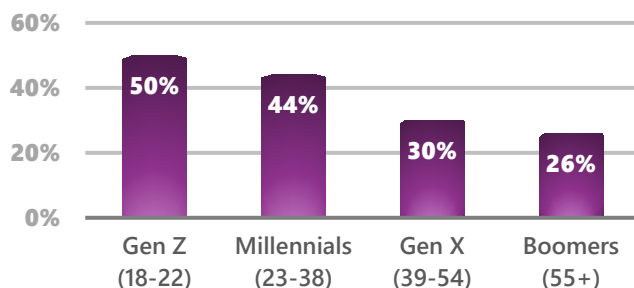
Source: Upwork, Freelance Forward 2020.

MORE DISRUPTION AHEAD: PERCENT OF JOBS THAT COULD BE AUTOMATED USING TODAY'S TECH

Industry	Percent
Accommodations & Food Services	73
Transport & Warehousing	60
Manufacturing	60
Agriculture	57
Retail Trade	53
Mining	51
Other Services	49
Construction	47
Wholesale Trade	44
Utilities	44
Finance & Insurance	43
Arts & Recreation	41
Real Estate	40
Administration	39
Information	36
Health & Social Services	36
Management	35
Professional Services	35
Education	27
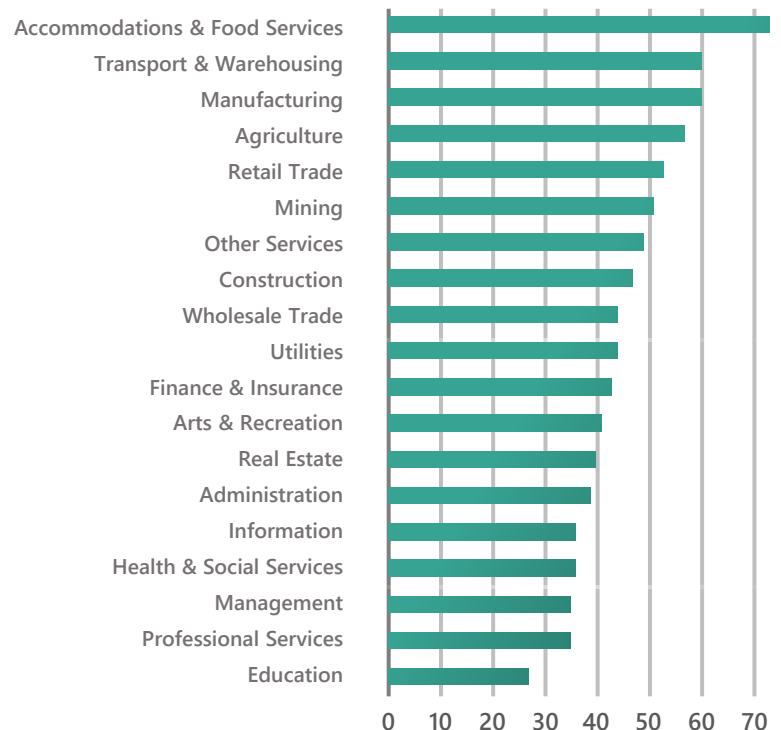
Source: McKinsey Global Institute, 2017.

WHAT COULD THE FUTURE LOOK LIKE?

With an aging workforce, declining labor force participation, and increasing skill requirements, will we have sufficient numbers of skilled workers in key industries?

Will automation displace a large number of today's workers, or free people up for productive activities in newer occupations?

How will a long-term shift toward flexible schedules and remote work impact traditional employment centers, housing choices, and commuting flows?

The global economy will continue to grow over the next decade, increasing market opportunities and competition for the United States. E-commerce experienced nearly a decade's worth of growth during the pandemic, reshaping supply chains and creating new delivery challenges. Post-pandemic supply chain capacity constraints threaten the recovery, but near-shoring, automation, and productivity gains could enable the United States to remain a global leader.

PROJECTED GROSS DOMESTIC PRODUCT GROWTH BY REGION, 2020-2030

Europe
$22.3 trillion
+25%

Russia & Former Soviet Union
$2.7 trillion
+32%

East Asia
$33.4 trillion
+55%

North America
$26.6 trillion
+28%

2030
2020
2030 real values shown. Units in $2015 dollars

Middle East & Northern Africa
$5.9 trillion
+43%

India & South Asia
$5.7 trillion
+74%

West & Sub-Saharan Africa
$2.5 trillion
+41%

Southeast Asia
$4.6 trillion
+60%

Mexico, Central America, and the Caribbean
$2.3 trillion
+33%

Australia and Oceania
$2.2 trillion
+29%

South America
$4.4 trillion
+38%

Source: USDA Economic Research Service, 2022.

GLOBAL TRADE GROWTH

Trillions of 2020 US Dollars

- Merchandise Imports
- Merchandise Exports
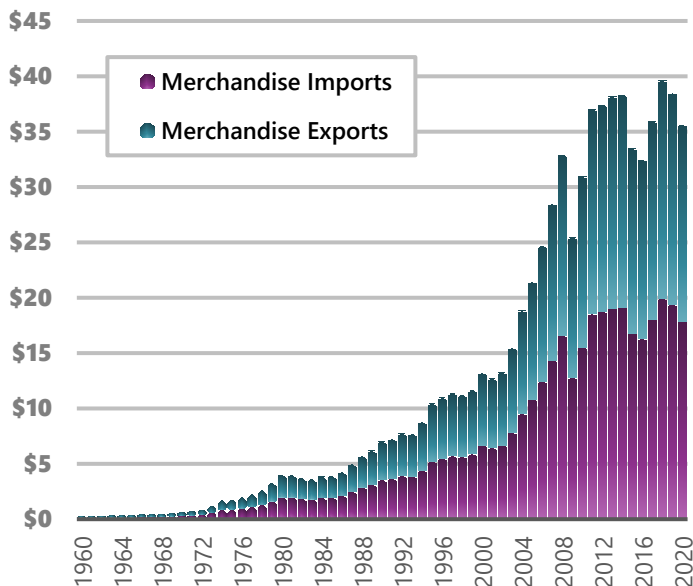
Source: World Bank, 2021.

U.S. FREIGHT TONNAGE GROWS MORE SLOWLY THAN GDP

% Change Since 1993

- Value (billons of dollars)
- Tons (millions)
- GDP (current US $)
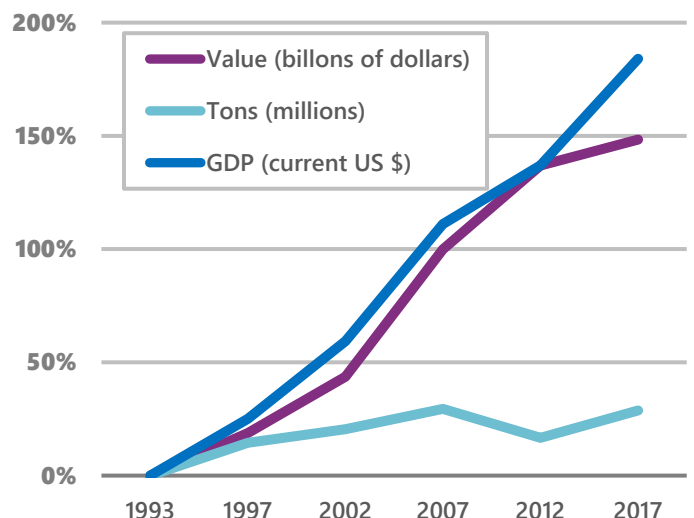
Source: US Bureau of Transportation Statistics, 2021.

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

VISION RETREAT

SIGNPOSTS

The U.S. added about 1 million manufacturing jobs between 2010 and 2021. Productivity gains in manufacturing are projected to yield a small job increase and 20% output growth by 2030 (*U.S. Bureau of Labor Statistics, 2022*).

The trucking industry is short about 80,000 long-haul drivers today. The industry may need more than 1 million new drivers over the next 10 years to accommodate growing demand and retirements of current workers (*American Trucking Association, 2021*).

Total logistics costs declined from 16% of U.S. GDP in 1981 to 7% in 2008 due to innovations in technology and inventory management, but were trending upward prior to the pandemic as shippers shifted from "just in time" to "just in case" practices (*Council of Supply Chain Management Professionals, 2021*).

As of January 2022, the average price worldwide to ship a 40-foot container was below its fall 2021 peak, but remained 79% above January 2021 rates *(Drewry Shipping Consultants Ltd. World Container Index, 2022).*
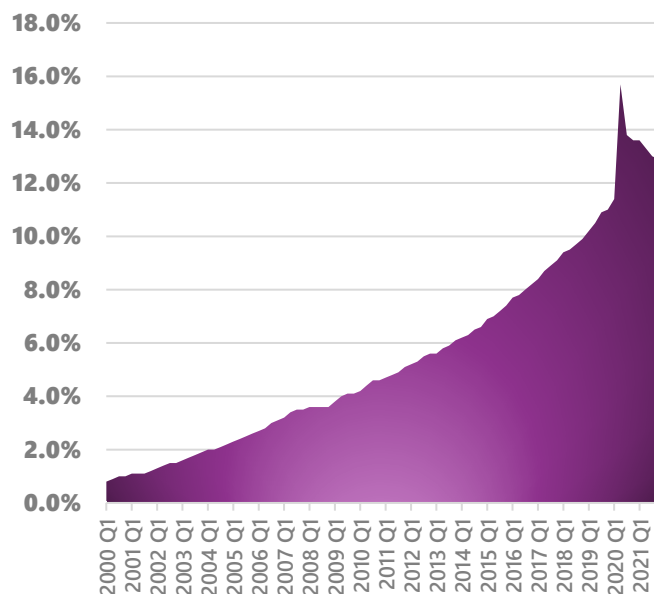
Measures of time to move waterborne freight from origin port to destination port in January 2022 remain more than 30 days above their January 2021 levels (*Flexport Ocean Timeliness Indicator, 2022*).

E-COMMERCE SOARS AS % OF RETAIL SALES

Source: *U.S. Census Bureau, 2021.*

The implementation of **FULL AUTONOMY** throughout the motor carrier freight system could **REDUCE TOTAL OPERATING COSTS** by up to

45%,
an estimated savings of at least
$85 BILLION

Source: *McKinsey Global Institute, 2017.*

Advances in **3D PRINTING** could disrupt freight by as much as

41% of Air Cargo

37% of Ocean Freight

25% of Truck Freight

(Loss in Annual Value)

Source: *Strategy & Business, 2015.*

WHAT COULD THE FUTURE LOOK LIKE?

Will the supply chain capacity constraints experienced in 2021 ease as the economy and freight demand return to 'normal,' or are we experiencing the start of a long-term structural issue?

How could a shift toward lighter, higher-value freight – particularly e-commerce - reshape supply chains and distribution networks?

Will freight and logistics costs increase due to capacity constraints and demand for same-day delivery, or decrease through automation and productivity?

How can U.S. manufacturers remain competitive in a rapidly shifting global marketplace? Which sectors might reshore some production back to the United States?

During the decade between 2010 and 2020, the United States grew at its slowest rate since the 1930s. Less than half of the nation's counties gained population. However, four out of five metropolitan areas added population, including the 10 largest metropolitan areas. Growth was concentrated in smaller cities and the suburban areas of larger metropolitan areas. Housing availability, cost of living, and water shortages may challenge continued dense growth in some regions.

PERCENTAGE CHANGE IN COUNTY POPULATION

Percent change
- 20.0 or more
- 10.0 to 19.9
- 5.0 to 9.9
- 0.0 to 4.9
- Less than 0.0
- Comparable data not available

Note: Bedford city, VA, was changed to town status and added to Bedford County, VA, effective July 1, 2013. For purposes of presenting data, Bedford County is treated as if Bedford city were included in it at the time of the 2010 census.

Source: 2010 Census Redistricting Data (Public Law 94-171) Summary File; 2020 Census Redistricting Data (Public Law 94-171) Summary File.

POPULATION GROWTH BY CITY SIZE, 2010-2020
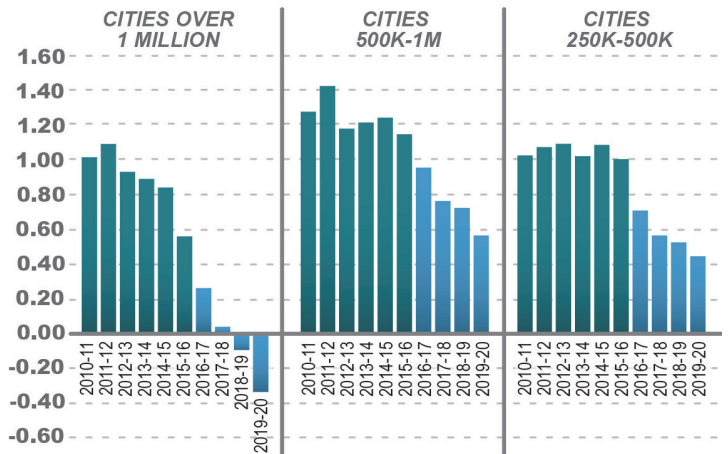
Source: Brookings Institute from U.S. Census, 2020 estimate.

EMERGING U.S. MEGAREGIONS

- Cascadia
- Northern California
- Southern California
- Arizona Sun Corridor
- Front Range
- Texas Triangle
- Gulf Coast
- Great Lakes
- Piedmont Atlantic
- Florida
- Northeast

Metro Area Population
- 150,000 to 1 million
- 1 to 3 million
- 3 to 6 million
- 6 million +
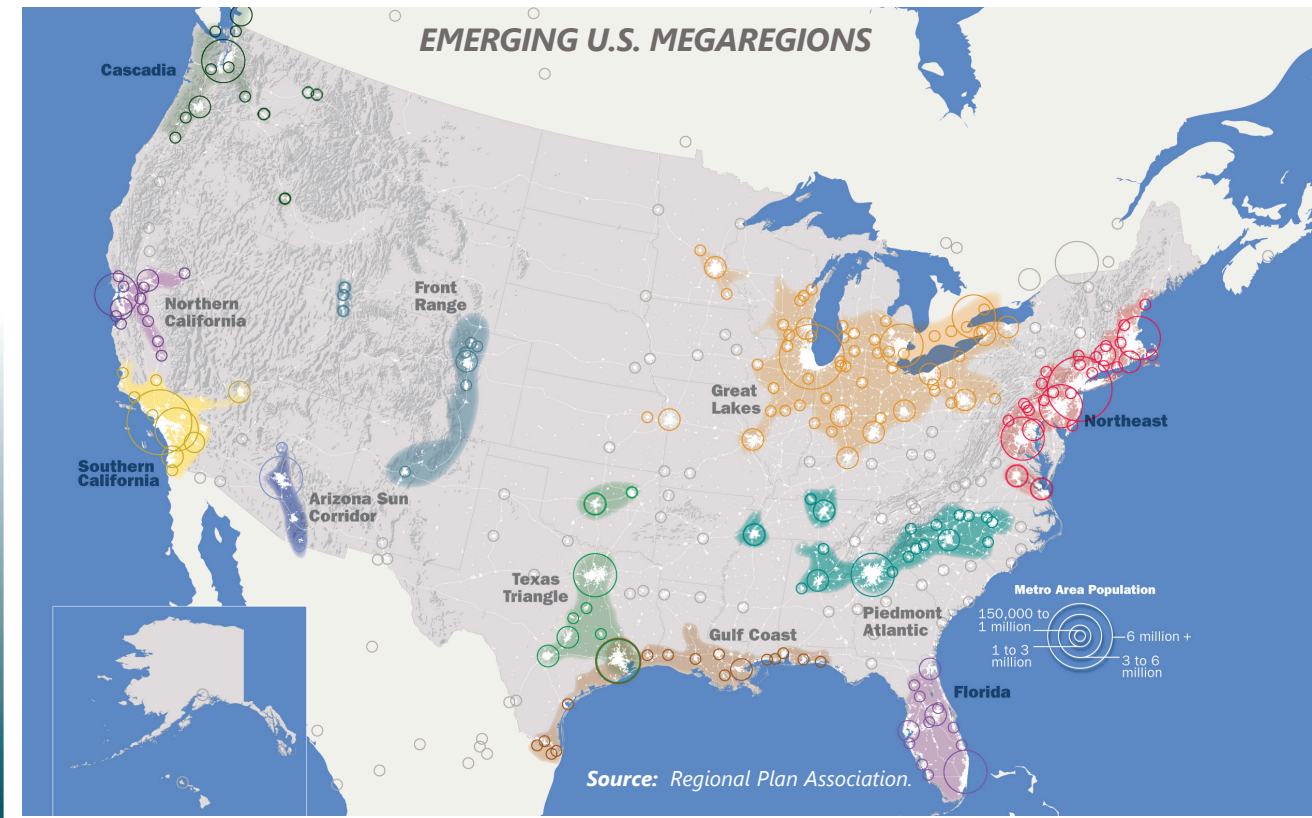
Source: Regional Plan Association.

SIGNPOSTS

Between nine and 13 "megaregions" are projected to account for the majority of U.S. population and economic growth through 2060.

The share of Baby Boomers who considered access to highways very important dropped by eight points from 2019 to 2020, from 39% to 31% (*National Association of Realtors, 2020*).

The share of residents who considered access to public transit very important declined from 2019 to 2020 among GenZ (37% to 31%) and Millennials (40% to 34%) (*National Association of Realtors, 2020*).

Nearly 80% of farming-dependent rural counties lost population from 2010 to 2020, but only 40% of recreation-dependent counties lost population (*Daily Yonder analysis of U.S. Census data, 2021*).

The American Society of Civil Engineers grades U.S. infrastructure for solid waste as C+; energy and drinking water as C-; hazardous water, parks and recreation, schools, and wastewater as D+; and stormwater, dams, and levees as D. Transportation infrastructure grades range from B for rail to D- for transit (*America's Infrastructure Report Card, 2021*).

By 2050, 32% of counties will be at high or extreme risk of water shortages, compared to 10% today (*U.S. Global Change Research Program, 2014).*

WATER DEMAND INCREASE BY 2050

Change (%)

< 0 | 0 to 10 | 10 to 25 | 25 to 50 | > 50

WATER SUPPLY RISK BY 2050
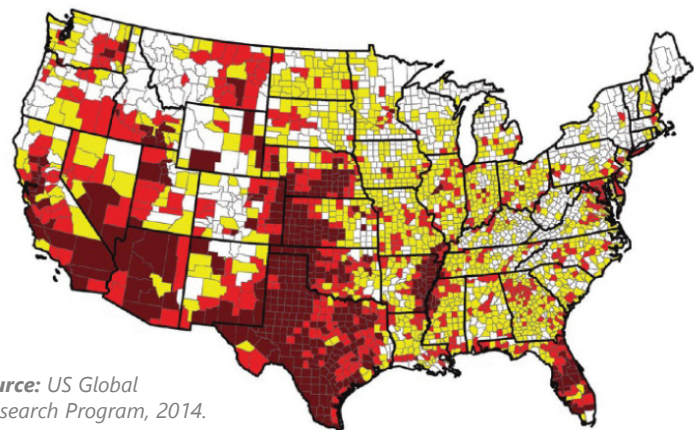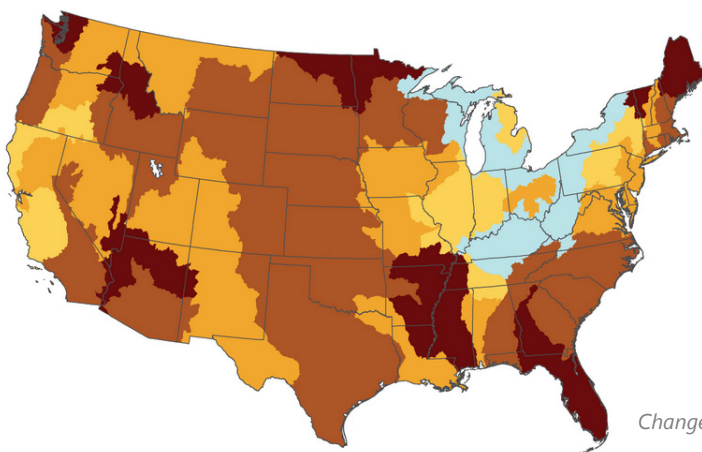
Source: US Global Change Research Program, 2014.

Water Supply Sustainability Risk Index (2050)

Low (929) | Moderate (1192) | High (608) | Extreme (412)
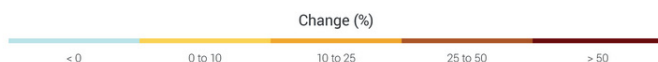
WHAT COULD THE FUTURE LOOK LIKE?

Will growth in large, dense cities accelerate after COVID-19, or will Millennials and GenZ continue to seek suburban areas and small-to-medium-sized metropolitan areas?

Will the long-term shift in U.S. population toward the South and West continue, or could concerns about changing climate, water and other resource shortages, and cost of living bring more residents to the U.S. Heartland?

If American metropolitan megaregions continue to grow, where will they find power, water, housing, food, and other essentials to support their people, particularly as the climate changes?

Americans are rethinking many aspects of how they live, from what they consume and the types of spaces they inhabit to the social structures they build in their communities. Housing has become increasingly unaffordable, prompting many people to explore new living arrangements. The shift toward remote work is reshaping where Americans spend their workday and the role of traditional central business districts and other gathering spaces. Many people are more interested in investing in their communities, whether through accessible mixed-use design, social networks, or ethical consumption, with profound implications for the built environment.

WITH INVENTORIES AT RECORD LOWS, EXISTING HOME PRICES CONTINUE TO INCREASE

MONTHS OF SUPPLY

CHANGE IN PRICE (PERCENT)

Legend: Months of Supply of Existing Homes — Year-over-Year Change in Prices (Right scale)
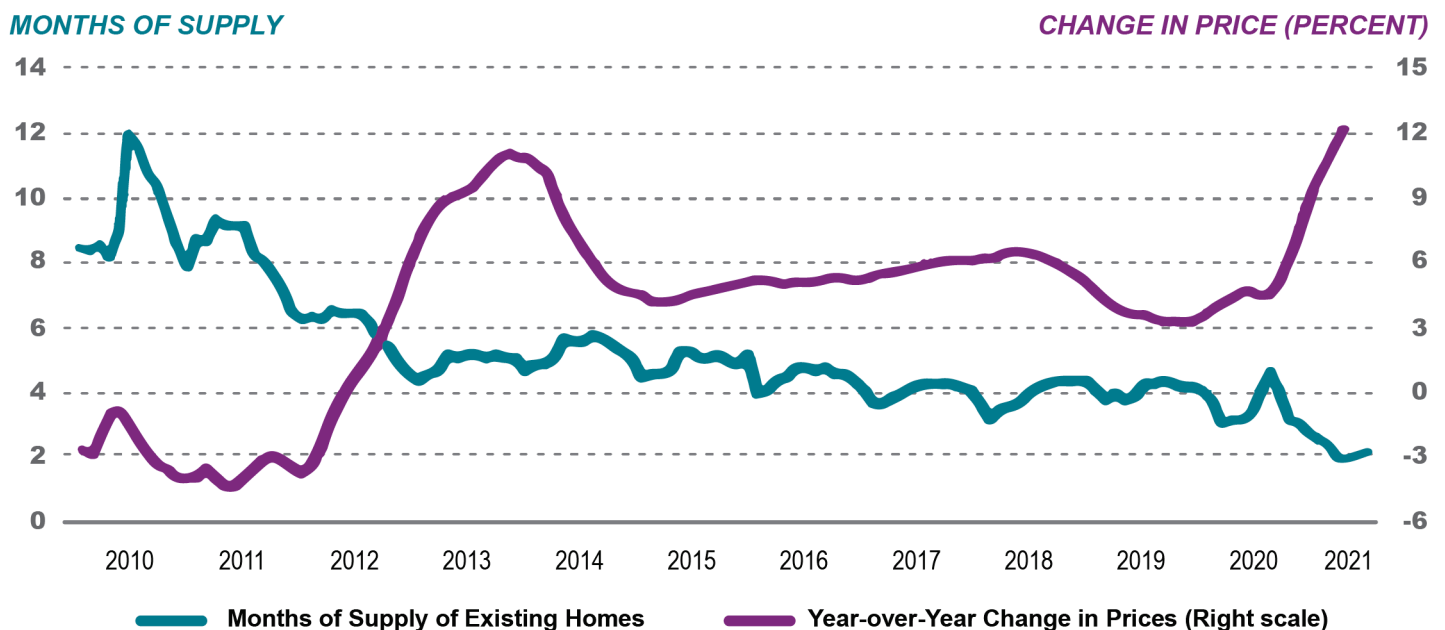
Source: Harvard Joint Center for Housing Studies, 2021.

SIGNPOSTS

Americans have become more aware of how inequality impacts their neighborhoods and communities. For example, since 2013 there has been a 20% drop in both Black and White Americans who say equal housing exists for Black people in their community; belief declined from 85% to 65% over this period among White adults and from 56% to 36% among Black adults (*Gallup, 2021*).

Nationally, homeownership is expected to drop by 2.5% by 2040, but homeownership rates will differ substantially by state based on prevailing housing costs. The average cost of a home in the five states with the lowest homeownership rates in 2020 was $525,973, whereas the average cost of a home in the five states with the highest homeownership rates was $282,290 (*Urban Institute, 2021*).

People are exploring new living arrangements. Co-living housing typologies feature shared amenities and a community ethos. Companies plan to open more than 55,000 beds in the U.S. the next few years and have raised hundreds of millions of dollars of equity to meet their expansion targets (*New York Times*, 2021).

THE "15-MINUTE CITY" CONCEPT IS A HUMAN-CENTERED URBANISM FOCUSED ON ACCESS

The "15-Minute City" describes an ideal geography where most human needs, and many desires, are located within 15-minute walk, bike, or transit sheds. The image below represents an analysis of American cities' alignment with this ideal; only Miami and San Francisco scored better than 6 out of 10 overall.

1 Miami, FL

POPULATION	FINAL SCORE
467,963	7.83

WALK & BIKE	8
DINING, PARKS, & COMMUNITY	8.4
CHILDCARE	10
HEALTH & SAFETY	7.2
HOUSING AFFORDABILITY	2.9

2 San Francisco, CA

POPULATION	FINAL SCORE
881,549	6.10

WALK & BIKE	8.9
DINING, PARKS, & COMMUNITY	8.0
CHILDCARE	2.3
HEALTH & SAFETY	5.9
HOUSING AFFORDABILITY	3.3

3 Pittsburgh, PA

POPULATION	FINAL SCORE
300,286	5.81

WALK & BIKE	6.7
DINING, PARKS, & COMMUNITY	7.3
CHILDCARE	2.8
HEALTH & SAFETY	5
HOUSING AFFORDABILITY	7.3

4 Boston, MA

POPULATION	FINAL SCORE
692,600	5.35

WALK & BIKE	8.5
DINING, PARKS, & COMMUNITY	7.9
CHILDCARE	0.4
HEALTH & SAFETY	4.9
HOUSING AFFORDABILITY	3.5

5 Washington, DC

POPULATION	FINAL SCORE
705,749	5.31

WALK & BIKE	6.8
DINING, PARKS, & COMMUNITY	8.4
CHILDCARE	2.0
HEALTH & SAFETY	3.4
HOUSING AFFORDABILITY	4

Source: *Congress for the New Urbanism, 2021.*

SIGNPOSTS

The COVID-19 pandemic spotlighted the importance of "social infrastructure" and "third places" in communities. Mutual aid groups – ad hoc volunteer groups organizing and delivering social supports – grew throughout the pandemic. Many used virtual platforms to respond rapidly to community needs (*New York Times, 2021*).

The share of people who said sidewalks and places to walk are very important factors in deciding where to live climbed over 50% in each generation except 75+ (*National Association of Realtors, 2020*).

About half of global consumers report considering factors related to sustainability when making purchasing decisions. Moreover, 52% said they were more eco-friendly than they were six months ago (*PwC, 2021*).

A sustained shift to remote work could set off significant changes in our cities. Some research estimates that remote work could reduce spending in major city centers by at least 5% to 10% relative to pre-pandemic levels, with profound impacts on the service sector and on tax revenues in cities across the country (*National Bureau of Economic Research*, *2021*).

WHAT COULD THE FUTURE LOOK LIKE?

How will a shift to remote work affect how to interact with each other and our urban environments?

How will we redefine how to build and sustain communities in an increasingly globalized world?

With ever-higher housing costs in many urban areas, will cities become increasingly less attractive, or will innovations in housing models provide new pathways towards stability?

Will younger generations of Americans continue to seek mixed-use housing close to work, childcare, essential errands, recreation, and entertainment? What does this mean for the structure of America's communities?

The pace of technological change continues to accelerate. Automation/artificial intelligence, digitization, connectivity, and electrification and new forms of energy are creating new opportunities for how we live, work, interact, and move today – with more technologies just over the horizon. Many of these technologies are part of what is known as the Fourth Industrial Revolution, which may be characterized by the fusion of digital and physical (even biological) realms.

HISTORICAL ADOPTION OF NEW TECHNOLOGIES

(Years until used by one-quarter of American population)

- Electricity *(46 yrs.)* 1873
- Telephone *(35 yrs.)* 1876
- Radio *(31 yrs.)* 1897
- Television *(26 yrs.)* 1926
- Personal Computer *(16 yrs.)* 1975
- Mobile Phone *(13 yrs.)* 1983
- The Web *(7 yrs.)* 1991
- Smartphone *(5 yrs.)* 2005
- Tablet *(2 yrs.)* 2010

First commercially available year
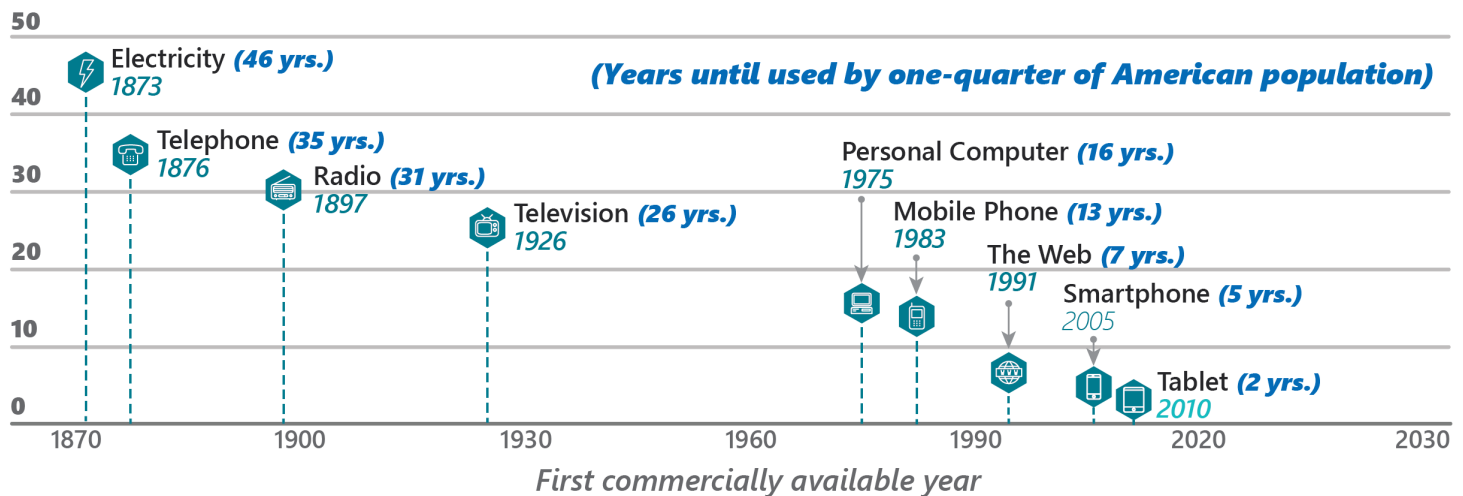
Source: CS synthesis and adaptation of work by singularity.com and other researchers.

TECHNOLOGIES LIKELY TO BE ADOPTED BY 2025 (BY SHARE OF COMPANIES SURVEYED)

- Cloud Computing (17%)
- Big Data Analytics (2%)
- Internet of Things and Connected Devices (9%)
- Encryption and Cybersecurity (29%)
- Artificial Intelligence (inc. ML and NLP) (8%)
- Text, Image, and Voice Processing (-)
- E-Commerce and Digital Trade (2%)
- Robots, Non-Humanoid (e.g. Industrial Automation, Drones) (10%)
- Augmented and Virtual Reality (1%)
- Distributed Ledger Technology (e.g. Blockchain) (11%)
- 3D and 4D Printing and Modeling (10%)
- Power Storage and Generation (-)
- New Materials (e.g. Nanotubes, Graphene) (-12%)
- Biotechnology (8%)
- Robots, Humanoid (11%)
- Quantum Computing (-5%)

Legend: ■ 2025 | 2018 ■ Difference

Source: World Economic Forum, 2020.

SIGNPOSTS

The Internet of Things will reach 64 billion objects by 2025, up from 10 billion in 2018 — all monitored in real time. 5G can support up to 1 million devices per square kilometer, compared with the 60,000 devices currently possible with current cell networks *(National Intelligence Council, 2021)*.

Over the next 10 to 25 years, graphene – a carbon sheet one atom thick, but 200 times stronger than steel -- could replace silicon as the primary material in semiconductors, with a market value that could reach $190 billion across data processing, wireless communications, and consumer electronics (*McKinsey, 2018*).

59 million people in the United States are estimated to use virtual reality (VR) at least once per month, and 93 million people to use augmented reality (AR) at least once per month (*eMarketer, 2021*).

The global artificial intelligence market is projected to grow from $47 billion in 2021 to $360 billion in 2028 (*Fortune Business Insights, 2021*).

By 2040, biotechnology will affect 20% of global economic activity through applications like medicine production, synthetic organisms, and transformed food production *(National Intelligence Council, 2021)*.

WHAT ARE THE NEXT "MOONSHOT" TECHNOLOGIES?

COMPUTATIONAL TECH	HUMAN TECH	CONSUMER TECH	GREEN TECH
6G 6G	Bionic Humans	Wireless Technology	Oceantech
Emotional AI	Immortality	Holograms	Nextgen Batteries
Brain Computer Interfaces	Synthetic Biology	Metaverse	Green Mining
		eVTOL	Carbon Capture & Storage
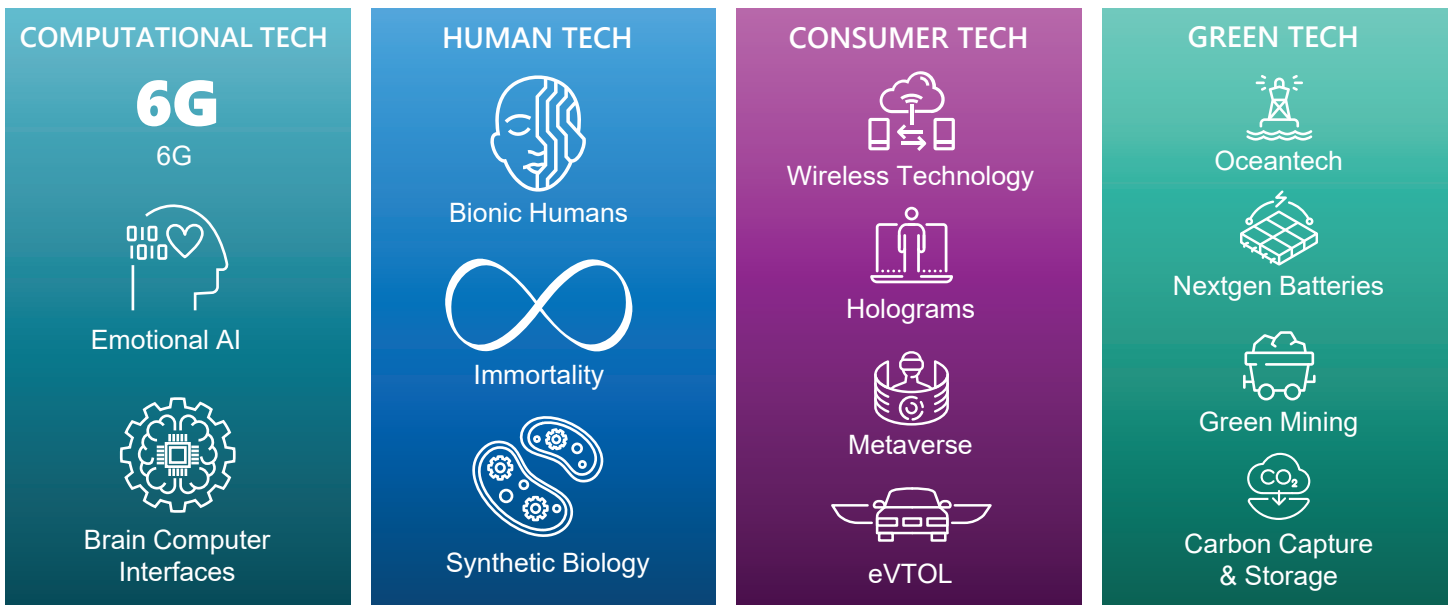
Source: *BofA Global Research, 2021.*

WHAT COULD THE FUTURE LOOK LIKE?

With advancements in green and consumer technology increasing rapidly, how will consumer behaviors shift?

How will advances in artificial intelligence impact the way we work and interact? What are the unintended consequences like greater security risks?

How will future interest in the metaverse or AR/VR impact economies and communities? How much of the economy will begin to occur in virtual space and will social events become more commonplace virtually?

What "moonshot" technologies will transform our economy or society next?

Under current policy and technology trends, increasing population and economic growth will increase global energy consumption through 2050. Decreasing prices are positioning renewable energy as a primary source for new electricity generation over the next decade, which can support the growing use of electricity in the transportation sector. Petroleum continues to account for about 90 percent of transportation energy in the United States.

GLOBAL PRIMARY ENERGY CONSUMPTION BY ENERGY SOURCE (2010-2050)

QUADRILLION BRITISH THERMAL UNITS
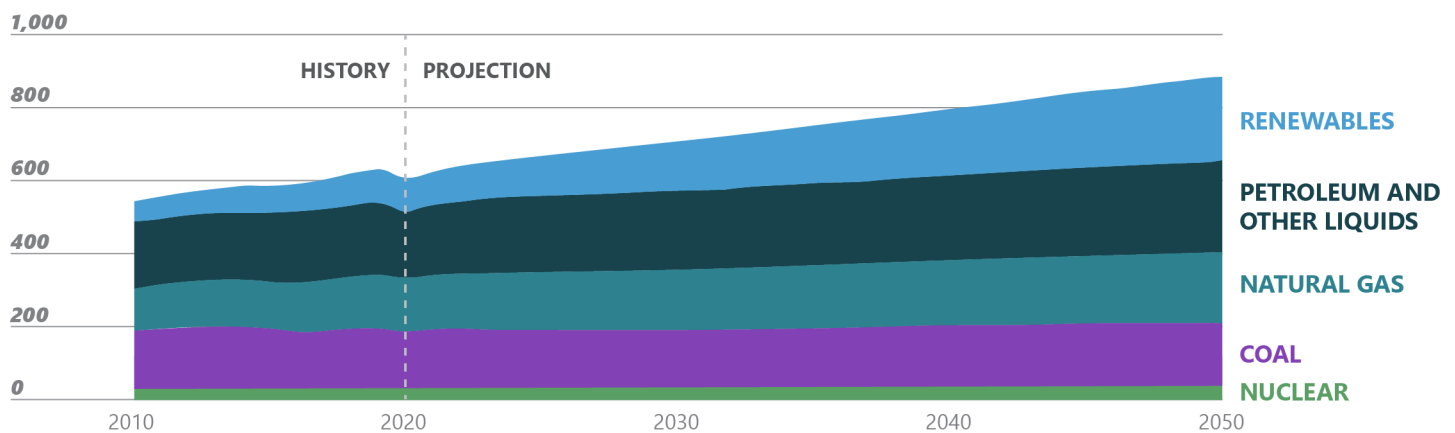
Source: U.S. Energy Information Administration (EIA), 2021. Petroleum and other liquids includes biofuels.

U.S. ENERGY CONSUMPTION BY SOURCE AND SECTOR, 2020

SOURCE

PETROLEUM
32.2 (35%)

NATURAL GAS
31.5 (34%)

RENEWABLE ENERGY
11.6 (12%)

COAL
9.2 (10%)

NUCLEAR
8.2 (9%)

TOTAL = 92.9 QUADRILLION BTU

90%
4%
5%
<1%
<1%

END-USE SECTOR

INDUSTRIAL
25.2 (36%)

TRANSPORTATION
24.3 (35%)

RESIDENTIAL
11.5 (17%)

COMMERCIAL
8.7 (12%)

ELECTRICAL SYSTEM ENERGY LOSSES
23.2 (65%)

TOTAL = 92.9 QUADRILLION BTU

Source: U.S. Energy Information Administration (EIA), 2020.

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102
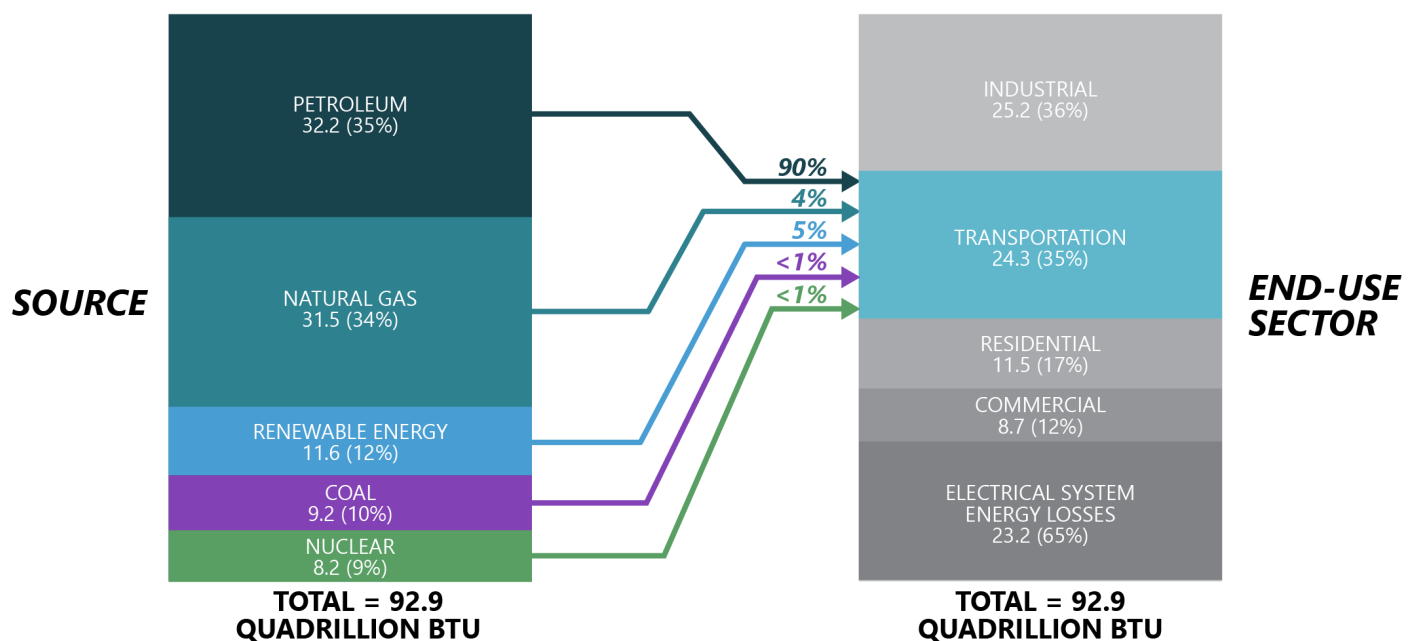
SIGNPOSTS

Renewables should more than double their global contribution to energy production by 2050 to supply 27% of global energy consumption. This total will surpass natural gas and coal, but lag petroleum and other liquids (*U.S. EIA, 2021*).

Long-Duration Energy Storage (LDES) batteries, capable of dispatching energy over multiple days to provide grid resiliency, could deploy 1.5 to 2.5 terawatts (TW) of power capacity by 2040 — 8 to 15 times the total energy-storage capacity deployed today — and store 10% of all energy consumed (*McKinsey, 2021*).

Distributed electricity generation will continue to increase as behind-the-meter generation (i.e., power on premises) is expected to reach 6.2 GWh in 2025. Solar will make up two-thirds of generation (*Wood Mackenzie, 2020*).

Growth in electrification across modes (electric vertical takeoff and landing aircraft for aviation, shore power for marine, e-bikes and electric vehicles for ground transportation) is expected to increase electricity's share in transportation energy consumption (*National Renewable Energy Laborato*ry, 2018).

If 66% of all cars are electric vehicles by 2050, power capacity would need to double to meet the increased demand. Carbon emissions would drop only if the electricity that is used to power them uses less carbon intensive sources like natural gas and renewables. (*National Renewable Energy Laboratory, 2021*).

PROJECTED U.S. EV SALES (2020-2030)

EV SHARE OF NEW VEHICLE SALES
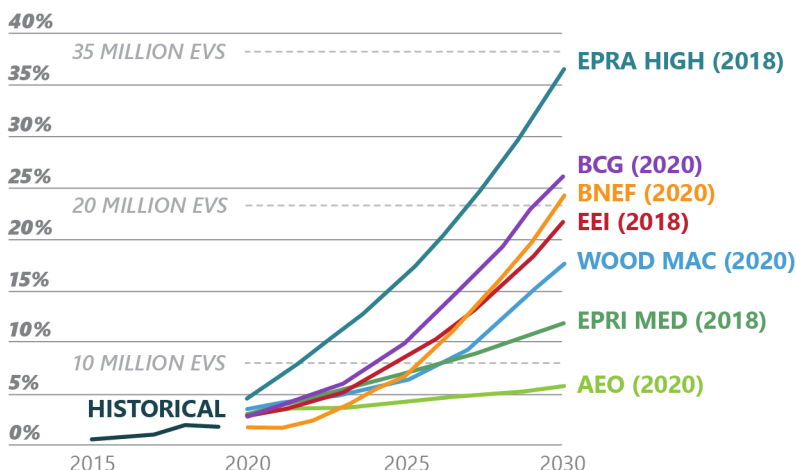
Source: Brattle Group, 2020.

DIGITALIZATION'S IMPACT ON ENERGY CONSUMPTION
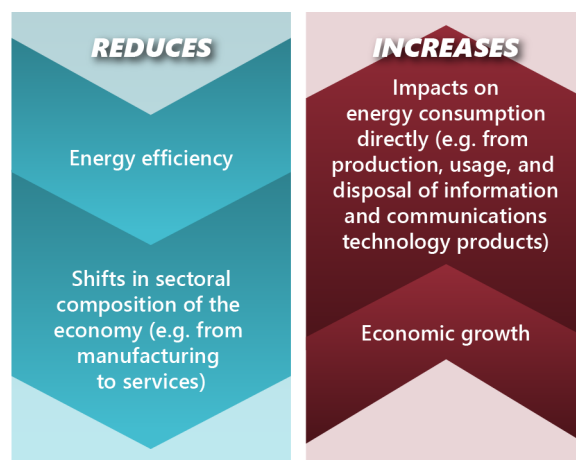
Adapted from: Lange, Pohl, and Santarius, 2020.

WHAT COULD THE FUTURE LOOK LIKE?

With advancements in alternative energy technology for private residential use increasing rapidly, how will consumer behaviors shift?

How will an increasingly decentralized grid approach resiliency and redundancy to reduce the risk of power outages and other disruptions?

How will the electrification of transportation (across all modes) affect electricity demand and grid reliability and transmission needs?

How will energy storage advancements (i.e. batteries) affect demand for certain energy sources and the materials needed to create batteries?

Our society is changing quickly, with shifting demographics and emerging technologies supporting new ways of interacting, engaging, and collaborating. Declining public trust, increasing polarization, and constrained funding make it more challenging for the public sector to respond to more complex issues. However, our state and local governments often are laboratories of democracy, and on-line platforms and informal "third sector" social groups are bringing fresh perspectives – and new ways of organizing – on many issues. Public sector agencies are working to meet the demand for digital organization and engagement by bringing more services online to share information, improve access to services, and optimize performance.

INCREASING PACE OF CULTURAL CHANGE
(NUMBER OF YEARS FROM AN ISSUE'S TRIGGER POINT TO FEDERAL ACTION)

RECREATIONAL MARIJUANA — *Currently Legal in 21 States (No Federal Action)*

SAME SEX MARRIAGE — **2015** *Obergefell V. Hodges*

ABORTION — **1973** *Roe v. Wade*

WOMANS SUFFRAGE — **1920** *19th Amendment*

PROHIBITION — **1920** *18th Amendment*

INTERRACIAL MARRIAGE — **1967** *Loving v. Virginia*

1775 1800 1825 1850 1875 1900 1925 1950 1975 2000 2025
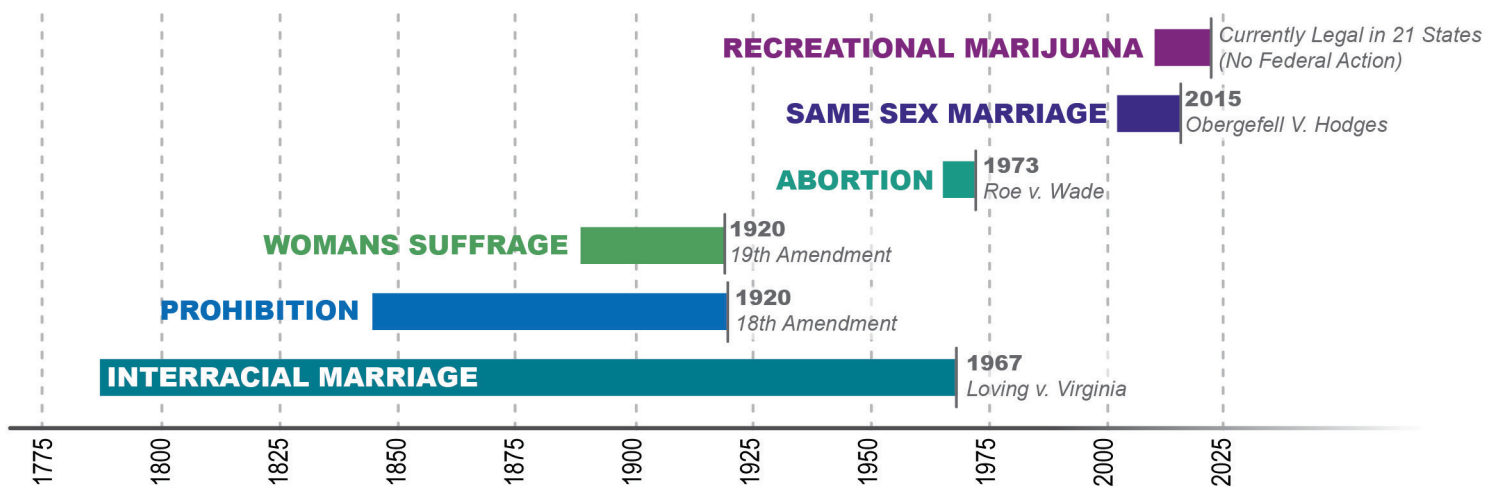
Source: Bloomberg, 2015.

SIGNPOSTS

Between 2013 and 2018, the number of campaigns on the crowdsourced fundraising platform GoFundMe increased from less than 50,000 to more than 450,000. More than 1 in 4 fundraising campaigns were designed to cover healthcare expenditures (*Journal of the American Medical Association, 2021*).

The COVID-19 pandemic led to a rapid acceleration in digital governance for short-term crisis response, offering digital solutions to access information and receive services. Many governments around the world expect to maintain these online platforms for governance and administration moving forward (*Deloitte, 2021*).

The percentage of people volunteering on an average day with traditional organizations fell from 7.1% in 2009 to 5.6% in 2019 (*U.S. Bureau of Labor Statistics, 2021*).

Mutual-aid groups, consisting of community members organizing donations and arranging volunteer networks to provide social support to neighbors, have grown in number and visibility in recent years. Many of these groups have organized through virtual platforms (*The New York Times, 2021).*

The loss of socialization during the pandemic has increased the prevalence of "Cave Syndrome," in which people are anxious or uneasy about in-person socializing. Cave Syndrome may motivate people to stay home and spend more time in digital spaces and online communities (*American Planning Association, 2022*).

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

Majorities of Americans say social media platforms are effective for raising awareness about issues, creating sustained movements

Source: Pew Research Center, 2020.

Influence policy decision
Get elected official to pay attention to issues
Create sustained social movements
Raise public awareness about issues

Legend: *Very* / *Somewhat*

0%   50%   100%
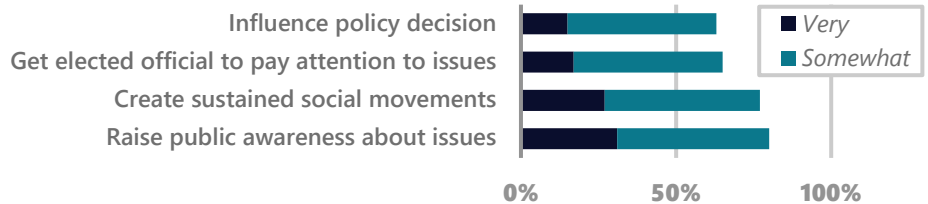
PERCENT WHO SAY THEY TRUST THE FEDERAL GOVERNMENT TO DO WHAT IS RIGHT JUST ABOUT ALWAYS/MOST OF THE TIME

77%
1964

20%
TODAY
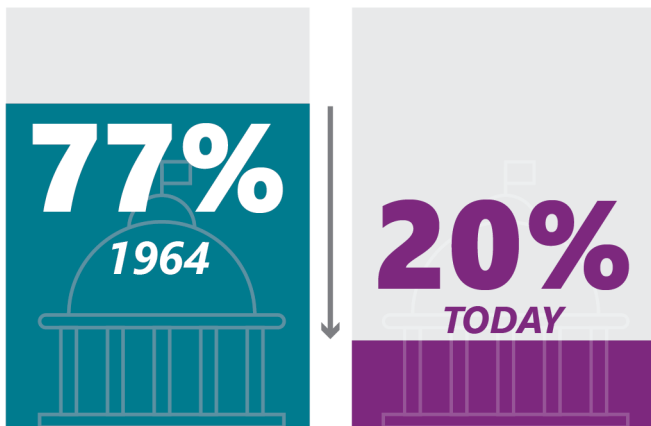
Source: Pew Research Center, 2020.

PERCENTAGE OF GLOBAL GOVERNMENT PORTALS WITH COVID-19 INFORMATION

57% — March 25, 2020
86% — April 8, 2020
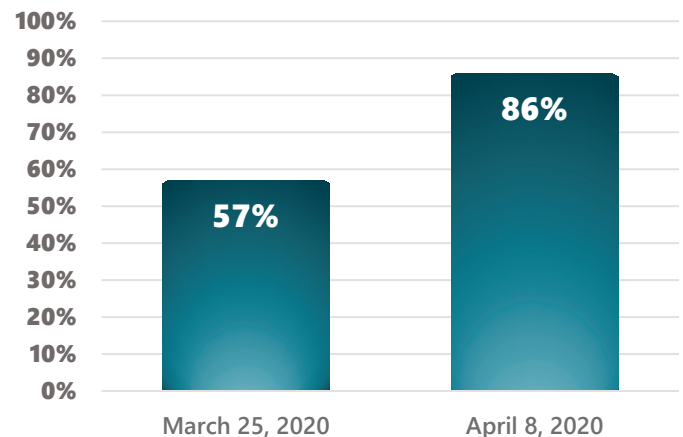
Source: United Nations, 2020.

SIGNPOSTS

Despite a low level of trust in government, Millennials and Generation Z are more likely to say the federal government should provide more support for people in health care and education (*Pew Research, 2021*).

Although voter turnout in 2020 was the highest it has been since 1904, voting rates in local elections are often as low as 15% (*National Civic League, 2020; Knight Foundation and Portland State University, 2016).*

Between 2016 and 2020, the percentage of Americans who said they are not friends with anyone with political opinions very different from their own increased from 7% to 19% (*YouGov, 2020*).

WHAT COULD THE FUTURE LOOK LIKE?

How can we encourage socialization and finding common ground across political lines?

How do we address declining trust in government as we recover from the COVID-19 pandemic?

Will state governments be able to attract and retain younger workers to encourage innovation?

How can we create connections between peer-to-peer support networks and formal institutions with the capacity for long-term investment and support?

How can political institutions connect to online spaces to better understand constituent preferences and needs?

The United States is exposed to a growing range of risks, from extreme weather and climate trends to public health emergencies to cross-border flows of invasive species to the potential for terror attacks and cybersecurity threats. We must identify, prepare for, respond to, and recover from these risks to protect our communities and our economy.

U.S. BILLION-DOLLAR DISASTER EVENTS PER YEAR
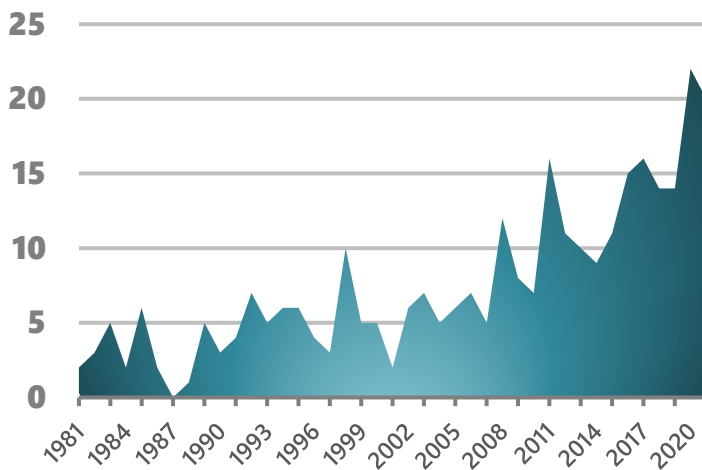
Average Annual Impact of Disasters, 2017-2021 ➤ $148B

Source: Federal Emergency Management Administration, 2022.

MAJOR DISASTERS BY TYPE, 1980-2021

- Winter Storm, 19
- Wildfire, 19
- Drought, 29
- Flooding, 35
- Freeze, 9
- Tropical Cyclone, 56
- Severe Storm, 141
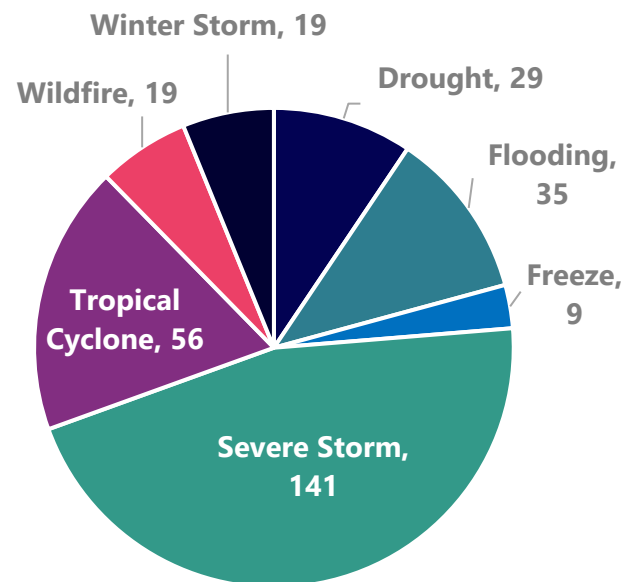
Severe storms are wind-related storms not classified as tropical cyclones or winter-storms that qualify based on their speed.

PROJECTED DIFFERENCE IN MAXIMUM PRECIPITATION DURING AN EXTREME EVENT (24-HR DURATION)

LEGEND
- 0
- >0 - 0.1
- >0.1 - 0.3
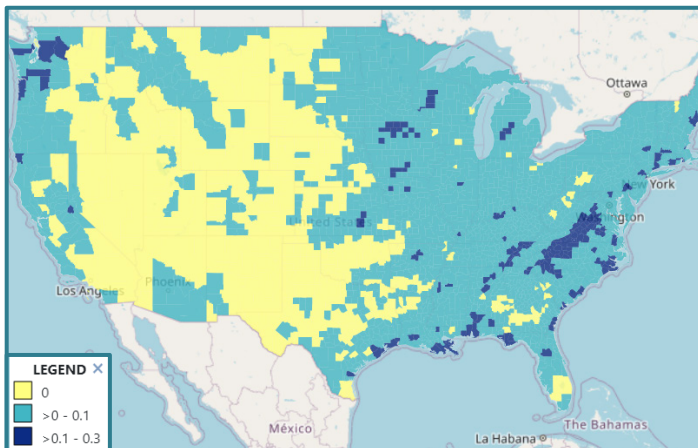
PROJECTED DIFFERENCE IN EXTREME HEAT DAYS (90°F THRESHOLD)

LEGEND
- 0 - 16
- >16 - 23
- >23 - 27
- >27 - 35
- >35 - 73
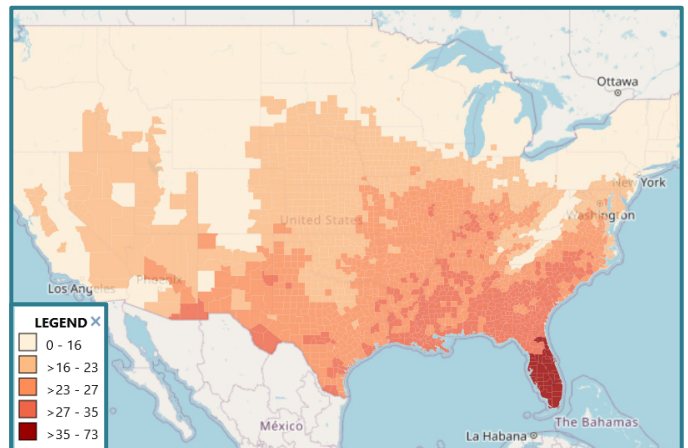
Source: Centers for Disease Control and Prevention. National Environmental Public Health Tracking Network, 2016-2045 differences under RCP 4.5 (low emissions scenario).

SIGNPOSTS

The top 10 warmest years on record worldwide all have occurred since 2005 (*National Oceanic and Atmospheric Administration (National Oceanic and Atmospheric Administration (NOAA, 2021*).

In many locations along the U.S. coastline, high-tide flooding is now 300% to more than 900% more frequent than it was 50 years ago *(NOAA, 2022).*

The U.S. experienced 156 significant cyberattacks between 2006 and 2020. The average cost of a data breach is the U.S. is $8.2M, more than twice the global average *(Specops Software, 2019; Ponemon Institute, 2019).*

84% of global experts are worried or concerned about the future of the world *(World Economic Forum Global Risks Survey, 2022).* The "doomsday clock," representing the likelihood for a man-made catastrophe, is set at 100 seconds to midnight, the closest in its 75-year history (*Bulletin of Atomic Scientists, 2022.*)

"WHAT IS YOUR OUTLOOK FOR THE WORLD OVER THE NEXT THREE YEARS?"

41.8%
Consistently volatile with Multiple surprises

37.4%
Fractured trajectories separating relative winners and losers

10.7%
Accelerating global recovery

10.1%
Progressive tipping points with increasing catastrophic outcomes

■ ■ ■ NEGATIVE SCENARIOS　　■ POSITIVE SCENARIO
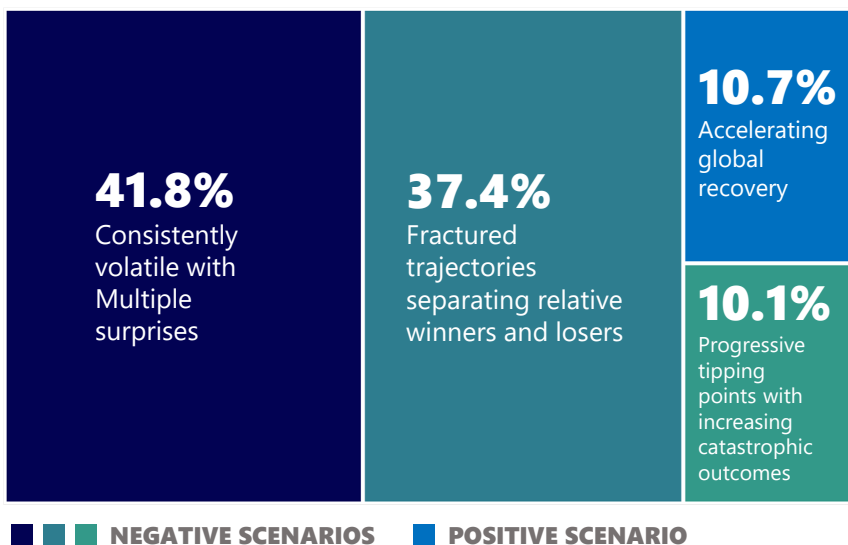
"IDENTIFY THE MOST SEVERE RISKS ON A GLOBAL SCALE OVER THE NEXT 10 YEARS"

1. CLIMATE ACTION FAILURE
2. EXTREME WEATHER
3. BIODIVERSITY LOSS
4. SOCIAL COHESION EROSION
5. LIVELIHOOD CRISES
6. INFECTIOUS DISEASES
7. HUMAN ENVIRONMENTAL DAMAGE
8. NATURAL RESOURCE CRISES
9. DEBT CRISES
10. GEOECONOMIC CONFRONTATION

■ ECONOMIC　　■ ENVIRONMENTAL
■ GEOPOLITICAL　　■ SOCIETAL
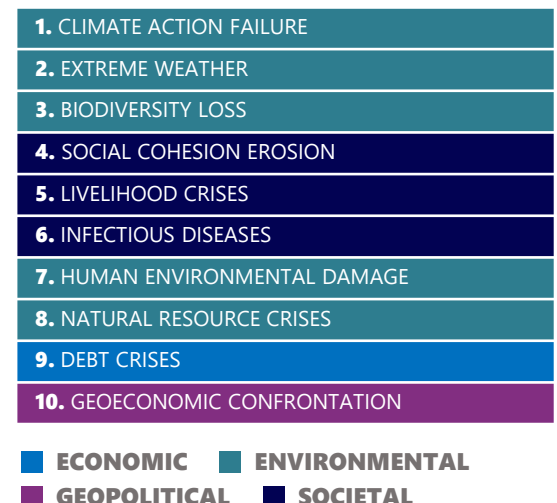
Source: World Economic Forum, 2021-2022.

WHAT COULD THE FUTURE LOOK LIKE?

What lessons should we learn from COVID-19 as we look to the potential for future pandemics?

How do we prepare for more frequent and severe storms, extreme heat, and precipitation?

Could increasing temperatures and sea level rise lead to significant migration of populations from coastal and southern locations to inland and northern states - and will our economy, communities, and infrastructure be able to accommodate these shifts?

How do we better prepare for emerging threats related to cybersecurity or geopolitical instability?

What risks are we not thinking about enough today?

APPENDIX D

Scenario Planning at the Vision Retreat

SCENARIO PLANNING SYNTHESIS

Scenario planning is a framework for critical, deliberate thinking about the strategic risks faced by an industry or organization to future-proof against uncertainty. Scenario planning typically uses one of three approaches:

- **Predictive**: What do we think is going to happen?
- **Normative**: How can we make something desirable happen?
- **Exploratory**: What could happen?

Scenario planning helps organizations look into the future, anticipate events and trends, understand risk, gather ideas for proactive organizational response, and help managers break out of their established mental models as they become aware of alternative future possibilities.

NCHRP Report 750 Foresight Series

EXPLORATORY SCENARIO PLANNING

Exploratory scenario planning embraces uncertainty to help organizations consider what might happen so they can prepare for what ultimately occurs. Exploratory scenario planning differs from traditional approaches to planning that often assume historical trends continue into the future. Instead, exploratory scenario planning considers a range of plausible futures. Each scenario describes a potential world where key uncertainties unfold in different directions. The scenarios help participants gain foresight into what could happen and consider how to best prepare.

TODAY / **TOMORROW**

POINT FORECAST
Planning for a short-term point in time based on current trends.

PLAUSIBLE FUTURE SCENARIOS
Letting the future drive planning by identifying a range of plausible alternative futures and linking futures with responsive strategies and signposts of change.

ALTERNATIVE FUTURE / ALTERNATIVE FUTURE / ALTERNATIVE FUTURE

Source: *NCHRP Report 750 Series Foresight: Informing Transportation's Future*

Exploratory scenario planning often answers four questions:

- **Where have we been? –** review of historic trends and conditions.
- **Where are we going? –** review of potential trends and uncertainties and how combinations of these trends and uncertainties form the basis for alternative futures.
- **Where do we want to go?** – identification of shared vision and goals.
- **How do we get there?** – identification of the strategies that will achieve the vision and goals across the broadest range of potential futures.

EXAMPLES OF EXPLORATORY SCENARIO PLANNING

More than three dozen recent scenario planning processes were reviewed, including examples led by state departments of transportation, metropolitan planning organizations, and local governments, as well as initiatives from outside of the transportation sector. While not an exhaustive list, the synthesis helped identify common themes across multiple processes. The examples emphasized scenario planning led by state DOTs and MPOs in support of long-range transportation plans, but also included standalone initiatives related to executive order or regional visioning processes.

KEY TRENDS AND UNCERTAINTIES

The synthesis identified several major trends and uncertainties that frequently informed scenario planning:

TOPIC	% OF EXAMPLES
Technology	91%
Land Use/Development	75%
Climate/Environment	69%
Economy	66%
Population/Demographics	63%

- **Technology,** including the pace of development and rate of adoption of new and emerging innovations such as automation, electrification/alternative energy, and connectivity.
- **Land use and development**, including broad settlement patterns related to the overall distribution of growth across geographic areas as well as more localized patterns such as housing and community design preferences.
- **Climate and environment,** including extreme weather events, long-term climate changes, and other broad environmental issues such as changes in biodiversity
- **Economy,** including changes in global trade, logistics, and supply chain patterns; the changing nature of work such as remote work or impacts to employment from automation, and the shifting mix of regional economic sectors.
- **Population and demographics**, including the overall rate of population growth as well as the changes in age, income, race, and other demographic characteristics.

Public health, governance, and tourism received greater attention following the COVID-19 pandemic, and risk has increasingly been a lens through which multiple trends (such as climate or security) have been addressed.

SCENARIO FRAMEWORKS

Scenarios or plausible futures typically are developed based on alternative assumptions about key trends, with emphasis on those with high potential impact and a high degree of uncertainty. States such as Florida, Hawaii, North Carolina, North Dakota, and Ohio have looked at the complex interplay of four to six uncertainties to develop scenarios.

Other processes have focused on how combinations of two uncertainties can shape the future- often a combination of demographic or economic change and technological change. **Michigan DOT** developed four scenarios based on the uncertainties of economic development and technological adoption. The **Commission for the Future of Transportation in Massachusetts** developed four scenarios based on the uncertainties of jobs and housing distribution and technology adoption.
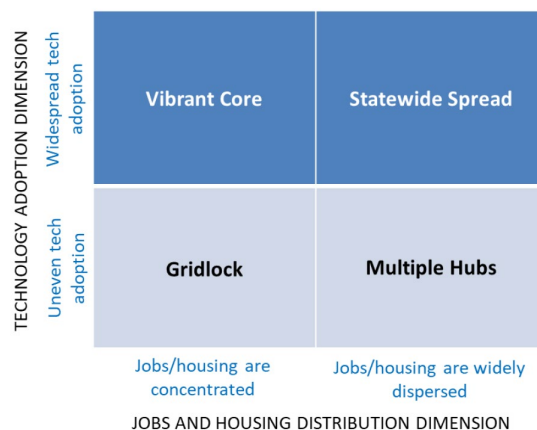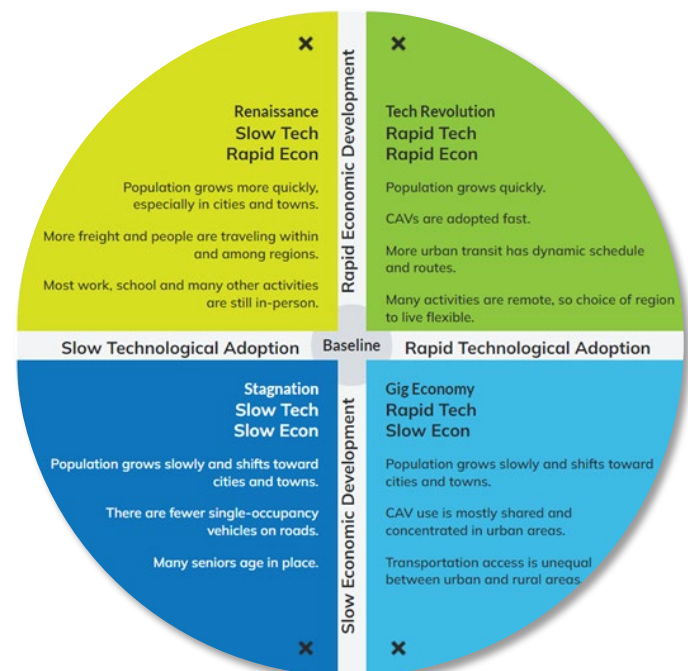
Source: Michigan Department of Transportation

Source: Commission on the Future of Transportation in the Commonwealth

APPENDIX E

Synthesis of State DOT Leader Interviews

SYNTHESIS OF STATE DOT LEADER INTERVIEWS

The project team interviewed nearly 30 leaders from state departments of transportation, including chief executive officers, senior career staff, and emerging leaders identified by their agencies. These interviews covered perceptions of the trends and uncertainties impacting the future of transportation, the changes facing their agencies, and the potential elements of a transportation vision. This document provides a summary of themes frequently expressed during these interviews. Direct quotes are highlighted in callout boxes.

WHAT WOULD YOU DESCRIBE AS THE MOST SIGNIFICANT CHANGES IN TRANSPORTATION IN THE PAST 50 YEARS? THE PAST 10 YEARS?

The pace of change is accelerating, impacting our ability to communicate with our customers, forcing innovation in our delivery processes, and increasing the public's expectation of predictability, convenience, and service. Everything is now considered essential.

Highway/roads departments are becoming transportation departments – from builders to operators of a multimodal transportation system. We have become focused on looking at systems and networks. We used to build pieces of infrastructure – now we are into systems thinking.

WHAT WOULD YOU LIKE TO SEE AS THE MOST SIGNIFICANT CHANGE IN TRANSPORTATION IN THE NEXT 10-50 YEARS?

An increase in safety and a sharp decrease in fatalities. If you can't travel safely, the rest of the system does not matter.

We will be proactive rather than reactive. Transportation will be seen as core infrastructure along with water and energy.

We recognize transportation is not only an end; it's also a tool to get there. Full service, safe mobility for freight and for people. Affordable access for all with no restrictions on access to transportation modes and more emphasis on seamless connectivity between modes. Reimagining how to move people and goods, recognizing transportation is about connecting communities and people.

> *Transportation should bring people together. In the past we separated people. In the past we have approached our job as getting people through communities. Are we asking how we can help a community achieve its goals? We can measure success not by transportation measures but by calling the mayor and asking if he or she would have us back.*

Technology will increase capacity more than constructing new lane miles and reduce the number of fatalities as we eliminate driver error. There's nothing else that comes close to the promise of technology.

There will be a focus on climate resilience and lessening the impact of transportation on the environment. We will smoothly transition to electric and smart infrastructure.

> *The ability to combine the physical and the digital will only accelerate. This is our biggest opportunity for taking transportation to the next level as a nation.*

It's time to pivot. Congestion is a problem no matter how big the city. We can't keep throwing money at this problem. We've hit the point of diminishing returns. We need to preserve what we've got and pursue other options.

WHAT EXTERNAL TRENDS, UNCERTAINTIES, AND RISKS DO YOU THINK ARE MOST SIGNIFICANT AS WE LOOK AHEAD TO THE NEXT 10 YEARS?

Demographic change. Understanding what different groups and communities value and how they move. Not knowing the long-term effects of the pandemic on travel.

Climate – not just sea level rise but extreme heat, more severe fires, and more frequent storms. More major events impacting the system. Changes in terms of how and where we build.

Economic diversification.

Technology – will it help us or create more issues?

We are facing a collision of changing demographics, the shifting nature of work, the rise of automation, the rapid move to electrification, the interplay of shared mobility options, and greater emphasis on climate. Any of these alone are significant and they are in a cauldron all together.

AS YOU LOOK AHEAD TO THE NEXT 10 YEARS OF TRANSPORTATION, WHAT GIVES YOU THE MOST CONCERN OR FEAR?

Policy not addressing the factors involved in transportation safety and the challenges involved in reducing fatalities.

Transportation requires a long planning process and commitments to projects and plans over a period of years. The fear is that partisan waves and a culture of extremism with no compromise will change plans, break commitments, and delay implementation. Winners from the past do not want to lose what they have today.

I'm not fearful of the future but I am fearful of the transition. We know how to manage the system today and we know the future will be better- but how do we work through the change?

We are straddling the here and now with the new. How quickly will the new become mainstream? We have a strong ability to adapt – both individual people and organizations – but change will create stress for a lot of people. At the same time, we need to accelerate our decision-making processes.

We need to create an understandable and acceptable narrative to educate the public about what we are doing and what we could be doing. We need to provide meaningful engagement so public expectations of what they will get and when they will get it are realistic.

People expect that they can be anywhere at any time, but options are not available or affordable to all, creating inequities and barriers to opportunity.

Revenue for transportation – impacts of changing technologies and policies are very uncertain. The legislature and others do not want to address future funding needs. Few elected leaders truly understand transportation, but they are key to our ability to make the needed transition in terms of policies, workforce, and funding options.

Fearful of continuing to suboptimize. Fearful of continuing to have silos of excellence that are not connected. Fearful of getting left behind by other countries that are innovating.

WHAT DO YOU SEE AS THE PRIMARY EMPHASIS OF YOUR AGENCY IN THE FUTURE?

Agencies are shifting from being builders to being stewards of the system. There will be increased focus on safety, system, asset, and emergency management and leveraging predictive analytics to get more reliability with our capacity.

Future improvements for rural connectivity, including access to resource-based industries and connections to airports and other modes.

Equity in transportation will be a primary focus. Taking a different approach to priorities and asking who is being served and how. Using technology in creative ways to improve public engagement and deliver better results.

Agencies will be more connected to the priorities of our state. We will have strategic investments but in different places and more integrated into land use planning.

More time will be dedicated to addressing issues like workforce and job creation or access to opportunity. More innovation in the last mile than in the major corridors and more focus inward on how to better serve the customer.

We always need to focus on asset management – we have a legacy system to maintain, even with significant demographic shifts. There's a long tail to where we are now in terms of where we need to invest.

The state system can't do it all alone, so we will need to provide more money to local governments to help them deliver good projects. We may spend more time helping local governments plan for their systems than we spend planning for our highways.

There will be more competencies in different areas – social sciences, communications, psychology. The workforce will include more integrated thinkers and systems professionals.

DOES YOUR AGENCY HAVE THE STRUCTURE AND AUTHORITY TO FOCUS ON THE ISSUES THAT WILL BE MOST IMPORTANT IN THE FUTURE?

The challenge will be in working through multiple levels of government – federal, state, and local – for alignment. As we expand the use of technology and have a more advanced system, we will need to address issues like communications and connectivity, which will require new partnerships with the private sector. Organizations still have a "sand box" mentality and may feel threatened in creating partnerships.

We need to change the image of the DOT as the last bastion of civil engineers- make it an exciting, attractive place to be. We need to attract people who are better and smarter than we are. We need to make our DOTs more reflective of the population that we serve.

We have been structured for building infrastructure, not operating a system or being a community partner. We are starting to explore how to shift some of our operations to more of a team structure.

We don't have authority to do what needs to be done. We don't make laws or appropriate money; others are charged with making those decisions. We are implementing agencies.

WHERE WOULD YOU STRIKE THE BALANCE BETWEEN CASTING A COMMON VISION FOR ALL STATES AND COORDINATING AS EACH STATE SETS AN INDIVIDUAL VISION?

We need to be able to answer, "What are we trying to achieve as a country?" and "What do we need to agree upon to accomplish our goals?" There needs to be some commonality, but we can't ignore the unique needs and issues of each state. A common vision we all agree on would be something nobody likes. We can advance concepts like "a system that works for everyone" but that means different things to different states.

We are a national union, but every state is different. There are places where we need national policy. For example, every state did some form of asset management, but we needed a national mandate to make the case for asset management across the board. We need a national vision to give states some cover to make difficult decisions.

Governors can provide visionary leadership by working with the state legislature to change the conversation. Look to those states who have accomplished something, not just talked about it. Being progressive occurs over time and someone must be the champion. The current process created competition – we are chasing the dollar instead of chasing the vision.

We may not have another Interstate System in us as nation. What can we do for the customer in a meaningful way across the country? Perhaps we should follow Mother Theresa's words - do a lot of small things in a great way.

There are common areas of focus for all states – safety, being responsible to constituents, and being driven by a market economy.

We need a bold vision at the level that set up the Interstate system, but this time with technology. The focus would be on digital infrastructure, where the private sector is making investments and DOTs are a partner.

We need a vision that provides core areas of agreement, allowing states that are ready to go farther while allowing others to evolve with the vision.

WHERE WOULD YOU STRIKE THE BALANCE BETWEEN DEVELOPING A VISION ABOUT TRANSPORTATION AND DEVELOPING A VISION ABOUT HOW TRANSPORTATION SUPPORTS OTHER SOCIETAL GOALS?

The vision should be about societal goals. We don't build highways because it's fun to build highways – we build highways because we are building communities or supporting economic development.

Focus on the purpose of the system and look at projects from a different, user lens. Do more to address projects and programs that address quality of life and access to opportunity.

Transportation should be a means to an end. If we view transportation as the end, we focus on the how. We need to focus on the why. Transportation supports society and it can't be an afterthought, but it can't be the first thing we put into place either. Consider and evaluate what a community wants to be and then consider the best transportation options.

We need to look at every project we do in terms of how it benefits societal goals. We will never with the Oscar for best actor, but we will always be the best supporting actor.

Invest money in a different way to change the outcome. Consider pushing money in a different direction to solve a problem – not an additional cost, but a different investment. Policies need to align outcomes with funding and investment. Expand focus on delivering public services efficiently.

APPENDIX F

Synthesis of Subject Matter Leader Interviews
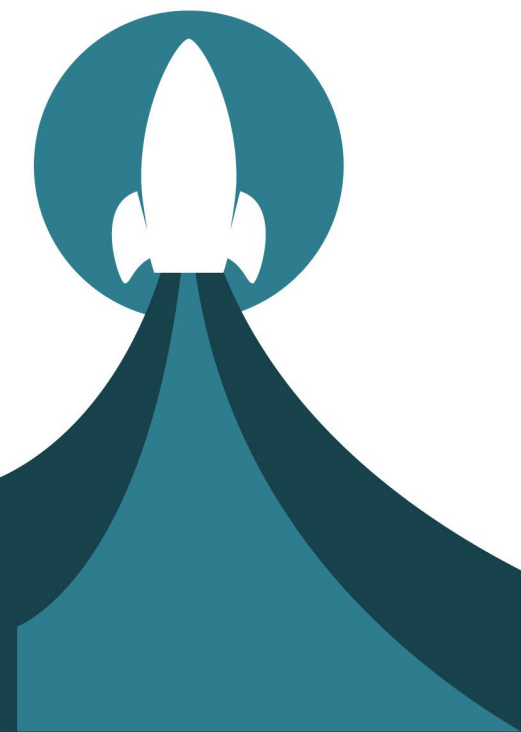
SYNTHESIS OF SUBJECT MATTER LEADER INTERVIEWS

The project team interviewed more than 30 thought leaders outside of state departments of transportation, including local governments, public transportation providers, and metropolitan planning organizations; and leaders in technology, energy, tourism, agriculture, economic development, workforce, health and human services, demographics, and the environment. These interviews covered perceptions of the trends and uncertainties impacting the future of the United States, and the implications of these changes for transportation. This document provides a summary of themes heard during the interviews as well as example quotes from participants.

DEMOGRAPHICS SHIFTS AND PROSPERITY GAPS

The significant demographic changes reshaping the United States are expected to have significant impact on all aspects of our society. These include the aging of the population, increasing racial and ethnic diversity, and increasing number of foreign-born residents. Participants observed the increasing diversity of our population will create more diverse mobility needs and reinforce a trend already underway toward more customized and convenient mobility solutions.

Transportation access to quality jobs is critical. We have not done enough here. It's not as simple as do you have transportation options. It's about how long will it take, what's the cost, and what are the tradeoffs. A 90-minute bus ride with multiple transfers is not access.

A single parent with a young son had to make the difficult decision to pay either her electricity or her car payment. There was no public transit available between her neighborhood and her place of work. To retain her job, she opted to pay her car payment and she and her young son went without power.

Interviewees said COVID-19 highlighted the critical role transportation plays, particularly for essential workers. They recognized the long-term impacts of COVID-19 on how we live, work, interact, and travel are still not known. The pandemic, as well as the MeToo and Black Lives Matter movements, highlighted the importance of justice, equity, diversity, and inclusion in all aspects of society. Issues include the historic legacy of communities disproportionately impacted by prior investments; uneven levels of safety, health, and environmental risk for different communities and population groups; and current gaps in access to jobs, health care, education, and other services across communities.

Future conversations may focus more on the concept of "mobility as a right;" how and where new innovations are deployed; and how transportation, public health, housing, education, childcare, and other systems collectively meet individual and family needs.

I'd like to buy an electric vehicle. But it's not just a question of whether I can afford one- it's also about where my wife can charge it. Will the location be safe? Will it be a place where she is comfortable waiting while it is charging, and will she be put in a place where people will judge her by the color of her skin?

TECHNOLOGY AND INNOVATION

Technology and innovation will continue to reshape every aspect of our society and economy. Many pointed to automation, connectivity, alternative energy, and advanced materials as key building blocks impacting every industry. We are just in the initial stages of these innovations, and the impacts on how we live, work, and travel will become even more apparent as deployment expands and emerging technologies like artificial intelligence become more commonplace. Future solutions may emphasize more blending of the digital and physical worlds.

The traditional view is that the humans are the problem. We think we can improve safety or mobility by taking the human out of the equation, and it does not work out. We need to think about how we use autonomy to enhance and team with human abilities, not replace them. What we need is human centered transportation, enabled by technology.

There is great optimism about the benefits of technology for safety, access, and mobility, but caution about whether the pace of change can meet public expectations and whether technology will allow for fresh solutions rather than simply automating existing ones. Recent supply chain bottlenecks and delivery backlogs are examples of the realities involved in introducing new systems and technologies. Innovation could perpetuate existing disparities or create new ones if digital divides or "technology redlining" occur.

Our market is changing quickly. We are working a step at a at time. But often the public sector thinks they need to design the 20-year solution now. What are the decisions you need to make today? How can we help you?

Most of these innovations will come from the private sector, creating new roles for transportation agencies as partners and facilitators. It also will create new public sector challenges in terms of workforce development, cybersecurity, and data management.

CHANGING ECONOMY, JOBS, AND SUPPLY CHAIN

Participants expect significant changes in our economy and jobs in the coming decades, primarily driven by innovation and changing customer demand. The shift to remote work, flexible hours, and "gig" employment may be early signals of a reshaping of the nature of work, with automation and increasing specialization impacting many industries. Because work is such an important part of many people's lives, these changes could have impacts throughout our society and economy.

We don't know what the workday will look like after the pandemic. What if we don't need as much office space or as much parking? What if we don't spend as much time in business centers? What if the primary need for some highways is no longer peak period commuting?

The current supply chain can't work much longer. Does it make sense to have so much of our trade concentrated in so few locations?

A just in time supply chain is like a relay race- it's beautiful to watch when the handoffs work, but there's not a lot of options when someone drops a baton. And I'd expect a lot more batons to be dropped because we are facing so many more risks and disruptions.

The pandemic also accelerated a shift toward e-commerce, home delivery of goods and services, and more distributed and precise supply chains. Participants expect more supply chain disruptions and changes in the future, reflecting inflation, shifting global trade patterns, changing energy sources and expectations to reduce carbon footprints, and reshoring or nearshoring of manufacturing back to the United States. Many industries will reexamine their supply chains and the places they choose to concentrate logistics and distribution activities.

CHANGING DEVELOPMENT PATTERNS AND THE FUTURE OF COMMUNITIES

My job is to build a public park, but I tell people I'm here to build a community. We need to think about transportation the same way – how does it build stronger communities?

Participants expect the U.S. population and economy to become more urban. They also expect greater variation in the form and character of urban areas, reflecting our diverse geography and population. As jobs become more portable, development preferences and patterns could shift more readily. Most rural areas could continue to see population loss, though some areas could remain important for agriculture and natural resources or outdoor recreation. Central business districts and suburban office parks will continue to seek a future not solely reliant on daytime office workers. Authentic locations like college towns or historic communities could be attractive to remote workers or retirees. Areas near airports or seaports could develop logistics districts with their own microgrids.

Participants expect more emphasis on community-based solutions that integrate transportation, land use, housing, water, energy, and other infrastructure and public facilities, and more emphasis on coordinating the timing of these investments. They also expect more innovation in community design, housing, and service delivery. Community leaders across the nation point to the value of shared regional visions and long-term master plans developed in the past and asked how these types of collaborative activities can move forward today.

When you build a house, you move in, and you can turn on the faucet or light switch or thermostat immediately. Why can't we do the same thing at a community level? Transportation should be in place before we build or rebuild a community.

RISK AND RESILIENCE

We always face the unexpected. The shock that could come from a storm event or another pandemic. We need to build our long-term planning around resilience and anticipate that those shocks and stresses are out there- some that we don't even know. We can't create a future where we are insulated from those things.

Climate change was identified as a critical risk by many participants, who took a broad view of impacts including sea level rise and extreme heat and precipitation. There is growing consensus around global climate trends, but many uncertainties remain including the potential for significant migration of population or wildlife and plant species and significant shifts in agriculture and other natural resource production.

Community and regional approaches for mitigation or adaptation could have significant impacts on the built and natural environment. Transportation is a key element of these solutions, but also will be impacted by how other sectors approach climate change.

Being resilient is like being in the boxing ring – you can dodge the punch, you can absorb the punch, or you can get knocked down and get back up.

Other risks include pandemics/public health emergencies, cybersecurity, and geopolitical instability. The expectation is that agencies and businesses will place more attention on identifying, preparing for, and responding to these risks in the future.

CHANGING CIVIC AND GOVERNANCE SYSTEMS

Participants noted that addressing these trends and uncertainties would be challenging in an increasingly polarized society and political systems.

Changing governance structures including the roles of federal, state, and local governments; increasing economic linkages into megaregions that cross traditional jurisdictional boundaries; and privatization and public/private partnerships all were cited as examples of how the context for making transportation decisions will change in the future.

How do we professionally, thoughtfully address the difficult issues of the future? How do we organize ourselves to work across disciplinary and jurisdictional lines? These are the things that keep me awake at night, particularly during times when our citizenry and our politicians are so at odds with each other, where there is a lack of commonality. In transportation you've got to develop long-term thinking and buy-in, and that's just so very difficult in these polarized times.

Changing community engagement also was cited as a challenge. Customer values and expectations are changing rapidly and often at a pace faster than the public sector can respond.

VISION FOR TRANSPORTATION

Participants offered their thoughts on how to describe a future transportation vision:

- "Getting people where they need to go in a sustainable way."

- "Access to housing, education, and jobs, no matter where you live, provided in an environmental and economically sustainable way."

- "Seamless and coordinated;" "frictionless."

- "Accessible, affordable, reliable service;" "convenience on demand."

- "Fundamental role of safety."

There should be bipartisan agreement about the future of transportation. Everyone is waking up to the limits in physical and social mobility that we face. We need new solutions. This is not a red or a blue issue, it's a nonpartisan issue.

Most people said the transportation vision must consider broader societal or community goals. Transportation can be part of solutions to housing or economic development or access to opportunity; at the same time, other sectors can provide solutions to transportation challenges, such as homeless encampments in terminals or suicides on rail systems.

Most people expressed a desire for a national transportation vision, while also recognizing the need for state and region-specific solutions. Most also recognized a future vision would require new roles and approaches for state department of transportation and other agencies – and welcomed the opportunity for future collaboration toward a common vision.

Everything connects to transportation. I would tell a DOT secretary that you have far more power than you realize to do good. You have way more money than anyone else in your state and way more capacity to deliver programs. You also have a great ability to convene people. You can unlock a lot of things as you focus on how transportation supports communities.

APPENDIX G

Community Values Related to Transportation

COMMUNITY VALUES RELATED TO TRANSPORTATION

This document synthesizes available information on community values related to transportation, based on public opinion surveys conducted at the national, state, and regional levels, as well as summaries of public input received from statewide and regional long-range transportation planning processes.

Visioning processes are most effective when rooted in an understanding of what matters most to the customers of a business or industry — including the public that is served by policy and investment decisions. This understanding should go deeper than simply documenting behavior — it should delve into what people value and how they make decisions.

There is no single source of information on customer values at a national level, and many available surveys were conducted prior to the COVID-19 pandemic. Many existing sources do not fully represent all socioeconomic groups. Available information suggests people place high value on transportation's role providing access to jobs, services, and other daily activities; place high priority on safety, convenience, and reliability; and view changing technologies and innovations with a mix of optimism and concern.

TRANSPORTATION VALUES AND PREFERENCES

Available surveys conducted by state departments of transportation (DOT) point to safety, travel time and congestion, connectivity for people and freight, the availability of transportation options, and the condition of existing roads and bridges as priorities for the public, with their relative importance varying in part due to external factors such as economic conditions.

- **Alaska:** nearly 65% of respondents identified improving connectivity between communities as one of their top three transportation priorities, followed by maintaining the existing system and supporting freight movement (*Alaska DOT&PF, 2021*).

- **Oregon:** nearly 99% of respondents said maintaining roads and bridges in good condition was very or somewhat important, followed closely by improving roadway safety and reducing traffic congestion *(Oregon DOT, 2020)*.

- **Florida:** a slight majority (54%) of respondents identified lack of travel options as the state's greatest transportation challenge during the next 10 years, followed closely by increasing traffic, congestion, and delay *(Florida DOT, 2020)*.

- **North Dakota:** 30% of respondents identified "fixing what we have" as today's most pressing transportation problem, followed by increasing safety (20%) and supporting economic growth (15%) *(North Dakota DOT, 2020)*.

- **Ohio:** 81% of respondents identified increasing safety as extremely or very important, followed closely by relieving congestion and providing a good freight system (*Ohio DOT, 2022*).

SAFETY: CONTINUED RISKS

- A California survey showed "distracted driving because of texting" was the biggest safety concern for 75% of drivers, followed by speeding/aggressive driving and impaired driving (*California Office of Traffic Safety and Safe Transportation Research and Education Center, University of California, Berkeley, 2020*).

- About 50% of drivers reported reading text messages while driving and 40% reported typing text messages. Speeding was reported by 65% of those surveyed (*AAA Foundation for Traffic Safety, Self-Reported Risky Driving in Relation to Changes in Amount of Driving During the COVID-19 Pandemic, 2022*).

- Multiple state and regional surveys identified safety as a concern, particularly for bicyclists, pedestrians, and other vulnerable road users. Many surveys also showed personal safety and security as a concern for potential public transportation riders — and this amplified significantly during the COVID-19 pandemic due to public health concerns.

TRAVEL PREFERENCES: CHANGING PATTERNS

- Respondents to most surveys reported use of multiple modes of transportation, with highways the predominant mode for commuting to work. The rapid acceleration of remote work for many employees during the COVID-19 pandemic is raising questions about future commuting patterns in many parts of the nation —with increased interest in walking, bicycling, and other forms of active transportation.

- The percentage of Americans rating access to highways and transit as important concerns when deciding where to live dropped from 2019 to 2020, reflecting changes in travel and housing preferences during the pandemic. At the same time, the share of people who said sidewalks and places to walk are very important factors climbed over 50% for each generation except 75+ (*National Association of Realtors, 2020*).

- Public surveys, public input as part of statewide planning activities, and example "personas" of how people would like to travel in the future developed in states such as Florida and North Dakota point to more interest in a connected transportation system with multiple options for local and long-distance trips and a high value on safety and convenience.

- After dropping during the pandemic, willingness to take trips seems to be returning. About 95% of Americans indicate they anticipate traveling in the next 3 to 12 months for leisure or business purposes (*Cornell Center for Hospitality Research, Survey Results: Pre- and Post-COVID Travel Preferences, 2020*).

- The pandemic changed characteristics of travelers. The International Air Transport Association developed six "COVID-19 Traveler Personas": the innovator, the young early majority, the untroubled 55+, the wait-and-see-X and Y generations, the late business trip, and the late leisure trip.

TECHNOLOGY: EVOLVING OPPORTUNITIES

- About 40% of adults 50-plus reported using digital technology in a new or different way. However, more than two in five said they do not believe technology is designed for all ages (*AARP, 2022 Tech Trends and the 50-Plus, 2021*).

- About three out of five Americans would like to have a clear understanding of who will be legally responsible in the event of a crash with a self-driving vehicle. One in two want laws to make sure self-driving cars are safe, and a similar share want to know how vulnerable they will be to hackers (*AAA Foundation for Traffic Safety, Self-Driving Cars Stuck in Neutral on the Road to Acceptance, 2020*).

CLIMATE: UNEVEN PERCEPTIONS

- Nationally, 72% of adults said that global warming is happening; the share varies from 58% in Wyoming to 83% in the District of Columbia. About 57% of adults said global warming is mostly caused by human activity *(Yale School of the Environment, Climate Opinion Maps 2021)*.

- About 62% of Utahns said they are very or somewhat concerned with climate change, an increase from 49% in 2014 (*Envision Utah, Utah Values Research, 2021*).

- About 81% of Massachusetts residents acknowledged climate change "probably" has been happening. If left unchecked, 79% said climate change will be a serious problem for the state *(The MassInc Polling Group, 2020)*.

POPULATION GROWTH: WEIGHING IMPACTS

- About 42% of Utahns said they believe growth will make the quality of life in Utah worse, up from 35% in 2014 (*Envision Utah, Utah Values Research, 2021*).

- Among a list of social and environmental concerns, lack of healthcare access was the most critically important topic (43%) for respondents *(Journal of Population and Sustainability, 2022)*.

APPENDIX H

Vision Retreat Summary

NCHRP 20-24(138)

Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure

PHASE I

VISION
RETREAT
SUMMARY

NCHRP 20-24(138) VISION RETREAT SUMMARY

PROJECT BACKGROUND

NCHRP 20-24(138), *Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure*, is an effort to explore and articulate what state departments of transportation (DOT) can do collectively and individually to establish and realize a transformative vision for the next era of America's transportation infrastructure. The primary audience for products of this work is the executive leadership of state DOTs, but the findings are relevant to the leadership of other public agencies, users and other stakeholders in the systems for which state DOTs are responsible, and the general public.

RETREAT OVERVIEW

The Vision Retreat took place over the course of two half-day sessions held on March 22 and March 23, 2022 at the Orlando International Airport's ITF/APM Complex. The event convened 53 leading practitioners and thought leaders in and related to transportation including the NCHRP 20-24 (138) project panel, 10 additional state DOT chief executive officers, thought leaders, and subject matter experts (see full list of participants in Appendix A). The objectives of the Vision Retreat were to build collective understanding around the external trends, uncertainties, and possibilities that will shape the future of transportation and to identify visions, aspirational goals, and breakthrough ideas for the future of transportation. See Appendix D for the retreat's agenda.

RETREAT DAY 1

Opening Remarks

Julie Lorenz, Secretary, Kansas Department of Transportation and Panel co-chair, welcomed participants and encouraged them to think boldly about the future of transportation. She referenced the construction of the Interstate highway system as a prime example of what we are trying to discuss today. She shared a quote from President Dwight D. Eisenhower stating that the Interstate highway was a solution identified to promote prosperity and security in the United States. Today, we are focused on identifying the overarching trends that are driving demand and changing our future. This session is focused on thinking big and generating ideas to shape the future of DOTs. Secretary Lorenz emphasized that state DOTs would work together to refine the ultimate solutions for implementation at a future meeting.

Tony Carvajal, facilitator, introduced the idea of the "numerator and denominator" to describe reflect the scale and focus of our discussion at this point in the visioning process. The focus of the retreat is "numerator" discussions – that is, on broadening the universe of possible ideas. Future "denominator" discussions would ground implementation in reality: funding, politics, or other practical constraints would narrow what we are able to do. Today's conversations are focused around exploring "What If?" questions, while future discussions will focus on "What now?" questions.

Participant Preference Polling

Tony Carvajal led an interactive discussion facilitated by electronic polling through Mentimeter. Participants first were asked to identify their organization type (Figure 1). Of the 50 respondents, nearly 70 percent (34) identified themselves as affiliated with partner organizations, while approximately 30 percent (16) were affiliated with state DOTs. Throughout the polling, results were tabulated by organization type to help discern whether any major differences in opinion existed between DOT and non-DOT participants.
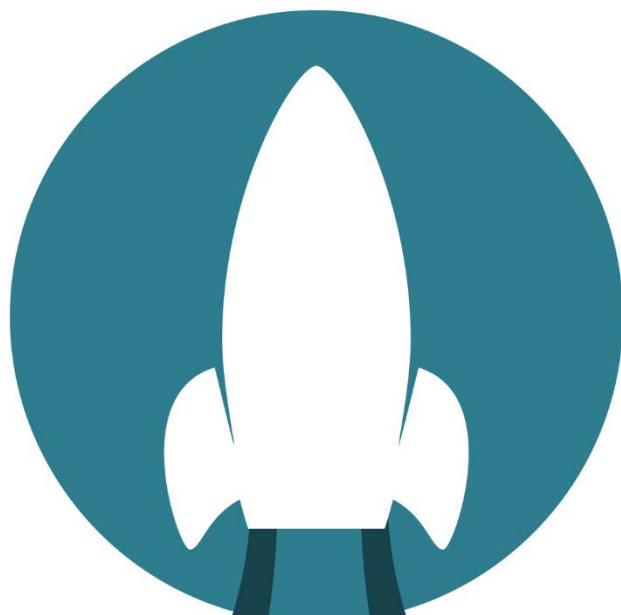
NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

1

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

Figure 1 Poll: Organization
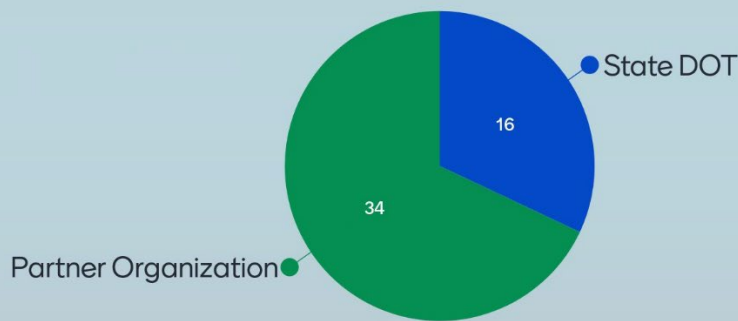
Next, participants described their expectations around the pace of change over the next 10 years. A plurality of the group said the pace of change will be "somewhat faster" than today, while a lesser but substantial portion anticipated that the pace of change would accelerate significantly (Figure 2). Similar proportions of DOT and non-DOT participants chose "faster and faster" and "somewhat faster" as answers. A small number of DOT participants expressed an expectation that the pace of change would remain the same or slow over the next 10 years.

Figure 2 Poll: Pace of Change
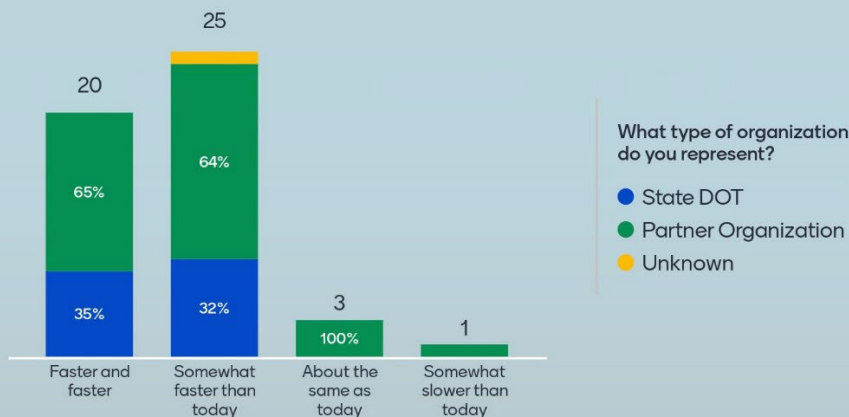
The next question prompted participants to consider the business models they perceive have most disrupted transportation over the past decade (Figure 3). Amazon Prime was the most frequent response, followed by transportation network companies ("Uber/Lyft") and Google. Similar proportions of state DOT and partner organizations chose each answer. Tony noted that while Amazon Prime and Uber/Lyft were identified as the most disruptive business models, each

of the options provided, and others, shifted the way people approach transportation. For example, he noted the impact of cell phones on the transportation system as people rely on their smartphones for navigation and trip planning.

Figure 3 Poll: Disruptive Business Models
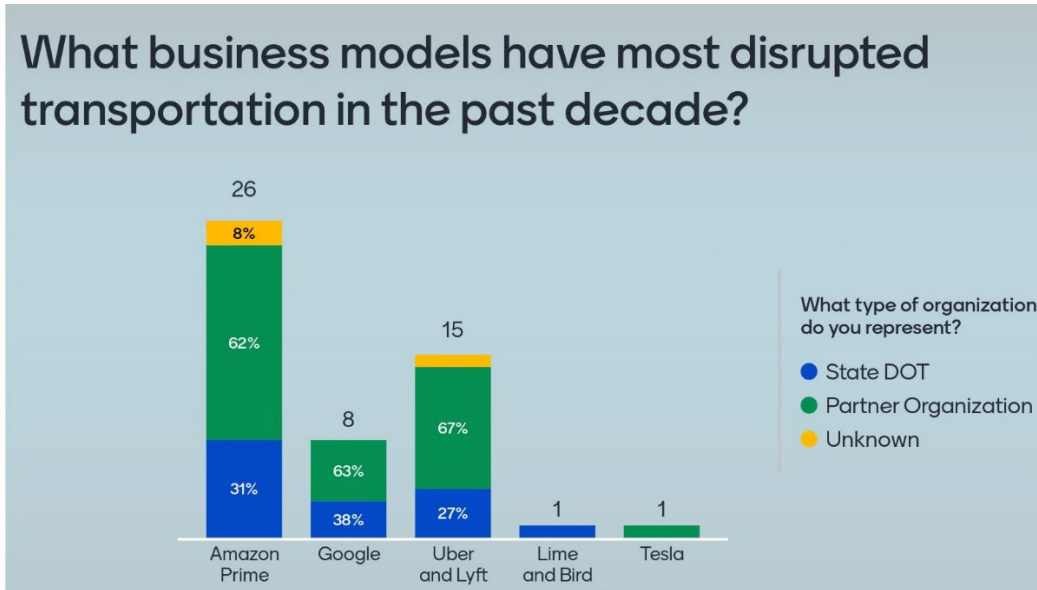
The final questions were oriented towards the group's thoughts on future priorities. One question asked about values that would be important to participants' children or grandchildren (Figure 4). Results were spread across value statements, with "seamless and easy," "healthy and equitable," and "safe and secure" as the top vote-getters.

Figure 4 Poll: Values Important to Next Generation
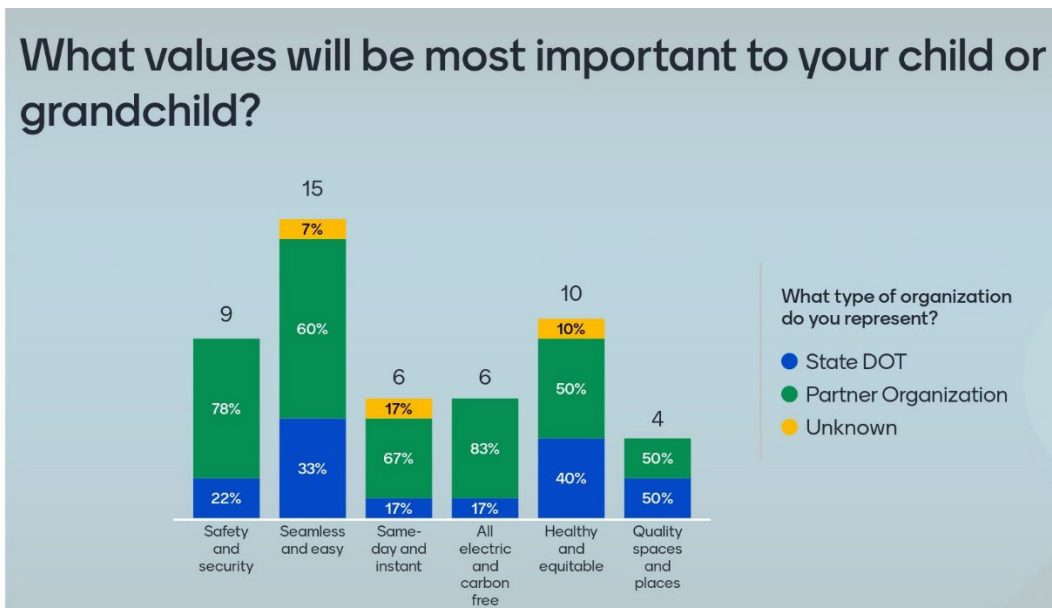
Participants were asked about their hopes and fears about the future of transportation. Participants expressed the most hope around "technology and innovation," followed by "providing more mobility options to more people" and "sustainability, resilience, and equity" (Figure 5). In contrast, responses around fears were more concentrated; almost half of participants (45 percent) selected "that we won't be able to agree on anything" as their greatest worry about the future (Figure 6).

Figure 5 Poll: Hope for the Future
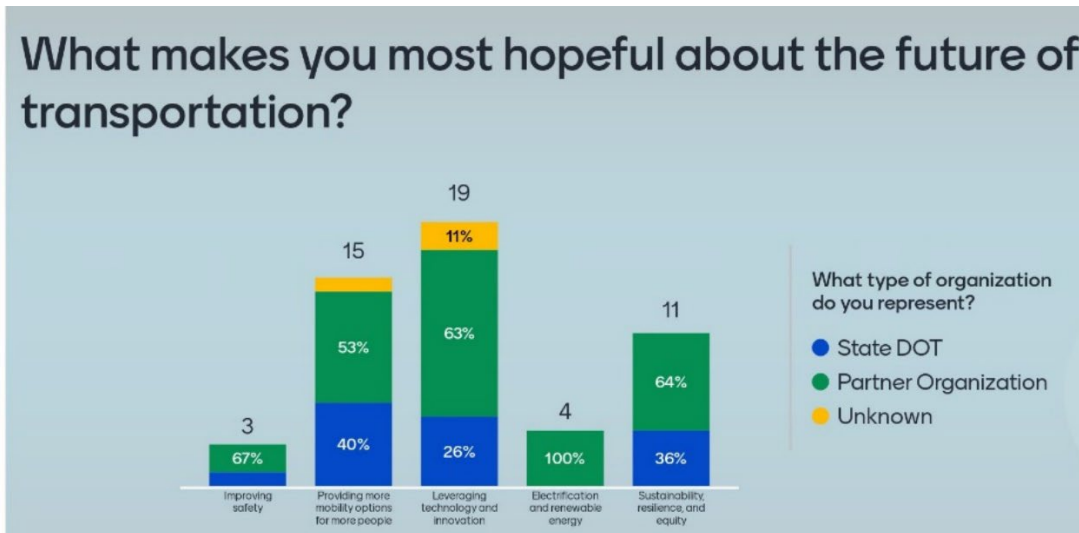
Figure 6 Poll: Worry about the Future
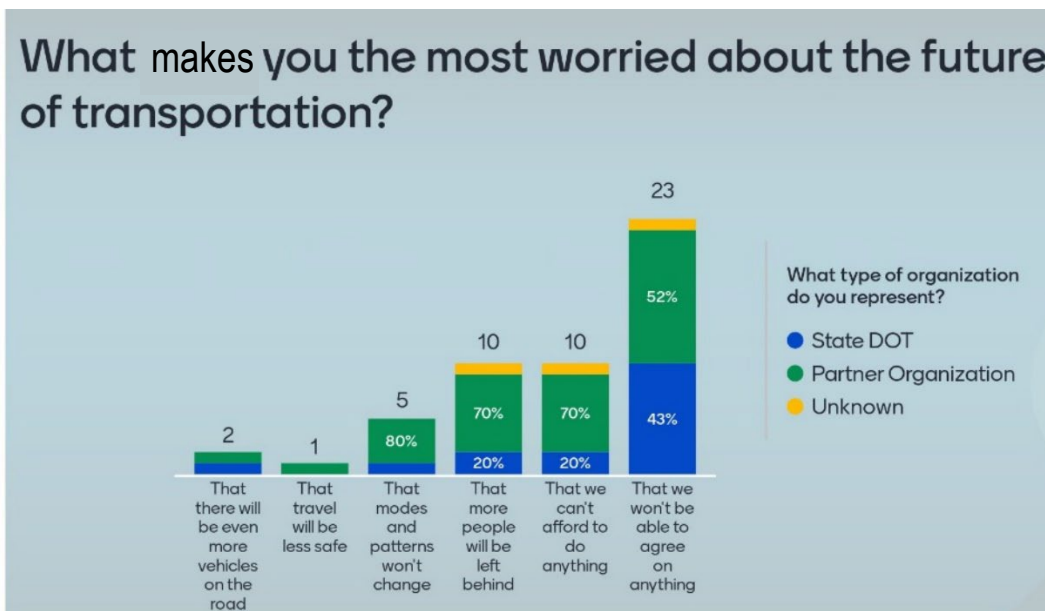
Panel Discussion: Surveying Our World: Trends and Uncertainties on the Path to 2035

Initial Remarks

- **Steve Polzin**, Research Professor, TOMNE University Transportation Center, Arizona State University

  The rate of U.S. population growth is more modest than historic trends -- below half a percent per year. Birth rates and fatality rates are stable, and thus predictable, but immigration is not. Going forward, more than half of the growth will be immigration, which is governed by policy. Uncertainty in population growth is one of the greatest challenges in planning for long range infrastructure.

  More important than overall growth is the variation in growth across different geographies. Some geographies have robust growth and thus robust needs, while other areas are at risk of declining demand. When people relocate, they create demand for new infrastructure and services. There are new constraints in population redistribution, such as the low supply of housing. Historically, population followed jobs, access to raw materials, arable land, and transportation opportunities. Now, with a greater share of information and service jobs, weather, cost of living/taxes, crime, schools, and core values drive relocation patterns.

  Income remains the most powerful determinant of travel. Travel per capita is not growing. Household-based travel is only about 70 percent of all travel today. Commercial, government, business, and freight travel have grown. Travel per capita is not growing; delivery of services and products has dampened household travel demand, but some has been replaced by commercial travel.

- **Anthony Townsend**, Urbanist in Residence at Jacobs Technion-Cornell Institute at Cornell Tech

  Cornell Tech, a new Cornell campus in New York City represents the "city of the future" – it is car free and is one of few places in New York City where it is challenging to use an automobile. In May, the campus graduated its first class of folks with a degree in "urban technology." The technology that these graduates think will change the field is artificial intelligence (AI). This is not something we can wait to hit us – if we wait, we can see human-centered mobility lose ground to machine-centered mobility by making autonomous vehicle operations ubiquitous and hiding the costs of congestion from the users.

  Transportation is full of edge cases - problems or situations that occur only at an extreme operating parameter and are thus difficult for AI to anticipate. While autonomous vehicles have come a long way towards being deployable, that has not been the case in all areas for all use cases. Automation is here – there is demand, there is supply, but it has been more difficult to execute than expected. Many of the early predictions about timing of market penetration and displacement of drivers have proven incorrect, even while automation moves forward. The question that remains is not whether automation will enter the transportation system, but where: freight, personal electric vehicles, or passenger cars? The points of entry will have significant implications for what sort of solutions we need to design to ensure safety and accessibility and keep human-centered mobility in our transportation system.

  The shift towards "remote everything" is not just about working from home. For many people, it is about school and healthcare. Remote school has been challenging, with many evaluations showing a loss of progress in learning for large numbers of students. In healthcare, what we thought was a positive outcome may not actually be positive. For example, telemedicine often forces people into models for lower-cost care delivery. Soon face-to-face services could become "luxury goods."

  It is possible we may not see as much dispersal of existing agglomerations. Instead, we may a process of fragmentation, where some parts of functions might be remote, while others in existing or new centers. These trends add up to a fast changing and unpredictable level of demand for both remote and in-person services.

- **Collin O'Mara**, President and Chief Executive Officer, National Wildlife Federation

  Unless we unite around global action to reduce greenhouse gases in the atmosphere drastically in the coming decades, these effects will drive one of the greatest transformations of our planet and its societies. We are in a race against time that will necessitate major transformations in industry and agriculture and tremendous leaps in technology, as well as cultural adaptations and, for many, migration to new homes. Politicians are now trying to reduce gas prices by replacing gas from Russia, while energy prices will lead to a push towards cleaner energy.

  Many of the most important climate innovations will be in transportation. The transportation sector is one of the primary drivers of carbon emissions and has a central role to play in addressing the climate crisis. We should be proactive about designing and building a cleaner, more resilient, more equitable transportation system, and this includes rapid electrification of passenger and freight vehicles, sustainable aviation, and the development of other fuels where electrification isn't feasible. We must consider how all these alternatives fit together.

  We are in the midst of a mass extinction event that climate change is accelerating. The transportation sector and those involved in the planning and siting of new infrastructure need to consider their impacts on climate as well as other environmental issues- for example, integrating wildlife crossings and other adaptations to help prevent deadly collisions for people and wildlife.

  We need our infrastructure — natural and built — to address generational inequities. For centuries Black, Latinx, and other communities of color have been afterthoughts to transportation planners, both in these communities' displacement and being forced to endure the worst impacts of air pollution. We need infrastructure and planning decisions that do not create or perpetuate racial inequities.

- **Tim Storey**, Executive Director, National Conference of State Legislatures (NCSL)

  Decentralized autonomous organizations (DAO), have grown in number in recent years, particularly among online communities. These decentralized groups have no formal leadership and reflect increasingly dissatisfaction with and disengagement from the political process. Given the lack of understanding around what state legislatures do and how they impact people's lives, it is not surprising that only 17 percent of Americans can name a state legislator.

  Predicting the future is difficult. In 2000, NCSL did a study on "legislatures of the future" for 2025. The report predicted a trend towards unicameral, as opposed to bicameral, legislatures (which did not happen) as well as women representing 50 percent of legislators (that figure is 30 percent today). The report correctly predicted we would stop printing magazines, there would be a great labor shortage, and the election of celebrities as politicians.

  We are in the fifth century of legislatures in North America. With predictions for further tremendous social, political, and economic stresses, there is concern that legislatures may not be equipped to handle these trends. People in these roles are already stretched to capacity. We have not added legislators as population has grown. Cryptocurrency and automated vehicles, for example, create new pressures for technical expertise at the state level, but state legislatures are not structured (or funded) to bring that expertise in-house, either through state legislators or staff. As DOT CEOs are making increasingly complex decisions, legislative members and staff need to have access to greater expertise. With polarization only worsening, holding onto the idea of the "citizen legislator" – someone who does not need to devote large amounts of time and energy wrestling with the challenges of governance and technology – is antiquated.

Discussion and Questions

- **Are there any crosswalks among the trends each of you identified?**

  Steve Polzin: Agree with polarization issue. Some of the issues transportation faces are related to the fact that we now have more goals than we've had before. Adding goals such as climate and equity to traditional ones such as safety or

cost effectiveness contributes to a more complex decision-making environment. These are not necessarily all complementary goals, and it is enormously complicated to sort this out.

Anthony Townsend: We recently held a weeklong event at Cornell Tech to celebrate the tenth anniversary of open data law. Advocates were talking about sophisticated visions of what they wanted to see. Participants built a generative model of how to expand New York's bike network, demonstrating how the balance of power has shifted to the public. It used to be that only consulting firms or U.S. DOT had access to this information and could make the types of smart and data-informed arguments being made by these groups.

- **How will technology change how we manage public participation?**

Anthony Townsend: We are using data analytics to make sophisticated claims with data-based arguments. Doing this in a legislative context is very challenging – it difficult to access legislators, and the time that members of the public have to make comments is constrained. At a municipal level, many government functions have shifted to virtual. This enables kind of people participate who previously had been burdened by commutes, childcare, and other activities. This is changing politics.

- **When does the U.S. natural population increase come to a halt (net zero increase)?**

Steve Polzin: It is likely that we are very close to this point already. Some evidence that COVID changed some things in terms of work-life balance and may impact the birth rate, with some women choosing to leave the work force in order to focus on childrearing or familial caretaking, but we already very near zero now.

- **Collin, you seem more optimistic about climate that some others. Can you talk a little more about that optimism?**

Collin O'Mara: Some of the investments, such as electric vehicle charging stations, have become a priority throughout the United States at both the federal and state levels. Climate is clearly getting attention and the investments in improving our climate are happening, even if it is at a slower rate than we would like. Investors in urban-tech have transitioned into climate-tech. Major investment has been poured into reducing carbon emissions and these investors are reflecting those opportunities for carbon reduction by 2030.

- **Anthony, can you talk about how states should be approaching advanced air mobility solutions, especially for personal travel?**

Anthony Townsend: Planting trees is the best solution. These advanced air vehicles are essentially small helicopters and they are loud. Trees can act as a good noise buffer for these vehicles. Supporting communities that aren't large enough to support a traditional hub and spoke aviation system are great candidates for this type of service.

- **Final thoughts?**

Steve Polzin: The planning community has defaulted to scenario analysis for dealing with uncertainty and is incorporating measures of flexibility and adaptability as well into planning forecasts. While confronting different decisions and different time frames, we may need to invest in infrastructure that can be adapted, so we can minimize risk without stranding the assets. It is critically important that people making the decisions have a strong perception of what going on – people fail to put things in the broader context. What we need to understand is how the different strategies scale up.

Anthony Townsend: The moment is yours. The vision that emerges from this meeting will be listened to and impactful – hopefully, it will be about decarbonization and improving mobility.

Tim Storey: This is an opportunity we haven't seen in a generation. We can make the people in this room the exemplar – transportation has been a place where party lines can fade away and people talk to each other. Showing how transportation can adapt and respond to these challenges could be inspirational for policymaking in other fields.

Determining Our Position: Trends and Uncertainties

Following presentations by panelists, participants prepared for the first set of breakout groups. To prepare for this discussion, participants had been asked to review a set of trend documents prior to the retreat. These documents synthesized trends and uncertainties around 10 major topics:

- Demographics
- Prosperity
- Future of Work
- Trade and Logistics
- Regions and Megaregions

- Communities
- Technology
- Energy
- Civic and Governance Systems
- Risk and Resilience

In addition to these trends documents, participants reviewed information on exploratory scenario planning in practice, steps for adopting a visionary perspective, a history of the development of the U.S. surface transportation system, a synthesis of community values and public opinion research related to transportation, and syntheses of DOT and thought leader interviews conducted as part of the NCHRP 20-24(138) research to date. This collection of resources was designed to prime participants to think in radically new ways about the future.

These groups were designed to group similar trends together:

- **People**: Demographics; Prosperity
- **Places**: Regions; Communities
- **Economy**: Future of Work; Trade and Logistics
- **Innovation**: Technology; Energy
- **Cross-Cutting**: Risk and Resilience; Civic and Governance Systems

Retreat participants were pre-assigned to these five groups to provide a mix of DOT and non-DOT participants in each.

Tony Carvajal introduced the concept of "tides, waves, and ripples," which describe different time horizons and levels of impact from change and disruption.

- **Tide:** Major shifts with lasting impacts; 10-year-plus duration. Examples: Aging population; rise of emerging markets; emphasis on wellness.
- **Wave:** Significant changes over a period of 4-9 years; some lasting impacts. Examples: Declining labor force participation; growing e-commerce; wearable technology.
- **Ripple:** Minor changes during a 1-3- year period with temporary impacts or short-term disruptions. Example: "Great resignation"; supply chain disruptions; use of melatonin.

Each breakout group used a tide/wave/ripple poster to organize their work (Figure 7). Photos of the completed posters with a list of trends identified are shared in Appendix B. Moderators facilitated discussions for the following activities:

- Review the trends factsheets to identify major missing trends;
- Sort trends using the framework of tides/waves/ripples;

- Discuss which trends had the greatest potential impact and which have the most uncertainty; and,

- Rank a short list of two or three high-impact trends to report out to the group for further discussion.

Figure 7 Tide, Wave, Ripple Concept
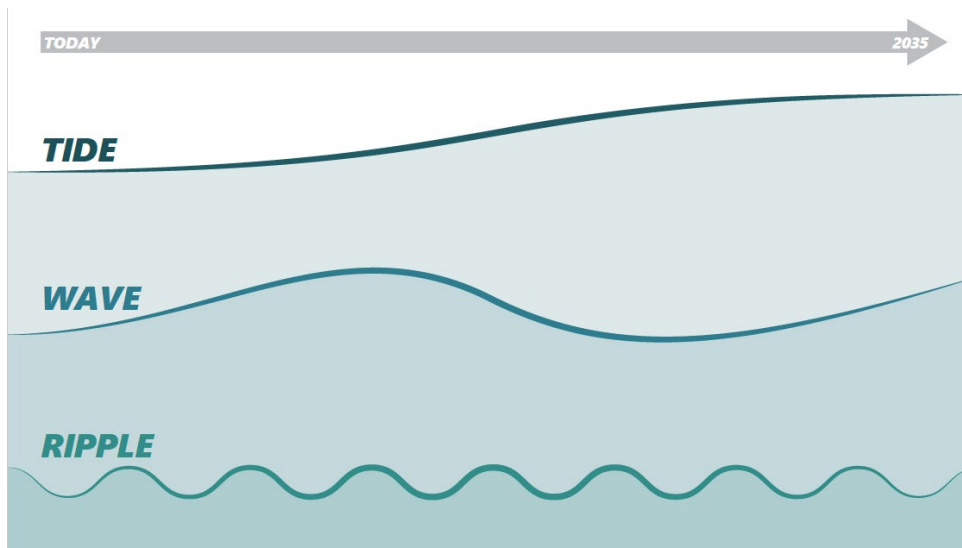
Breakout Groups and Report Out

A member of each breakout group reported back the key trends and uncertainties identified through discussion.

- **Demographics/Prosperity** (*reported by Roger Millar, Secretary, Washington State DOT*)

   In analyzing the numerous trends influencing demographics and prosperity in the United States, the group identified a common theme: disparity. An accelerating gap between high-income earners and low-income earners is creating disparity not only in terms of economic success, but in terms of wealth creation, housing access, community vitality, and public health. Low-income wages have not kept up with increases in the cost of living, hindering low-wage earners' ability to access affordable housing (particularly in amenity-rich areas) or receive health care. The reduced ability to access these resources in turn hinders wealth creation, leading to multi-generational poverty and raises the risk of a permanent underclass. The group concluded that concentration of income and wealth along historic socioeconomic demographics has produced an environment in which the growing diversity of the nation's population is not reflected in its power structures – while the population is diversifying, decision-making is not. These dynamic produces policy environments that may allow those with wealth and power to design and choose their communities, while those without are subject to larger forces, such as limited geographic mobility, constraints in housing choice, or exposure to environmental and health risks.

- **Technology/Energy** (*reported by Carlos Braceras, Executive Director, Utah DOT*)

   The group said an overarching issue for technology and energy is finding the right data at the right time and turning that data into information for the right decision-making. Technology is making data abundantly available at a lower cost, but DOTs must build the structures to organize and analyze that data and apply it to specific use cases for planning and management.

   In the energy space, decarbonization in energy production and electrification of the transportation network are accelerating. Low- and zero-carbon power generation, distribution, and storage are improving from a technological

perspective, but the decentralized nature of these advances require DOTs to become partners with utility companies and other energy sector players to develop governance structures to organize and optimize these resources.

The group concluded it is critical that governance improve because as electrification of major economic sectors increase, so does overall energy consumption. Ensuring that energy is accessible and reliable for the different sectors will be critical to the sustainability of the future energy network – and the transportation network that relies on it.

- **Communities/Regions** (*reported by Victoria Sheehan, Commissioner, New Hampshire DOT*)

   Understanding communities and regions to be inextricably linked, the group discussed the topics together. Participants identified several Tides: extreme weather (drought, fires, floods, heat), healthcare, work-life balance, and quality of life. Waves included collaboration and workforce issues. Conversation touched on the increasing value on work-life balance, and the types of communities (a participant noted the 15-minute city concept) that can meet people's needs. Discussion also touched on the extent to which people self-select into communities of ideologically like-minded people. At the same time, the group recognized that although it is important to consider the qualities in communities that make people want to live in them, it is also important to consider the disparities in the choices that people have to access communities of their choosing. A "wealth gap" means that affordable housing and access to jobs restrain choices available to many. The group identified cross-sector collaboration as a tide and voiced the importance of continued cross-sector work. Transportation professionals must start to address the identified challenges in a holistic way.

- **Freight and Logistics/Future of Work** (*reported by Marc Williams, Executive Director, Texas DOT*)

   The group noted freight and supply chain can get lost in the dialogue. Fuel costs, labor shortages, and international volatility were all raised as uncertainties moving forward. One Wave: change in consumption prompted many questions about what the United States will do on the consumer side: How will we consume things in the world? Has e-commerce peaked? Longer-term issues included thinking about climate impacts, congestion, and capacity constraints. Volatility was a major theme, leading to discussions on the longer-term vision of balancing capacity constraints with resiliency and climate change. There was also recognition of more companies moving toward vertical integration of their supply chain to buffer against international volatility.

   Flexibility and inflexibility were key issues describing the future of work. Equity issues – the ability of a society to meet human needs through work – were discussed. The group felt strongly that issue of equity, the yawning gap between the haves and the have-nots, was a major issue for the future. They saw the issue of filling lower-wage hourly work as a bigger problem moving forward. There was also much discussion of changing expectations around remote work and desirability of workers to have more living space (which may lead to greater sprawl). The group wondered how the metaverse will impact how we work and where we live. They also felt jobs will increasingly get automated.

- **Risk and Resilience/Civic and Governance Systems** (*reported by Patricia Hendren, Executive Director, The Eastern Transportation Coalition*)

   The group identified emerging themes related to how systems operate and how systems can be maintained. In the short-term, risk can be viewed as predominantly operational. Disruptions due to severe storms and flooding are occurring more frequently, and, some group members argued, are having greater impact. These risks threaten the ability of the transportation network to operate as designed and can hinder emergency response. Additionally, cybersecurity is becoming an increasingly significant issue for transportation providers and utilities. As the transportation system becomes smarter, with greater capacity for connected and autonomous operations, these risks are likely to increase. Building operational resiliency will therefore require hard infrastructure improvements as well as digital security strategies. Taking a longer-term perspective, participants also identified risk and resiliency considerations related to system maintenance and management. Revenue management was an emerging theme in

this area, with participants calling attention to the growing gap between traditional transportation funding mechanisms (namely, the gas tax) and the use of the transportation network due to more fuel-efficient vehicles and alternative fuel vehicles. In both perspectives, participants emphasized the need for continual risk assessment and resiliency planning to identify new risks, evaluate their impacts, and develop strategies for response and mitigation.

Regarding civic and governance systems, the group discussed the need to ensure that the right people are at the table. At the same time, DOTs have more expertise than some customers, so how do DOTs ensure this expertise is valued? The group discussed institutional barriers, including legislative constraints, that hinder DOT actions. Participants called attention to the changing ways in which public and private entities are involved in and take responsibility for governance. These lines are blurring due to a wide array of factors, from public-private partnerships to the growing role of social media in public debate. As a result, the public may struggle to understand which entities are responsible for different systems and how these entities may be held accountable.

Group Discussion

Based on report-outs, staff produced Figure 8 and Figure 9, which first combined and then organized into groups key tides/waves/ripples identified by groups. Figure 9 organizes these issues into several broad categories: resiliency, consumer change, innovation and technology, and disparity/equity.

Figure 8 Summary Slide: Breakout Tides, Waves, and Ripples
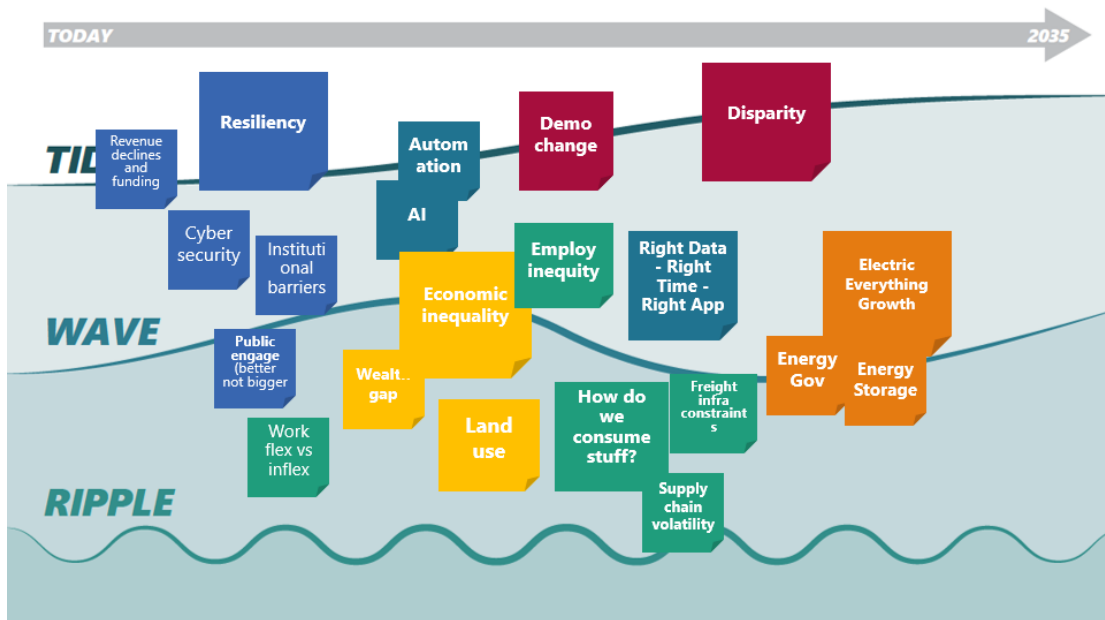
Figure 9 Reorganized Summary Slide: Breakout Tides, Waves, and Ripples
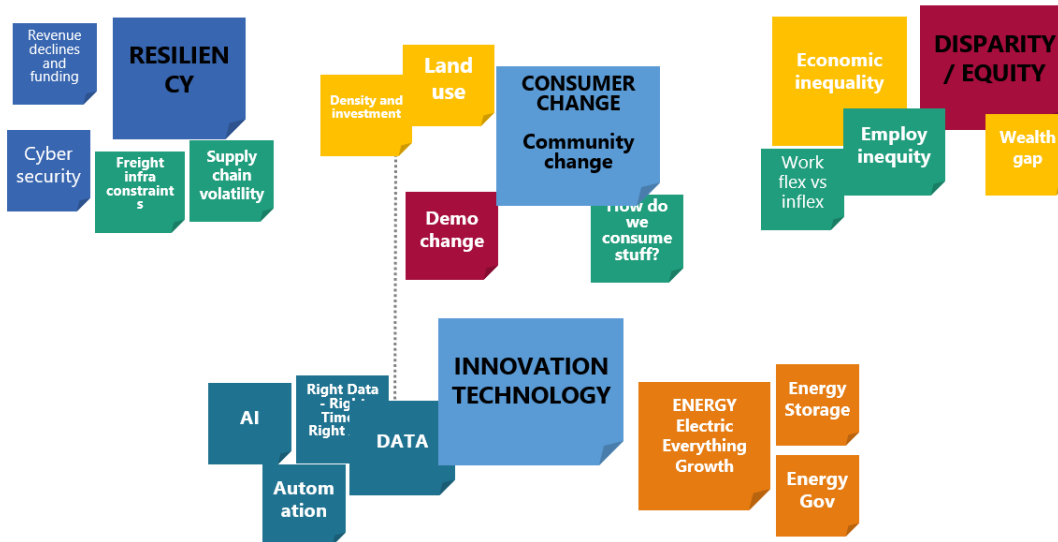
This visualization provided a jumping-off point for guided discussion around several questions.

- **Is the overlap in these conversations because we have similar perspectives or because the trends are leading us to the same conclusions? Was anything surprising?**

  Resiliency, equity, and economic disparity issues were common themes across many of these topics. Commenters agreed the trends are leading to similar conclusions. A participant noted some of the tides/wave/ripples have synergies and some are in direct conflict with each other. Some could be solutions while others could be the source of friction; our task is determining how to address those complexities.

- **How does our approach towards transportation planning need to change?**

  Transportation professionals often **are not at the right table** and **aren't moving fast enough** or collaboratively enough. It is not sustainable to take two years to develop a plan when we need to capture and adapt to recent trends. We need to start with **community planning** as an approach to transportation planning. There is an opportunity to bring the most impacted communities into the **decision-making process**. There are risks in not changing how things are currently done. Refusal to change what we are doing can be devastating to our underserved communities. Being more **inclusive in partners** changes incentives; when partnering with roadbuilders and the contractors, we get agendas that say, 'let's build something.' Regional entities, such as metropolitan planning organizations (MPO) can serve as a conduit between DOTs and local communities.

  There are **institutional limitations** to DOTs that limit their ability to do their jobs well. One issue is the civil service, and how DOTs hire, reward, and retain. Another failure is our **legislative structure** nationwide. There is a political incentive to defer maintenance because the benefits of maintenance are not readily understood by the public. This results in state legislatures not putting enough money into operations and maintenance. Transportation is too close to the legislative process and not reliant enough on data that illustrates needs. One solution would be to think of **transportation as a utility**. If an electric utility is out of service, it is fixed. In contrast, if a bridge out of service, it might be 20 years before a DOT fixes it. We have not considered our infrastructure to be as significant as utilities. Similarly, we could look to **link planning and investment**. Agency after agency makes plans only to see investment

become a legislative food fight. (One commenter cautioned, though, against overusing the idea of "transportation as a utility." To those in some areas of the country, utilities are seen as unreliable.)

A more **holistic**, **less siloed**, approach to transportation planning asks, "Is transportation the end or the means?" In that case, is "**mobility planning**" a better term? The job of the DOT is not infrastructure; it is to provide mobility to the community so they can get to jobs, food, health care, school, and other services. In the end, it comes back to **"Who are we trying to satisfy?"** Is it a legislature? A user? One commenter said. "It's about the communities that we serve, and they all need different things. If we don't do things differently, we will always get what we always get."

RETREAT DAY 2

Opening Remarks

Dr. Shawn Wilson, Secretary, Louisiana Department of Transportation and Development and Panel Co-Chair: There is energy around doing a better job serving people. Today, we are extending an invitation to validate where we are in this process. We need to have the dialogue, challenge ourselves, and be strategic about where we want to see transportation go.

Julie Lorenz: We should see this group as our "challenge network" to confront these issues. We will be coming back to the group as we move from vision to moonshot to strategies, so we should focus on the big ideas today. Participants do not have to code their language. Timeframe should be faster than we've comfortable with but slower than we'd like to see.

John Kaliski, Cambridge Systematics research team: Reviewed the idea of "moonshot thinking" (Figure 10). Moonshot thinking represents the intersection of visionary thinking, breakthrough ideas, and extraordinary challenges and opportunities. These are highly ambitious ideas that represent fundamental shifts rather than incremental change.

Figure 10 Visuals Illustrating "Moonshot Thinking"
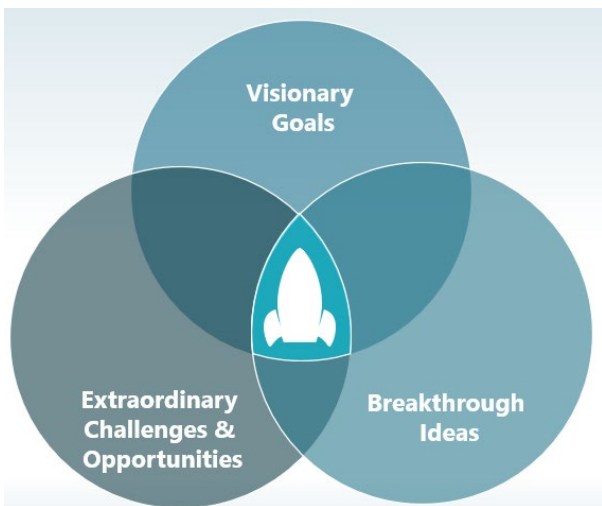
John introduced **Pamela Rauch**, Florida Power and Light, to share an example of how FP&L applied moonshot thinking. Pam said FPL recognized that the energy industry would be disrupted, so we decided to get out in front. As the regulated utility in Florida, we have developed a company culture to compete against ourselves to do better by customers. For example, FPL converted its power generation to natural gas. That investment saved customers $11 billion and reduced emissions by 50 percent. Now, FPL needs to invest in solar in a regulated way. We started evaluating how we could drive the cost down, and now have 50 solar farms that serve 750,000 homes. Investing in smart technology has changed way we

do business. The deployment of data analytics has enabled FPL to now predict outages, leading to FPL being rated as the most reliable electric utility in the country. PPPs are required to get these things done. How we think about transportation of the future is the same way we're trying to look at electricity.

Tony Carvajal asked for observations on the first day's discussion.

> One commenter highlighted the tension between the views that **expanding highway capacity** is bad and the national commitment to **electrification**. If vehicles are all electric, and automated vehicles lead to more vehicle-miles traveled, is that a bad outcome?

> Another participant spoke to the idea of a "nation in crisis" as far as political polarization, climate, and inequality. One way to break through the politics would be to establish a **common cost-benefit analysis**. This allows us to establish not only a vision, but a way to talk about it.

> Another commenter encouraged participants to consider the 42 percent of households are **asset limited, income constrained, and employed** (ALICE). In considering solutions, people should think: "Is this helping ALICE? Is this going to hurt ALICE? Is this going to address some of the past things that have been done to perpetuate inequality?"

> A commenter reminded participants that we must consider how to **govern for disruption**; every outcome discussed at this workshop will be disruptive, so how do we develop a framework to respond early?

Participant Polling

In preparation for small group exercises – and recognizing the imprecise nature of language – participants were asked to reflect on their own understanding of the terms "disparity" and "resiliency." This exercise was intended to prepare participants for the subsequent activity's matrix charting resilience and opportunity.

Participants aligned around a definition of disparity that incorporated income inequality; racial, ethnic, or gender disparities; unequal access to live, work, and learning opportunities; and different abilities to benefit from technology. Eighty-four percent of participants answered "all of the above" (Figure 11).

Figure 11 Poll: Meaning of Disparity

When you think of DISPARITY, what could it mean?

What type of organization do you represent?
- State DOT
- Partner Organization
- Unknown
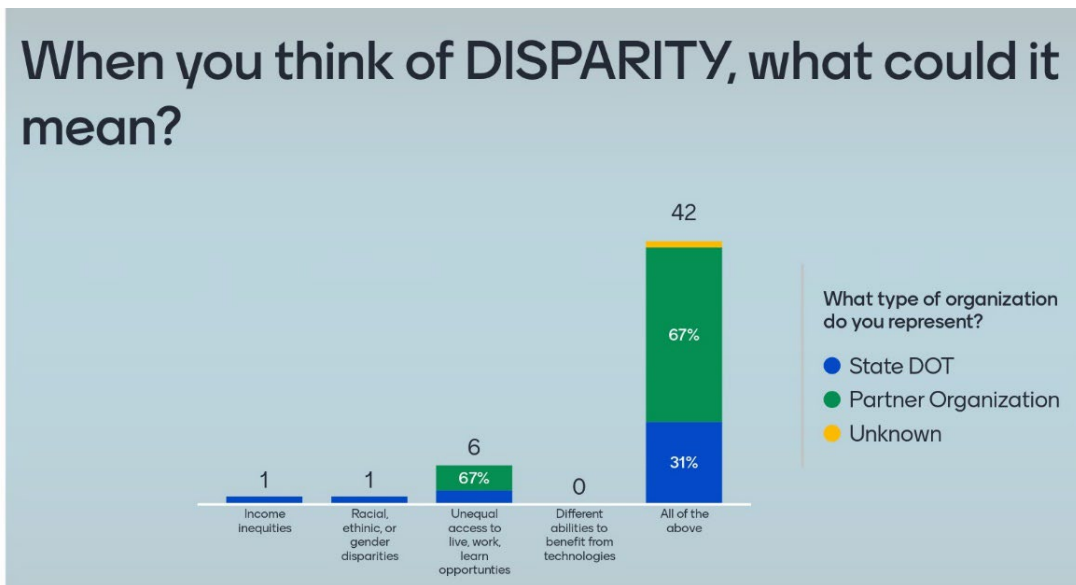
For resiliency, about one third of respondents limited their definition to "climate and weather challenges" (36 percent). Close to two thirds selected "all of the above," choosing a definition that considered additional risks such as technology and cybersecurity risks; funding, legislative, or regulatory uncertainty; and market supply and demand volatility (Figure 12).

Figure 12 Poll: Meaning of Resiliency
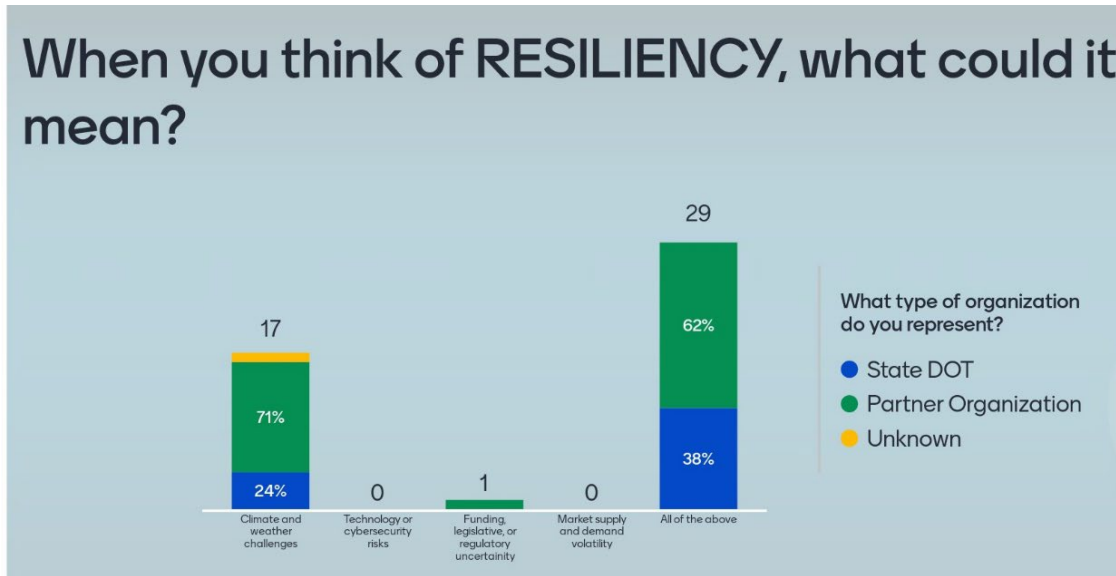
Small Group Exercise

The second exercise was involved exploratory scenario planning. Scenario planning is a framework for critical, deliberate thinking about the strategic risks faced by an industry or organization to future-proof against uncertainty. Exploratory scenario planning focuses on identifying what could happen under different assumptions of the future, and then identifying the combination of strategies likely to be most effective across a range of plausible futures.

To simplify the process, four scenarios were constructed based on a combination of two primary assumptions:

- Degree of **resilience** – low (communities are volatile, disrupted, and uncertain) to high (communities are flexible, agile, and responsive)

- Degree of **opportunity** for individuals and families – low (disparate access and significant gaps) to high (equitable access to technology, energy, quality of life, and standard of living).

Each breakout group considered a one of the four distinct futures defined by these two primary assumptions (Figure 13). To jumpstart conversations, each future was compared to a science fiction movie setting:

- A **high resiliency**, **high opportunity** future is similar to the world depicted in *Star Trek*, where society is highly organized and provides equitable access to opportunity.

- A **high resiliency**, **low opportunity** world was likened to *Star Wars*; although there is a high degree of organization and systems are resilient in this world, society itself is unequal.

- A **low resiliency, low opportunity** world was likened to *Mad Max*, where society is more individualistic and there are vulnerabilities to external shocks.

- A **low resiliency, high opportunity** world was likened to *Avatar,* demonstrating high degrees of cooperation within decentralized groups but vulnerability to external shocks.

The intent was to explore these four plausible futures, not select a preferred one- noting that even in the high resiliency, high opportunity society there are potential concerns about the role of the individual.

Figure 13 Scenario Exercise Framework

STAR WARS	STAR TREK
Empire Control but Rebellion Against Outcomes	Highly Organized Federation with Equal Opportunity
MAD MAX	**AVATAR**
Roving Bands of Warlords Without Civic Structure	Decentralized Tribes in an Equitable Society

In this exercise, participants self-selected a group, where they worked together to consider the following questions:

- **What?** How would you describe this future? Identify a few key words or phrases. Does this future seem plausible – do we need to change any assumption to make it more plausible?

- **So What?** What this future could mean for transportation? Identify a short list of potential implications.

- **Now What?** What aspirational goals or vision statements would we identify (e.g., zero fatalities)? What breakthrough ideas could help state DOTs accomplish these goals (focus on strategies, not details of implementation)?

After answering these questions about their assigned future, participants spent a few minutes looking at the other three futures and to consider how thinking about goals, visons, and breakthrough ideas be different in this future. Boards from group discussion sections are included in Appendix C.

Breakout Groups and Report Outs

- **Low Resiliency, Low Equity ("Mad Max"):** *Reported by Jordan Davis, Smart Columbus*

Status quo: The status quo under this scenario is a concentration of power without appropriate levels of accountability and transparency to ensure that the public interest is protected and upheld. Both virtually and online, this is a disconnected world that is highly segregated. The barriers to entry to a better life are constantly increasing and more difficult to overcome. There is a lack of data ownership and privacy, both of which can lead to exploitation of historically disadvantaged communities.

Aspiration: Enhanced mobility for all and a system that is safe, secure, and equitable. To ensure the public interest is upheld, planners and decision-makers should consider the system from an outcomes lens, with successful delivery and efficient operations as primary objectives. A creative balance of public-private sector participation would allow for innovative thinking and problem-solving while ensuring there is a robust and well-informed administrative function to intervene in the market at the right time. It is important to develop an understanding of what government does best – consider the trade-offs in selecting best bids versus low bids when procuring a good or service. If a government is trying to do everything, it may not end up doing that well. Government could offload some types of tasks based on this balance of expertise, efficiency, accountability, and protection.

Breakthrough Ideas: Mobility as a universal right; mobility as a social service; service standards for emerging mobility services to ensure accessibility.

- **High Resiliency, Low Equity ("Star Wars"):** *Reported by David Harkey, Insurance Institute of Highway Safety*

This group described this future as the most representative of our lived reality today. They summarized discussion in terms of three broad areas in which DOTs may need to adapt:

Communication: Both within the DOTs and among partners, we must reimagine communication. We have to communicate across silos while keeping DOT at the center of these conversations. Also, communication and messaging with/to the end user is important.

Decision-making: We must improve the decision-making processes to address inequities across communities (urban/rural). There are barriers in the process that could be removed, including political barriers. There are institutional problems with funding; might DOTs be pushed if they had to draw from competitive funding pots rather than relying on a transportation trust fund? This approach also would allow for pooling of resources. Authorities are a good example of this – models may be above, beyond, or outside of the traditional DOT structure.

Technology access: Safety features, for example, are not accessible to all. Everyone should have access to mobility options. Some people lack cell phones for accessing certain types of transportation – how do we improve this access? Framing mobility as a right may help ensure that new mobility solutions are integrated into the transportation system in a way that makes them accessible to all users.

- **High Resiliency, High Equity ("Star Trek"):** *Reported by Brittany Birken, Federal Reserve Bank of Atlanta*.

The group discussed the idea of integrated community planning, which would consider questions such as: What is the vision? Who needs to be engaged? Who are the important partners? This type of approach would help create a shared vision for integrated community planning that could cultivate community values and principles. The group emphasized there needs to be a deeper understanding of what the community actually wants and collaborative efforts to identify the best way to deliver those visions rather than assuming the experts already know the best solution. This approach could be made implementable with a series of measurements and investment strategies that align with the values and principles of the community.

The group also discussed the environmental review process. There are global differences in terms of how we deal with environmental approvals. There is a need to think about a regulatory framework that does not make the process too onerous.

- **Low Resiliency, High Equity ("Avatar")** *Reported by Stephanie Hoopes, United Way ALICE and Christine Kefauver, Brightline Trains*

Mobility for All: The DOT will need to become an integrated part of the fabric of our communities. People will continue aging in place and mobility will need to be ensured for them. This scenario could be the 15-minute city for everyone. Or is it cheaper to just buy cars for everyone rather than make people wait for transit-based solutions? Considerations of how mobility is provided to and used by ALICE populations at all ages will be an important factor in this decision-making process. The DOT will also need to be mindful of the role of the private sector and how to leverage that role to achieve public aims; in scenarios where government is struggling, the private sector must step in.

The "C's" of the Future: The group organized thoughts around the future DOT according to several key terms: catalyst of change; convener of conversation; cooperative in this process (no silos); coordinated; community (coordination with housing and jobs, etc.); creative and mindful of cultural issues; co-construct; collaborative (with the private sector); culturally competent workforce.

Workforce Development: The DOT will need to respond to workforce development needs in the future. It can provide apprenticeship programs for local residents from underserved communities to create a pathway to higher wage work. This can complement the creation of livable, transit-oriented places consistent with environmental and mobility goals.

Technology: What if we had cars that couldn't crash? What would be the role of safety regulators in that future? How would that impact a DOT's ability to ensure mobility when autonomous cars still clog highways? Or will universal broadband obviate congestion? Will we be attending football games in the metaverse in the future?

Group Discussion

- There is a need for **institutional reforms** that would make DOTs more accountable to customers and legislatures. Toll agencies and public private partnerships build in long-term stewardship and make them accountable to real customers. If it were possible, CEOs might want to govern all the modes under one umbrella versus these separate bodies.

- **Mobility as a right** is a visionary concept – everything follows from this. Not just the "what" but the "why." This concept changes how a city or MPO thinks about what their business is. This creates difficult conversations about funding. Not based on mode – it's about what people need is to get to work on time. People think "how do I get everything done in a way that is affordable and safe?" DOTs should be proud of our vision. The bigger problem is to figure out how to bring public along to get there.

- We could term this concept "**access"** for all, instead of "mobility." Mobility is the ability to move freely and easily - to what end? "Access" may be more important – this gets at the ability to enter a place. In Copenhagen, it's not about the technology but about the quality of life. We need to harness the technology for the **quality of life** that we want.

- There is a need for better **community engagement** and integration; there shouldn't be a wall between the DOT and the community. The DOT has an opportunity to be a more proactive and valued member of the community. MPOs are good at planning; maybe this isn't the DOT's job. Where is there an opportunity to step back, DOTs should consider taking it, recognizing that this may be out of character for DOT CEOs.

- There is a lot of agreement in terms of the things that need to change – essential to ask ourselves why we share these goals but they're not happening. Everyone in this room has significant **power** to make change. State DOTs have the authority of shape and re-shape and **co-create**. Innovation can come from creating new types of constraints on the system – "What if we don't have to prioritize enough? What if the people who feel like they're yelling at us were part of decision-making roles so that they understand what's needed?" DOTs put ourselves in a position where they *have* to come along, but this does not produce consensus. DOTs should build a pipeline to get these people on our board so you have to **dialogue** with them. That could be part of creating an uncomfortable space that requires agencies and the public to confront difficult trade-offs and reach a compromise.

NEXT STEPS

The NCHRP Project Panel and research team will use today's input to craft a simple, compelling vision for the future of transportation; one or moonshot ideas; and a menu of actions state DOTs can pursue collectively or individually to move toward the vision. They also will discuss ways to keep the retreat participants engaged as a "challenge network."

APPENDIX A: WORKSHOP PARTICIPANTS

Name	Organization
NCHRP 20-24 (138) Panel Members	
Shawn Wilson	Louisiana Department of Transportation and Development
Julie Lorenz	Kansas Department of Transportation
Carlos Braceras	Utah Department of Transportation
Yassmin Gramian	Pennsylvania Department of Transportation
Diane Gutierrez-Scaccetti	New Jersey Department of Transportation
Patrick McKenna	Missouri Department of Transportation
Bill Panos	North Dakota Department of Transportation
Other State DOT CEOs	
Eric Boyette	North Carolina Department of Transportation
Everett Lott	District Department of Transportation
Nicole Majeski	Delaware Department of Transportation
Russell McMurry	Georgia Department of Transportation
Roger Millar	Washington State Department of Transportation
John Selmer	Nebraska Department of Transportation
Victoria Sheehan	New Hampshire Department of Transportation
Mike Smith	Indiana Department of Transportation
Craig Thompson	Wisconsin Department of Transportation
Marc Williams	Texas Department of Transportation
Members of Opening Panel	
Collin O'Mara	National Wildlife Federation (panel only)
Steve Polzin	TOMNE University Transportation Center, Arizona State University (panel only)
Tim Storey	National Conference of State Legislatures
Anthony Townsend	Cornell Tech's Jacobs Institute
Other Participants	
Zak Accuardi	Natural Resources Defense Council
Erin Aleman	Chicago Metropolitan Agency for Planning
Brittany Birken	Federal Reserve Bank of Atlanta
Leslie Blakey	Coalition for America's Gateways and Trade Corridors
Janet Bowman	The Nature Conservancy
Flora Castillo	Pivot Strategies
Laura Chace	Intelligent Transportation Society of America
Adam Cohen	University of California at Berkeley
Jordan Davis	Smart Columbus
Nat Ford	Jacksonville Transportation Authority
David Harkey	Insurance Institute of Highway Safety
Patricia Hendren	The Eastern Transportation Coalition

Name	Organization
Stephanie Hoopes	United For ALICE
Britta Gross	Rocky Mountain Institute
Tim Jackson	Weyerhaeuser
Matt Johns	Rapides Area Planning Commission
Christine Kefauver	Brightline
Gabe Klein	Cityfi
Caryn Moore Lund	Lilium
Ed Mortimer	NextNav
Joe Moye	Beep
Bob Poole	Reason Foundation
Pam Rauch	Florida Power & Light Company
Mike Steenhoek	Soy Transportation Coalition
Steve Szabo	Space Florida
TRB	
Neil Pedersen	Transportation Research Board
Chris Hedges	Transportation Research Board
Lori Sundstrom	Transportation Research Board
Ann Hartell	Transportation Research Board
AASHTO	
Jim Tymon	American Association of State Highway and Transportation Officials (AASHTO)
King Gee	American Association of State Highway and Transportation Officials (AASHTO)
FHWA	
Kelly Regal	FHWA's Turner-Fairbank Highway Research Center
Consultant Team	
Kirk Steudle	Econolite Group
Susan Martinovich	HNTB
Deb Miller	KU Public Management Center
Steve Lockwood	Steve Lockwood, LLC
Tony Carvajal	Carvajal Consulting and Management
Price Armstrong	Cambridge Systematics
Susan Binder	Cambridge Systematics
Baird Bream	Cambridge Systematics
Evan Enarson	Cambridge Systematics
Mikaela Humphrey	Cambridge Systematics
John Kaliski	Cambridge Systematics
Karen Kiselewski	Cambridge Systematics
Kurt Lehmann	Cambridge Systematics
Leah Pickett	Cambridge Systematics
Danny Shopf	Cambridge Systematics

APPENDIX B: DAY 1 BREAKOUT GROUP POSTERS

Demographics/Prosperity Breakout Group Discussion Board

Tides

Racism and ethnic diversity
Diversity as a strength
Increase diversity, race/ethnicity
Diversity of population
No "majority"
People who stepped out of work - will they step back?

Waves

Aging population
Slowing population growth
International democratic decline/rise in autocracy, uncertainty
Differences in life expectancy via race/demographics, neighborhoods
Life expectancy
Gaps between middle income wages and cost of living

Ripples

Ages and demographics for labor force participation
Uncertainty, immigration
Young people don't want blue collar jobs

Decline married parent families
Mental health/behavioral health
Percent chronic health with youth
Percent population with disability/chronic health issue
Aging population
Huge wage disparity
Resident movement, urban/rural

Communities and Regions Breakout Group Discussion Board
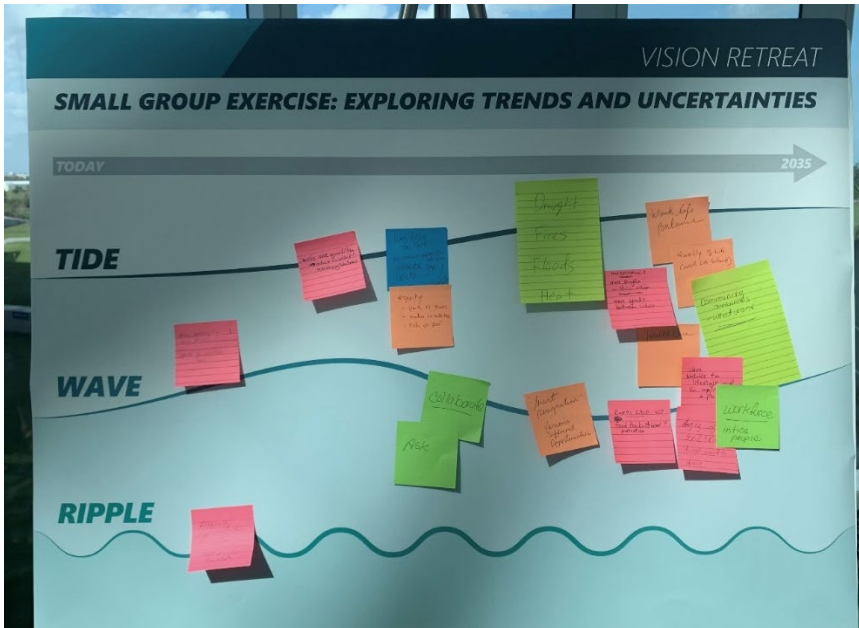
Tide

Drought, fires, floods, heat
Limiting factors to where people can live (wealth gap)
Health care
Work life balance
Quality of life
Equity (auto vs. auto free, rich vs. poor, youth vs. seniors)
Safe air quality (technology to reduce emissions)

Wave

Collaborate
Ask
Workforce, entice people
"Great Resignation" and various opportunities
Healthcare
Community amenities – what do they want?
Cities walkable for lifestyle and aging in place

Rural land use
Flood protection?

Ripple

Flexibility

Trade and Logistics/Future of Work Breakout Group Discussion Board
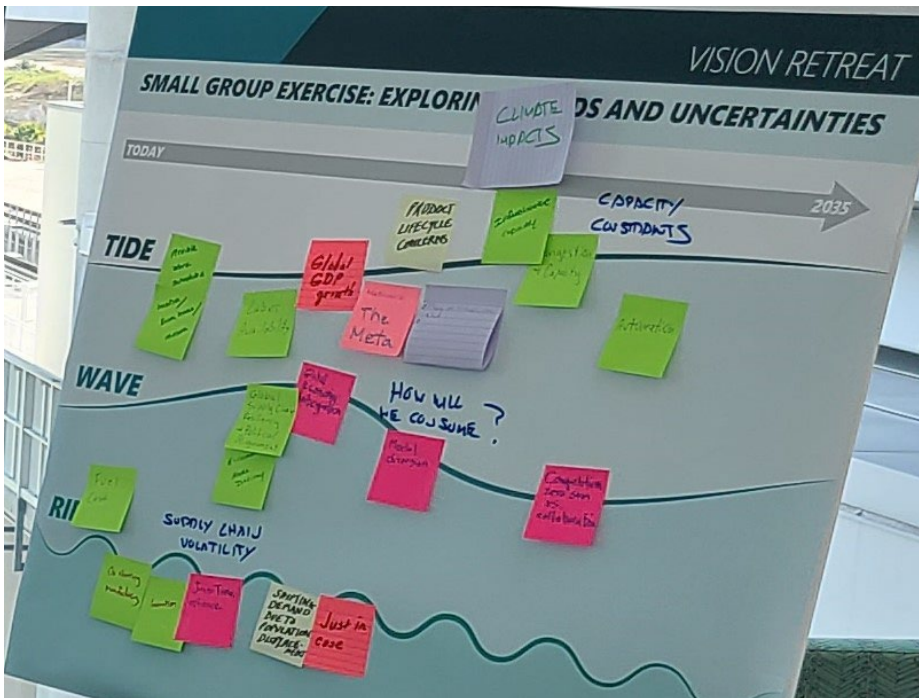
Tide

Climate impacts
Product lifecycle concerns
Congestion and capacity
Automation
Labor availability

Wave

Global gross domestic product growth
The metaverse
How will we consume?
Competition vs. collaboration
World economic integration
Global supply chain resiliency
Modal diversion vs. vertical integration

Ripple

Fuel cost
Supply chain volatility
"Just in case" delivery
Just in time delivery
Shifting demand

Technology and Energy Breakout Group Discussion Board (Board 1)
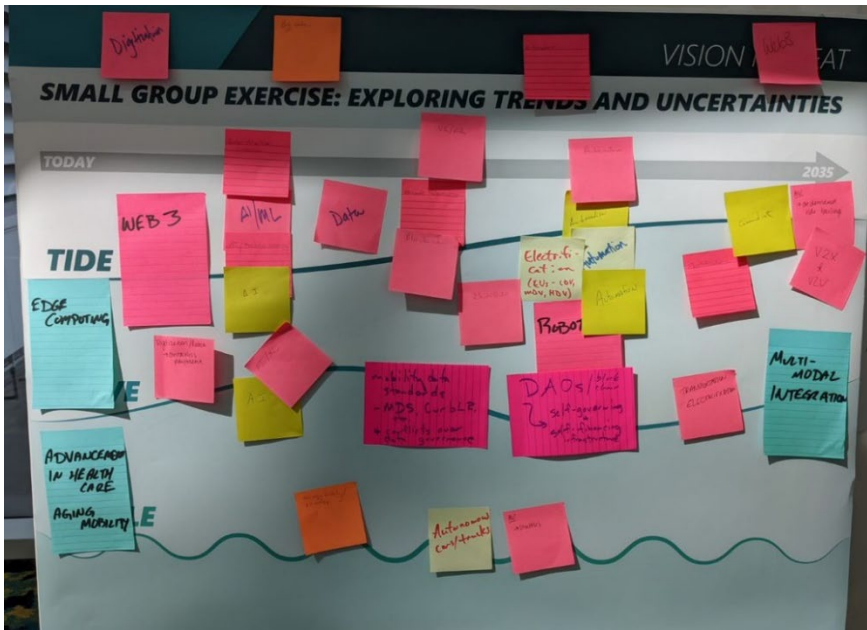
Tide

Web 3.0 (Web3)
Artificial intelligence (AI)/machine learning (ML)
Data
Robots
Automation
Vehicle-to-everything (V2X) and vehicle-to-vehicle (V2V)
Edge computing
Virtual reality (VR)

Wave

Edge computing
Artificial intelligence (AI)
Electrification on electric utilities
Mobility data standards, Mobility data specification (MDS), conflicts our data governance
Decentralized autonomous organizations (DAO) - self-governing and self-financing infrastructure
Transportation electrification
Multi-modal integration

Ripple

Advancement in health care, aging, mobility
Autonomous cars/trucks

Technology and Energy Breakout Group Discussion Board (Board 2)

Tide

Regulated versus unregulated
Distributed versus centralized
Increasing consumption
Renewable energy
Clean energy
Carbon capture
New battery storage
Viable nuclear fusion power
Storage grid electric vehicle charge, renewables
Vehicle to grid
Flexible energy loads
Compatible—viable nuclear fusion power

Wave

Energy density
Clean energy
Vehicle to grid
Flexible energy leads

Ripple

Energy costs

Risk and Resilience/Civic and Governance Breakout Group Discussion Board (Board 1)

Tide

Climate change
Sea level rise
Cybersecurity
Future revenue loss

Wave

Balancing development with environmental value
Wrong expectations
Investing improperly
Extreme weather: heat, flooding, storms

Ripple

Roadway fatalities
Supply chain disruption
Data accuracy
Continual risk assessment
Underinvesting in transit, bike, and pedestrian communities
Overinvesting in highway capacity
COVID behavioral impacts

Risk and Resilience/Civic and Governance Systems Breakout Group Discussion Board (Board 2)
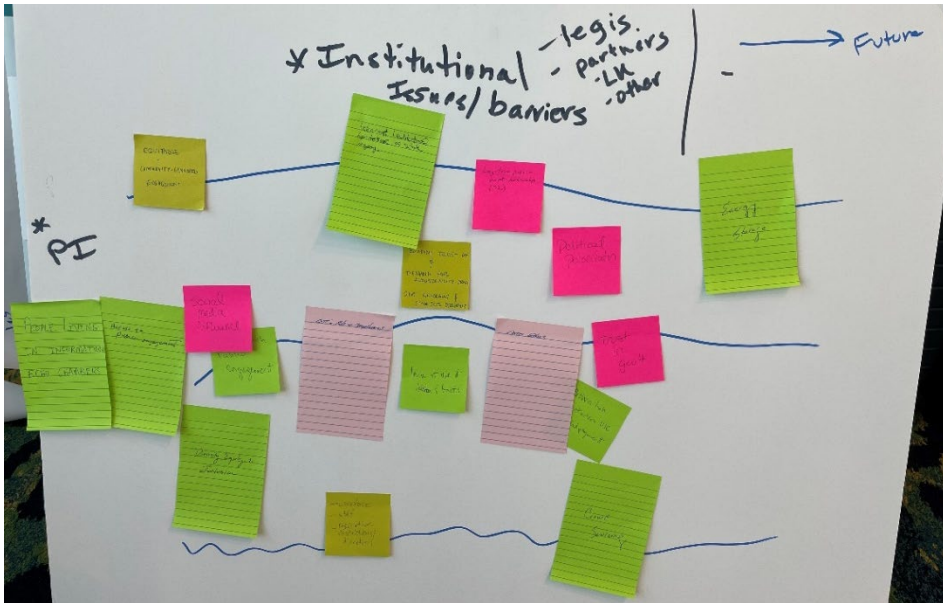
Tide

Institutional issues/barriers — legislature — partners — land use — Other
Future
Energy storage
Political polarization
Legislative restrictions
Long-term public-private partnerships
Equitable and community-centered engagement

Wave

People living in information echo chambers
Trust in government
Data ethics
Broken link between use and payment in transportation
Eroding trust in government and state DOTs
Social media influence
Diversity, equity, and inclusion
Access to public engagement

Ripple

Crowd sourcing
Workforce and staffing

APPENDIX C: DAY 2 BREAKOUT GROUP POSTERS

High Resiliency, Low Opportunity ("Star Wars") Discussion Board

This quadrant reflects the **status quo** in today's cities, where transportation choices available are dependent on wealth. The group saw **modal silos** as a significant issue in this reality; there may be competition where there should be collaboration and complementary actions. Mobility as a Service (MaaS) is one effort to break out of these silos. Better **communication**, both across these modal silos and to DOT customers, emerged as a theme.

In a discussion of how we could move to the right along the axis (towards "High Opportunity"), participants discussed models where the DOT remains central, but more **inclusive**, in the transportation decision-making process. This future DOT looks quite different – it may be **smaller**, **more disperse**, and not necessarily be at the "top of the food chain." The future DOT is less centralized, with staff seen as trusted advisors and communities more in change. Part of this process may involve asking the question of **who DOTs are serving**, and potentially broadening our idea of the customer. DOTs do not "choose" customers; the idea of a rural versus urban influence in decision-making is a political construct created by the specifics of legislative funding structures.

Relatedly, the group considered **how DOTs spend money**, asking if this needs to change to support genuine mobility. Instead of "sustainers of infrastructure," DOTs could start to see themselves as "providers of opportunity." Having adopted this mindset, agencies might begin to approach transit from a **holistic** perspective (example of Jacksonville Transit Authority).

High Resiliency, High Opportunity ("Star Trek") Discussion Board
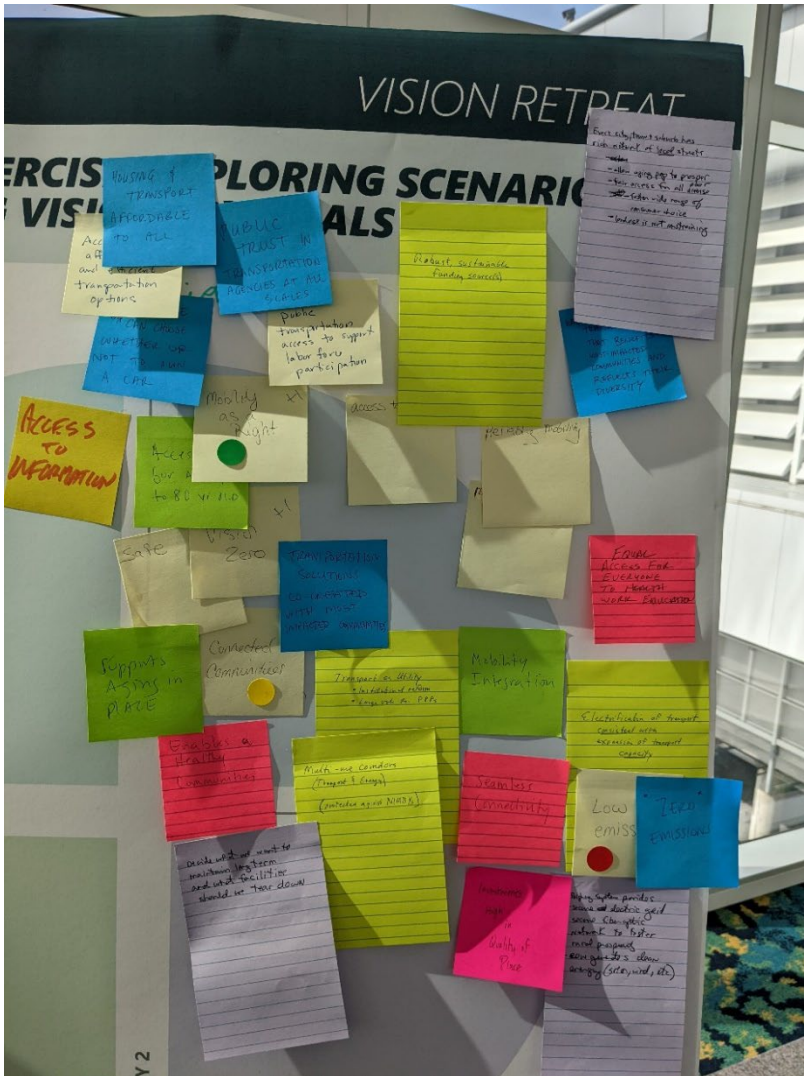
This quadrant represents a **highly equitable** and **technologically advanced/dependent** community. The group characterized this community as one that offers equitable and affordable mobility options for all that are also extremely reliable and resilient. **Safety, seamless connectivity,** and **low/zero emissions** each emerged as common themes that would be highly prioritized in members of this community. The group emphasized a robust **community partnership** and deep understanding of a community's needs is necessary to develop a **shared vision** to achieve a highly equitable community that effectively leverages technology.

The group identified **integrated community understanding** as the foundation this quadrant is built on. This understanding includes planning, engagement, support, partnership, and political understanding with the community. Participants agreed that a shared understanding of the common good and cultivation of a **shared community vision/values** is critical to building and sustaining a highly equitable community that effectively leverages technology. Once this shared vision/values is/are established, **proactive** steps must be taken to achieve that vision/secure those values using **shared resources** (public/private partnership). To ensure proactive action is taken, **institutional change** is necessary to clear barriers to progress while protecting the values and best interests of communities.

Low Opportunity, Low Resilience ("Mad Max") Discussion Board
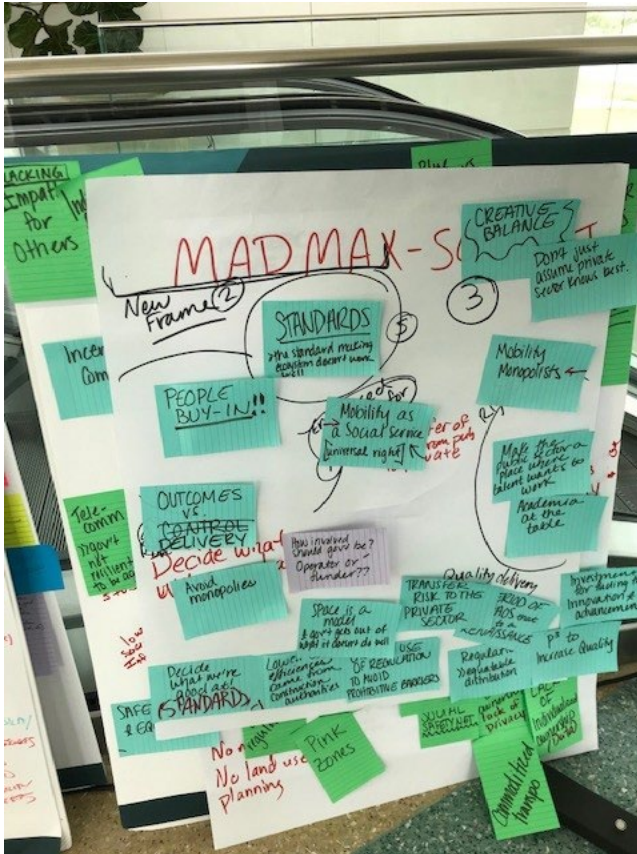
This category represents a **highly inequitable** community with institutions that have **low levels of stability and resiliency**. Power is concentrated within a handful of actors with limited accountability to the rest of society. Some participants argued that this situation is representative of certain contemporary sectors, such as the tech industry, wherein **a small number of companies control large components of social infrastructure** and can make decisions about that infrastructure with limited input from the public or from public representatives. Under such a framework, communities become **increasingly fragmented with high barriers to entry**. Infrastructure systems, whether physical or digital, operate with a lack of transparency and a lack of coordination. However, participants pointed out that some of this privatization of public infrastructure was due to **a sense of cynicism towards the public sector** and its ability to take advantage of new innovations, and the popularity of these private services demonstrated their success at service delivery.

To address the challenges associated with this community, participants acknowledged that private and public sectors have different areas in which they perform well and meet public needs and discussed a framework that would achieve a **creative balance between innovation and equity**. **Public-private partnerships** are thus a key component of making equitable improvements to society. This framework would involve achieving a consensus on what government should be responsible for and what risks it should transfer to the public sector for service delivery. As some members of the group stated directly, **if a government is trying to do everything, it may not end up doing that well**. To reduce and mitigate this risk, there is a need for governments to set **clear standards for private-sector innovations** to operate under and **clear outcomes to evaluate success and quality** in service delivery. Many of these ideas coalesced around the principle of **mobility as a universal right**, which is upheld by universal accessibility in all services.

High Opportunity, Low Resilience ("Avatar") Discussion Board
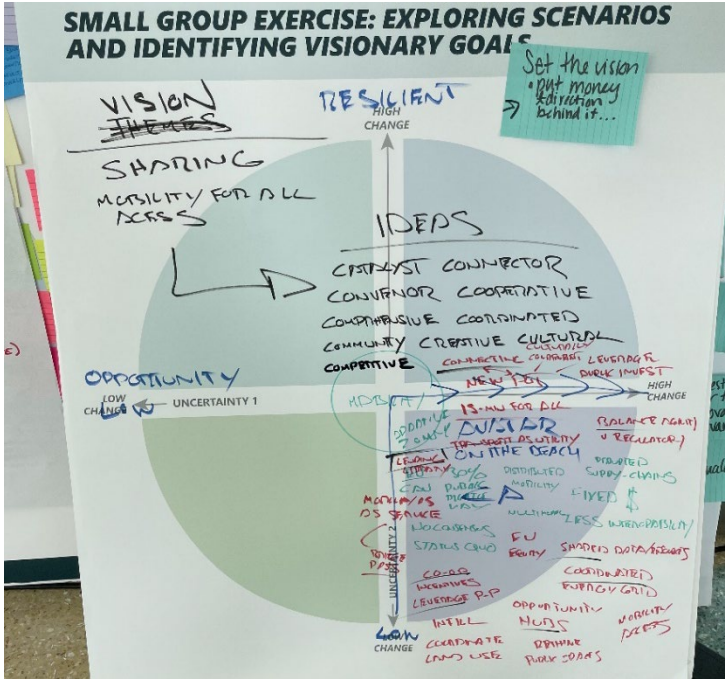
The group discussed low resilience as a possible outcome of today's society if existing funding patterns endure; if there is not **investment in change**, there will not be resilience. Could this future be investments that don't work out? (e.g., "banking on Beta Max"). Participants said that this scenario represented a society that cannot come to agreement on anything. This is also a future where infrastructure is perhaps not operating at its highest and best use. The group also discussed the definition of **equity and opportunity** from the perspective of race/ethnicity, income, and gender, and thought about differences between opportunity and equity. In considering equity issues, one suggestion was that it might be cheaper to provide personal vehicles than to build transit, creating a lending library of cars.

The group discussed challenges associated with **silos**. Transportation should not operate in isolation and should be considered in conjunction with multi-modal and land use decisions. Funding and financing are separate (e.g., co-location of utilities and transportation). Related to silos within DOT are workforce considerations and how the DOT can more directly benefit residence in historically overburdened communities. They noted there are a lot of people who can benefit from apprenticeship programs and local employment requirements – but not all."

The group discussed that where government is struggling, the private sector can and should fill the void. Rural electrification could be one example. Figuring out the right public/private blend is challenging, and DOTs need to ask private partners how they would react to new investments (e.g., new interchange results in new gas station). One example is how vehicle manufacturers, not regulators, are driving vehicle safety. What happens if car crashes are eliminated through technology? What is the role of regulators then? A big idea is **MaaS as a utility**.

The group raised many questions: What does this future look like for people with disabilities and older adults? Given the 70/30 home-based to non-home-based travel currently - will this change over time? Is this the "right" mix? If we go 100 percent work-from-home, what happens to rail investments? What happens to downtown housing? Is this an affordable housing opportunity? What if we made charging infrastructure for all? What would interstate collaboration look like in this future? Why do we assume people are going to continue living in urban areas? Could we see a return to rural living? How can we use existing programs (5310/5311) to bridge the gap until we implement solutions?

APPENDIX D: RETREAT AGENDA

VISION RETREAT

OBJECTIVES

Build collective understanding around the external trends, uncertainties, and possibilities that will shape the future of transportation

Identify visions, aspirational goals, and breakthrough ideas for the future of transportation

AGENDA

MARCH 22, 2022 (afternoon, 1 pm – 5 pm)

Optional Tour: Cape Canaveral Spaceport (8 am-12 noon; hosted by Space Florida)

12:30 | REGISTRATION

1:00 | BUILDING THE TEAM: INTRODUCTION AND OVERVIEW
Welcome and Introduction:
Dr. Shawn Wilson, Secretary, Louisiana Department of Transportation and Development

Julie Lorenz, Secretary, Kansas Department of Transportation

Today's Agenda and Format:
Tony Carvajal, Carvajal Consulting and Management, Facilitator

Initial Discussion and Text Polling

1:40 | SURVEYING OUR WORLD: TRENDS AND UNCERTAINTIES ON THE PATH TO 2035
Panel Discussion:
James Johnson Jr., Director, Urban Investment Strategies Center, University of North Carolina at Chapel Hill

Collin O'Mara, President and CEO, National Wildlife Federation

Tim Storey, Executive Director, National Conference of State Legislatures

Anthony Townsend, Urbanist in Residence at the Jacobs Technion-Cornell Institute at Cornell Tech

2:40 | BREAK

2:55 | DETERMINING OUR POSITION: TRENDS AND UNCERTAINTIES
Small Group Exercise:
Exploring Trends and Uncertainties

Large Group Discussion:
What Matters Most on the Path to 2035?

5:00 | ADJOURN

Optional Evening Tour and Reception: Lake Nona (5:45-7:30 pm; hosted by Beep and Lilium)

NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

VISION RETREAT

AGENDA (CONTINUED)

MARCH 23, 2022 (morning, 8 am – 12 pm)

7:00 | BREAKFAST

8:00 | WELCOME, REVIEW OF TODAY'S AGENDA

8:05 | DEFINING MOONSHOTS
Small Group Exercise:
Exploring Scenarios and Defining Visionary Goals

9:45 | BREAK

10:00 | CASTING A VISION
Report Outs
Large Group Discussion

11:50 | NEXT STEPS AND CLOSING REMARKS
Dr. Shawn Wilson, Secretary, Louisiana Department of Transportation and Development
Julie Lorenz, Secretary, Kansas Department of Transportation

12:00 | ADJOURN

APPENDIX I

Draft Vision Framework
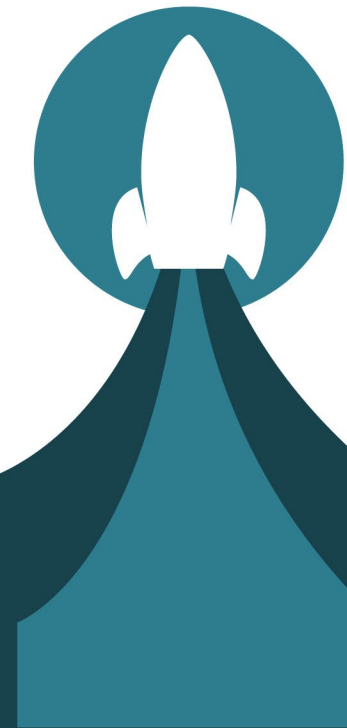
DRAFT VISION FRAMEWORK

This document provides a preliminary framework for a vision for the next era of transportation in the United States, including individual and collective actions state departments of transportation (DOT) can take to move toward realizing that vision.

VISION

Shared values/ambitions for state DOTs, including a desired end state for transportation over the next decade. Intended to help communicate the changing role of state DOTs, including broadening their focus from building and maintaining roads to serving customers and convening partners to manage a comprehensive multimodal transportation system and support community goals.

GOAL	OUTCOME
Community-centered transportation	Reflects community vision and connections at all scales- local, regional, megaregional, national, global
Safe & secure	No fatalities or serious injuries to customers on all modes of the transportation system; the transportation system reduces risks to the public from natural disasters and human decisions
Accessible & affordable	Affordable and convenient transportation options to access jobs, health care, education, food, recreation, and other services for all Americans - regardless of geographic location, age, ability, or socioeconomic status
Seamless & reliable	Convenient, human-centered choices on demand for complete trips for both people and goods from origin to destination, with no unnecessary delay and quick transfers between modes and systems
Healthy & thriving	Transportation investments help grow the economy and enhance the quality of life for all Americans
Clean & sustainable	Zero net emissions of greenhouse gases (carbon-free) and air quality pollutants, and protection and enhancement of the natural environment
Agile & resilient	Communities protected against and able to recover from service disruptions, climate change, and other natural and human-made hazards

NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

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MOONSHOT IDEAS

Bold ideas to make progress toward the vision/aspirational goals, requiring collective action among a large number of state DOTs and other partners.

WHAT IF WE…	WHAT IT COULD MEAN…
Reorient our transportation goals and investments to support communities	• Focus on moving people and freight, not vehicles • Build and sustain diverse, inclusive partnerships • Make major transportation decisions in the context of community visions • Refocus planning process, performance measures, and investment decisions on building and sustaining communities
Rethink how we connect communities	• ***Within communities*** – place greater emphasis on sidewalks, trails, micromobility, and other human-scaled transportation • ***Between communities within a region*** – create more options for local and regional trips including urban and regional transit; strengthen first/last mile connections • ***Between regions within a megaregion*** –provide more connectivity options such as high-speed ground transportation and urban air mobility; redefine how interregional corridors interface with communities • ***Between megaregions within the United States*** – create "Interstate 2.0": rebuild critical corridors (all modes) with 21st century design and materials; close connectivity gaps on multiple modes – highways, rail, water, and air - to support interstate commerce; refocus corridor rights of way as pathways for mobility, energy, water, broadband, other systems • ***Between U.S. and global trading partners***- continue to enhance global gateways and corridors for trade and visitors
Reinvent how transportation systems are operated and managed	• Research, develop, and promote adoption of "Transportation 4.0" solutions- applications of Industry 4.0 technologies (automation, connectivity, artificial intelligence) for transportation through public/private collaboration • Advance human-centered, machine-enabled transportation to enhance safety, mobility, and access
Refresh how transportation systems are powered	• Electrify everything- deploy nationwide network to use electricity and alternative fuel sources throughout the transportation system • Use transportation system to help generate and store energy, such as solar highways, and pavement sensors
Redesign how customers experience transportation	• Create a mobility marketplace that allows customers to choose the travel option(s) that most effectively meet their needs and preferences • Enable a choice of providers, ratings of trips/mode/vehicles for efficiency, consumption-based payment, and mobility budgets for customers

NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

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SPECTRUM OF ACTIONS

Actions that state DOTs can take to advance the vision in ways that work today and in the future for their states. Examples of how actions can be tailored to a specific state's situation are provided below.

LEVER OF CHANGE	SPECTRUM		
	MODEST CHANGE	SIGNIFICANT CHANGE	TRANSFORMATIVE CHANGE
Communications and engagement			
Partnerships	Support nontraditional partnerships (for example, serving on housing coalition or public health working groups)	Establish working groups to maintain regular engagement with nontraditional partners	Leverage convening power and delivery capacity to catalyze community visions and develop/deliver projects for local governments
Policies/regulations			
Plans/programs	Increase emphasis on community vision/values in planning process	Enhance community engagement at all phases of decision-making; flag community-priority projects for incorporation into programs	Work with local government and community partners to redesign planning process with community vision at the center
Assets/right of way	Maintain assets in state of good repair; identify potential vulnerabilities to extreme weather and climate change	Incorporate resilience considerations into asset management decisions	Strategically assess function of existing right of way and assets; make decisions to renew/repurpose/ decommission/relocate as appropriate
Land use coordination	Review transportation impacts of proposed land use changes and consider community impacts of transportation investments during the planning process	Incorporate local and regional land use planning objectives and related policies such as housing into long-range transportation planning process	Play active role in shaping land use decisions, functioning as a long-term planning arm for the state in partnership with local government

LEVER OF CHANGE	MODEST CHANGE	SPECTRUM	
		SIGNIFICANT CHANGE	*TRANSFORMATIVE CHANGE*
Investments			
Technology/data			
Human resources			
Governance/organization			

APPENDIX J

Notes from Various Meetings

NCHRP Project 20-24(138)
Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

WASHTO Work Session Summary
Tuesday, June 7, 2022
7:30 – 9:00 a.m. Central
Dallas, TX

Attendees

WASHTO Board members
Bill Panos, Director, North Dakota DOT (President)
Ryan Anderson, Commissioner, Alaska DOT&PF
Malcolm Long, Director, Montana DOT
John Selmer, Director, Nebraska DOT
Kristina Swallow, Director, Nevada DOT
Tim Gatz, Executive Director, Oklahoma DOT
Joel Jundt, Secretary, South Dakota DOT
Marc Williams, Executive Director, Texas DOT
Carlos Braceras, Executive Director, Utah DOT
Roger Millar, Secretary, Washington State DOT

Additional WASHTO member representatives
Greg Byers, Deputy Director and State Engineer, Arizona DOT
George Abcede, Highways Administrator, Hawaii DOT
Dan McElhinney, Chief Operating Officer, Idaho DOT
Rebecca Qualls, Executive Assistant to the Director, Nevada DOT
Jennifer Turnbow, Deputy Director for Planning, North Dakota DOT
Matthew Swift, Strategic Asset and Performance Management Engineer, Oklahoma DOT
Mark Gillette, Chief Engineer, Wyoming DOT

AASHTO representatives
Shawn Wilson, Secretary, Louisiana DOTD (AASHTO President)
Jim Tymon, Executive Director, AASHTO
King Gee, Director of Safety and Mobility, AASHTO
Gummada Murthy, Associate Program Director, Operations, AASHTO

NCHRP 20-24 (138) Project Team members
Kirk Steudle (CAVita), Principal Investigator
John Kaliski (CS), Project Manager
Susan Martinovich (HNTB)

1. **Project Overview**

   - **Carlos Braceras** introduced the NCHRP 20-24 (138) project, noting the project panel and research team are developing three initial products as part of a future transportation "vision" for the United States:

     o A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals

     o One or more "moonshots" or breakthrough ideas for collective action toward the vision

o A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

Carlos said the project is an initial visioning phase today, which will run through October 2022. A second phase focused on implementation will follow.

- **Kirk Steudle** described project activities to date, including:

  o Review of prior eras of transportation
  o Review of lessons learned from other industries
  o Analysis of major trends and uncertainties shaping the future of transportation
  o Interviews with state DOT CEOs, senior career staff, and emerging leaders, as well as subject matter experts
  o A two-day vision retreat with 16 state DOT CEOs, 29 leaders from other industries, and TRB and AASHTO staff in March 2022.

- **John Kaliski** briefly described the key trend and uncertainties prioritized by the project panel and retreat participants, including demographic change; prosperity and opportunity gaps; technology and innovation; and risk and resilience.

- **Bill Panos** explained the purpose of today's work session is to get initial input from the WASHTO Board on the visionary goals, moonshot concepts, and spectrum of actions currently under development.

- **John, Kirk, and Susan Martinovich** each presented an element of the draft recommendations, and **Bill** facilitated discussion among Board members.

2. **Visionary/aspirational goals**

- Every state is different. Is this a good framework that works for all of us?

- DOTs traditionally have focused on building stuff, not on serving people. We're good about talking about assets, but not people. Everything we do ultimately is for people. Our future is about better connecting people and supporting their well-being. These goals move us in that direction. The connection is obvious on topics like safety. We also need to think about topics like health and how they connect to transportation.

- Transportation is tied to daily life. At the end of the day, if you can't move, you can't live. It's about equity and inclusion; getting kids to school and healthcare. It's about our economy too – if a governor wants to impact the economy, the first place to start is with the DOT.

- Goal framework is a good start. Thinking about how it applies to my state, which is so dependent on all mode. One question is where do topics like human trafficking and drug trafficking fit? Transportation is a conduit for these, and we're being asked to address them.

3. **Moonshot concepts**

- The original moonshot under JFK ultimately was not about getting to the moon; it was about restoring national confidence.

- This is a tremendous challenge. Collaboration will be important. Our transportation commission includes two major trucking companies, and that perspective is valuable. We need to think about engagement with automated vehicle, drone, and other technology providers, and also with Native American nations. We have a diverse community. The biggest challenge is getting from here to there – how do we manage the process to get to a moonshot, and how do we deal with legacy systems at the same time? I'm thrilled to be talking about these topics.

- It's important for us to have the discipline of thinking about vision first before we get into actions. The moonshot ideas help us think about how quickly we could see change. As an example, Uber and Lyft were disruptions that rapidly reshaped the taxi industry. The Cape Canaveral tour in Florida was an example of how private sector investment and innovation could produce a better, more affordable solution.

4. Spectrum of actions

- We found the enemy, and the enemy is us. Government is built to prevent moonshots. IIJA has too many buckets and risk avoiders. Moonshots are about taking risk, not mitigating them. Transportation money can't be used for health, and vice versa, and yet these solutions are integrated. Our training and processes are engineering centric, and we need to adapt them to be community focused.

- Community centered is the right approach. The first moonshot concept is the key one – everything else is a way of accomplishing the vision of being community focused. It all starts with serving the community. We have been talking about many of the same concepts in our state. We might want to look at more personal language – not just community, but people and families. The strategies and actions will differ across states; they also will differ within states- what works in a large urban area is different from what works in a smaller city or rural area. This is a great start.

- Agree with the point about differences within states. We have fast-growing cities and some rural areas and Tribal Nations with older roads and inaccessible areas. We need to untie funding restrictions and buckets to support this kind of a vision.

- The biggest challenge will be the societal aspect. What is acceptable? Some people aren't ready for automated vehicles. Multimodal options are important.

- Our role is bigger than in the past. We need to focus on our high-level purpose and take the shackles off.

- The scalable piece is important. It's interesting that the system maps in the presentation included highways but not transit or rail – as a society we have oriented our thinking about geography around highways. I'd encourage future presentations to include the entire network or even encourage us to think about what connectivity looks like for other modes. Large segments of our population – perhaps 25-40 percent - don't have access to cars, and all of us eventually will outlast our ability to drive. Let's keep the focus people centered. We also need to think about equity. As a DOT secretary I have concerns about the impacts of Interstate highways on communities in my state; but I also recognize that the decisions we make about these corridors have impacts on other states that rely on them to move goods, often through our ports.

- Important for all of us to think big and bold. What can you do to create the community of your dreams?

5. Next Steps

- The team will send copies of the presentation and vision framework document as well as the supporting trends worksheets to WASHTO Board members for further review; please send comments/questions to Kirk, John, or Susan.

- The team will explore the possibility of an additional discussion as part of a virtual meeting in late summer.

NCHRP Project 20-24(138)
Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

NASTO Work Session Summary
Wednesday, July 13, 2022
Hartford, CT

Attendees

NASTO Board members
Joseph Giulietti, Commissioner, Connecticut DOT
Nicole Majeski, Secretary, Delaware DOT
Jim Portis, Secretary, Maryland DOT
Jamey Tesler, Secretary, Massachusetts DOT
Victoria Sheehan, Commissioner, New Hampshire DOT
Diane Gutierrez-Scaccetti, Commissioner, New Jersey DOT
Marie Therese Dominguez, Commissioner, New York State DOT (president)
Yassmin Gramian, Secretary, Pennsylvania DOT

Additional NASTO member representatives
Pamela Sucato, Director, Government Relations and Policy Coordination, Connecticut DOT
Shante Hastings, Deputy Secretary and Chief Engineer, Delaware DOT
Joyce Taylor, Chief Engineer, Maine DOT
Bill Cass, Assistant Commissioner, New Hampshire DOT
Andre Briere, Deputy Commissioner, New Hampshire DOT
Melissa Batula, Acting Executive Deputy Secretary, Pennsylvania DOT
Michele Boomhower, Director of Policy, Planning & Intermodal Development, Vermont AOT

AASHTO representatives
Shawn Wilson, Secretary, Louisiana DOTD and AASHTO President
Jim Tymon, Executive Director
King Gee, Director of Safety and Mobility

NCHRP 20-24 (138) Project Team members
John Kaliski (CS), Project Manager
Joe Zissman (CS)

1. Project Overview

Shawn Wilson introduced the NCHRP 20-24 (138) project, noting the project panel and research team are developing a future transportation "vision" for the United States. He noted that the project has challenged the panel to think about the ultimate goal and vision for transportation in the United States. He also said the project is not just about developing the vision, but also about buy-in for the vision. The intent of the regional workshops this summer is to gather additional input as we prepare to bring a vision to the full AASHTO Board in October.

John Kaliski briefly reviewed the research work to date and the initial thinking on three potential products:

- o A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals

- o One or more "moonshots" or breakthrough ideas for collective action toward the vision
- o A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

John distributed copies of a brief overview presentation, a draft vision framework, and 10 supporting trends factsheets.

2. Discussion

- I would recommend providing greater emphasis on safety in the vision and goals. The vision also should be looking at mobility of all forms.

- We will never build anything that looks like the Interstate again. Our politics are very different than in the 1950s. So, we need a menu to take account of where everyone is and what things we can do. NEVI has forced all of us to talk to each other about border crossings. We have to make sure we're planning by the 50-mile target and that people can continue to see the Interstate as a system blind to state lines. That's the spirit we should have here too. Those five moonshot ideas to me become the framework of activities that we can build on. With MUTCD, our customers recognize the symbols and the signs because of our coordination; can we articulate actions in these new areas in a similar way? We don't come in with bulldozers and backhoes and tear up your neighborhood anymore – DOTs have become much more cognizant of our social responsibility, and we don't promote that enough. This gives us the opportunity to try and change that public misperception in a coordinated way

- We have to undo everything we've done so far in terms of our thinking. We always focus on our assets – roads, trains, bridges, etc. We need to shift to the people – how transportation is going to serve the people. What matters to people is education, healthcare, jobs. Everything we're talking about with IIJA is an opportunity to redefine and create a new identity for the transportation industry. The reason we are referring to a "moonshot" was because the Apollo program was designed to rebuild the country's faith in its systems. This is the same thing for transportation.

- I agree with the importance of safety. We start on different points in that journey, but we all end up in the same place. Everything we're dealing with comes down to safety. Do we convince ourselves that we can move all of our own workforce safety and effectively? First you have to convince yourself and then convince everyone else.

- It used to be that we were builders of things. It isn't anymore. What we do is a means to an end, and we do it in a variety of ways. Safety is embedded in all of it. Our commitment to communities is all about keeping them safer – whether it's the installation of a full-phase walk signal or big things.

- As we think about the term "moonshot," we should keep in mind that everyone at NASA understood what the mission was and why it was so important.

- I appreciate where this is heading in terms of the spectrum of actions. We're not the DOTs of old. We've already changed significantly – we want to take credit for where we already are on that spectrum and communicate where we go from here and how we get there.

- The fact that AASHTO is taking this project on, in addition to NCHRP, it makes this about the whole transportation community.

Shawn Wilson said he appreciates the input. In every region, this discussion takes on a different perspective, but the commitment to being community-centered is there.

3. Next Steps

The team will explore the potential for a web-conference of the NASTO board in late summer to provide additional input to the process prior to the AASHTO Annual Meeting.

The project team is available for individual briefings as well, particularly for CEOs who were not able to attend the Vision Retreat in March 2022 and/or participate in the prior round of interviews.

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Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

MAASTO Work Session Summary
Wednesday, July 27, 2022
Des Moines, IA

MAASTO Board Members
Julie Lorenz, Secretary, Kansas DOT (MAASTO chair)
Omer Osman, Secretary, Illinois DOT
Michael Smith, Commissioner, Indiana DOT
Scott Marler, Director, Iowa DOT
Jim Gray, Secretary, Kentucky Transportation Cabinet
Paul Ajegba, Director, Michigan DOT
Nancy Daubenberger, Commissioner, Minnesota DOT (virtual participation)
Patrick McKenna, Director, Missouri DOT
Jack Marchbanks, Director, Ohio DOT
Craig Thompson, Secretary, Wisconsin DOT

Additional Attendees
Shawn Wilson, Secretary, Louisiana DOTD and AASHTO President
Joel Skelley, Director of Policy, Kansas DOT
Jim Tymon, Executive Director, AASHTO
King Gee, Director of Safety and Mobility, AASHTO

NCHRP 20-24 (138) Project Team members
Kirk Steudle (Econolite), Principal Investigator
John Kaliski (CS), Project Manager
Susan Martinovich (HNTB)
Baird Bream (CS)

1. Project Overview

Julie Lorenz introduced the project and discussed the concept of a national vision for transportation. Secretary Lorenz provided an overview of the development of the vision framework and the input received from different stakeholders during the process. Secretary Lorenz described the relationship between the components that the group would review and discuss today:

- A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals.
- One or more "moonshots" or breakthrough ideas for collective action toward the vision.
- A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

While she encouraged everyone to recognize that DOTs have broader goals and higher aspirations than just being road builders, she emphasized these actions are designed to be broadly applicable to each DOT's unique needs and operating contexts. She encouraged participants to think of this initial framework not as an anchor, but a milestone. The intent of the regional workshops this summer is to gather additional input as the project team prepares to bring a vision to the full AASHTO Board in October.

Kirk Steudle reviewed highlights of the vision framework developed to date. The project team distributed copies of brief overview presentation, draft vision framework, and supporting trends factsheets.

2. Discussion

- It is challenging to build and work towards a vision under a polarized political environment. The symbolism of the individual DOTs coming together to offer a shared vision is important and bold. I appreciate the effort to bring in non-traditional partners to call attention to some of the broader challenges and issues, such as the 13% of American households who live below the poverty line and the 29% of who are considered to be asset-limited, income-constrained, and employed (ALICE). State DOTs can address these issues and break down the barriers that keep people from economic opportunity.

- I agree with the framing of the process, emphasizing the importance of avoiding the temptation to jump directly to a tactical solution and instead focus first on a vision. The original moonshot – the moon landing – was not just a "10x improvement," but something that had never been done before. We should think in such visionary terms while trying to improve "health, wealth, and security for everyone." The "community-centered transportation" vision balances between bottom-up approaches, which provide local context for needs and priorities, and top-down approaches, which can maintain a strategic perspective for national priorities such as intestate commerce. In response to the comment in the presentation that the U.S. may not build another interstate highway system, the digital highway – a digital overlay of our existing infrastructure – is a comparably important and transformative initiative, even if it does not "build" a new system.

- Any time a DOT defines a mission or a vision, it is essential to incorporate these statements into everyday activities so that the DOT can demonstrate success and progress. With the passage of the Infrastructure Investment and Jobs Act (IIJA), DOTs have a significant opportunity to improve the transportation system, but also have a responsibility to demonstrate improvement in the quality of life for residents in their states.

- We need to show movement in the right direction by highlighting projects that were underway before IIJA but are representative of IIJA's policy goals. DOTs need to be thinking not only about how they execute projects under IIJA, but also how their actions will influence the next surface transportation reauthorization bill.

- The need to demonstrate change was part of the motivation behind establishing the Challenge Network of non-traditional partners for this project. DOTs needed to hear from more voices that challenged them to demonstrate changes DOTs are making and benefits they are creating. The Challenge Network motivated DOTs to "think big enough, deep enough, and differently enough."

- We should expand the Challenge Network to include more health and human services groups from both urban and rural areas. Our state leadership puts multiple departments together to address issues, and this approach is being applied to improve coordination of human services transportation. Other agencies may not be as effective at managing transportation service programs that are funded through non-transportation sources (such as health and human services), but we can help them improve their management practices. Our desire is to share best practices rather than take over programs.

- There are over a dozen sources of social service funding for transportation and there is little coordination among them, despite efforts from Congress.

- When considering mobility as a concept, the transportation industry must recognize the economic component of mobility as well. There's a baseline level of economic stability that each American needs to make progress. DOTs and partner agencies must establish a baseline level of mobility that

is essential to social belonging and economic stability. It gets back to the fundamental vision of transportation: access for all. What can transportation do to help build that baseline of stability?

- I agree with the need for taking an individual perspective of mobility. This includes first-mile and last-mile accessibility issues for transit.

- Regarding the demographics and prosperity trends: how can a DOT can contribute to every change driver. We should take the goals, identify a way that DOTs impact every outcome, and build a metric to demonstrate that impact. We should consider how the proposed moonshot ideas and action would address these trends.

- Perhaps we need a crosswalk between the moonshots and actions and the desired outcomes.

- We should consider the concept of equity as it relates to community-centered transportation. DOTs should identify gaps in transportation service coverage and access. DOTs also should conduct in-depth outreach to community groups to define how these gaps affect outcomes for people and to engage local expertise for decision-making processes.

Shawn Wilson closed out the discussion by encouraging DOTs to advance a vision as an industry. While the issues that were discussed are prevalent at the federal level, it is important for DOTs to not wait for elected or appointed leadership to give direction. Secretary Wilson encouraged using the Challenge Network to galvanize people outside the industry around the goals expressed in the vision.

3. Next Steps

A webconference will be scheduled to receive additional input from the MAASTO board prior to the AASHTO Annual Meeting.

The project team is available for individual briefings as well, particularly for CEOs who were not able to attend the Vision Retreat in March 2022 and/or participate in the prior round of interviews.

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NCHRP Project 20-24(138)
Collective and Individual Actions for State Departments of Transportation Envisioning
and Realizing the Next Era of America's Transportation Infrastructure – Phase I

SASHTO Conference Summary
Tuesday, August 30, 2022
Biloxi, MS

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SASHTO Board Members
Brad White, Executive Director, Mississippi DOT (SASHTO chair)
John Cooper, Director, Alabama DOT
Lorie Tudor, Director, Arkansas DOT
Russell McMurry, Commissioner, Georgia DOT
Jared Purdue, Secretary, Florida DOT
Jim Gray, Secretary, Kentucky Transportation Cabinet
Shawn Wilson, Secretary, Louisiana DOTD (AASHTO President)
Eric Boyette, Secretary, North Carolina DOT
Eileen Vélez Vega, Secretary of Transportation and Public Works, Puerto Rico
Butch Eley, Secretary, Tennessee DOT
Angela Whitworth, Georgia DOT (SASHTO treasurer, ex officio)
Drew McWhorter, Mississippi DOT (SASHTO secretary, ex officio)

Additional State DOT Attendees
Ed Austin, Chief Engineer, Alabama DOT
George Conner, Deputy Director, Operations, Alabama DOT
Will Watts, Assistant Secretary for Engineering and Operations, Florida DOT
John Hibbard, Operations Director, Georgia DOT
Jeff Ely, Chief of Staff, Mississippi DOT
Joey Hopkins, Chief Operating Officer, North Carolina DOT
Burt Tasaico, Strategic Initiatives Director, North Carolina DOT
Justin Powell, Deputy Secretary for Finance & Administration, South Carolina DOT
Brandye Hendrickson, Deputy Executive Director for Planning and Administration, Texas DOT
Lance Simmons, Chief Engineer, Texas DOT
Cathy McGee, Chief Deputy Commissioner, Virginia DOT

Additional Attendees
Jim Tymon, Executive Director, AASHTO
King Gee, Director of Safety and Mobility, AASHTO
Gummada Murthy, Associate Program Director, Operations, AASHTO

NCHRP 20-24 (138) Project Team members
Kirk Steudle (Econolite), Principal Investigator
John Kaliski (CS), Project Manager
Alpesh Patel (CS)

1. Project Overview

Shawn Wilson introduced the project and stressed the importance of outlining a vision for the future of transportation. He emphasized the project is not designed to direct state DOTs in a top-down manner, but to provide tools and resources including:

- A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals.
- One or more "moonshots" or breakthrough ideas for collective action toward the vision.
- A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

Shawn said the work to date considered trends to help state DOTs recognize and respond to unprecedented change that is in concert with AASHTO's strategic plan; valuable insights from a larger circle of friends and stakeholders with differing views of transportation; and an opportunity to ask hard questions and engage in critical conversations about the future of transportation. This included a visioning retreat involving 17 state DOT CEOs and about 30 thought leaders and subject matter experts in March 2022 in Orlando.

Kirk Steudle distributed copies of the draft vision framework and supporting trends factsheets. Kirk walked through the handouts describing the content and noting that the vision is intended to reflect that every state is unique. The vision emphasizes the importance of community centered transportation, recognizing there are many scales of community from local to regional, multi-regional, statewide and global perspectives. Kirk described the levers the scale of change and potential actions (from modest to transformative), including how states may find themselves at different stages and places on the spectrum.

2. Discussion

- My perspective on the project changed significantly at the Orlando visioning retreat because of the input from the thought leaders outside of transportation. The focus shifted from identifying another major national investment to describing how transportation can support broader community and economic goals. The vision framework and spectrum of actions captured the thinking well, but the document does not capture yet the potential transformative changes in the interface with the private technology sector. DOTs need to expand relationships with the private sector and find ways to work together and accomplish their unique agenda. The moonshot part is positioning to develop these relationships. The moonshot was previously considered the Interstate system – today it should focus on technology and operational aspects of managing an integrated transportation system. Data sharing, data management, vertiports, and other forms of mobility are integrating transportation at an unprecedented rate. The Interstate Highway System will remain an important asset moving forward and can be modernized to address these trends.

- We should recognize the importance of policy as a lever for change. CEOs typically execute on the federal aid program expecting only incremental change. IIJA introduced important changes and future federal acts may be more transformative but will take time to implement. State DOTs face challenges to optimize funding and integrate transportation with other programs from state legislative constraints. The policy piece is critical because we need to totally rethink the structure of transportation funding and finance.

- Communication and engagement are critical to coordinate land use and transportation decisions, which goes a long way to facilitate integrated, multimodal services.

- Each CEO has levers they can pull and use to influence change in their role. I like the lever and spectrum approach as it helps to frame what states can do independent of the federal government. The levers are dependent on each other and we need to leverage those relationships. Prior success has occurred through utilizing levers and empowering staff on the ground to execute change.

- Funding remains the biggest challenge and should be addressed explicitly as a moonshot idea or a lever or change.

- Funding is a state specific issue. Some of the funding questions can be resolved through pulling the right lever at the state level. It is best to focus on where we are like minded and what we have in common rather than trying to force a single funding direction on every state.

- Interested in learning how to offer ideas related to funding and move directionally towards the big "what if" questions to test options and implications.

Jim Tymon noted the AASHTO board meeting will hear a summary in October including a discussion on next steps.

Shawn Wilson concluded by noting this was the last of the briefings to the four regional AASHTO conferences and the AASHTO Board of Directors would receive an update at the October meeting. He stressed the excitement and energy building around this project and looks forward to the next phase of work.

NCHRP Project 20-24(138)
**Collective and Individual Actions for State Departments of Transportation Envisioning
and Realizing the Next Era of America's Transportation Infrastructure**

Reconvening the Challenge Network
9/30/2022

Attendees

Challenge Network Members

- Zak Accuardi (National Resources Defense Council)
- Erin Aleman (Chicago Metropolitan Agency for Planning)
- Flora Castillo (Pivot Strategies)
- Laura Chace (Intelligent Transportation Society of America)
- David Harkey (Insurance Institute of Highway Safety)
- Patricia Hendren (The Eastern Transportation Coalition)
- Matt Johns (Rapides Area Planning Commission)
- Ashby Johnson (Capital Area MPO)
- Christine Kefauver (Brightline)
- Deron Lovaas (National Resources Defense Council)
- Caryn Lund (Lilium)
- Edward Mortimer (NextNav)
- Steven Polzin (Arizona State University)
- Greg Slater (Tampa-Hillsborough Expressway Authority)
- Mike Steenhoek (Soy Transportation Coalition)
- Steve Szabo (Space Florida)

NCHRP Project Panel Members

- Julie Lorenz, Secretary, Kansas DOT
- Shawn Wilson, Secretary, Louisiana DOTD

AASHTO Staff

- Jim Tymon
- King Gee

NCHRP Staff

- Ann Hartell

Research Team Members

- Kirk Steudle, Econolite/CAVita
- Deb Miller, KU Public Management Center
- John Kaliski, Cambridge Systematics
- Evan Enarson, Cambridge Systematics
- Leah Pickett, Cambridge Systematics
- Tony Carvajal, Carvajal Consulting & Management

Introduction/Overview Presentation

Julie Lorenz welcomed all participants and thanked them for their time. She said this process is an opportunity to map out a vision for best way transportation can be delivered. The project team wants to start out by listening to everything. The conversations this group had in Orlando at the Vision Retreat in March have already enormously impacted how states are thinking about transportation. We want participants to "push us to be uncomfortable."

Julie provided a brief presentation on the initial thinking coming out of this process, focusing on transportation is a means to an end. At the center of the vision is "community-centered transportation." Community can be scaled up or down – everything from a neighborhood to globally. This means understanding that transportation is a system of systems and consider this system connects across communities. She reviewed the aspirational goals for the system as well as initial concepts for "moonshots" to advance the vision over the next decade.

Discussion: What additional suggestions do you have for aspirational goals or moonshot ideas that would build on the conversation in Orlando?

- Good thinking in the presentation. The Infrastructure Investment and Jobs Act (IIJA) embraced a lot of these ideas. Based on experience with Congress, it important to define the federal versus the state or local role. That has been a hang-up in implementing big ideas in the past.

- What if the Federal role doesn't become clear? Does this mean state DOTs should not do anything?

- Many state DOTs are marching far ahead of the Federal government. They should keep marching on ahead. Many provisions in IIJA embrace DOTs that think outside of the box. We should be building on this as we get to another Federal bill. We should not wait for the Federal government.

- The language about supporting communities feels apologetic. Many DOTs are already doing this. Be careful of how you brand this, particularly about implying it's only about moving people. Freight and commerce also support communities. Be careful about images in slides and what they are communicating – for example, the final presentation and document should communicate mobility for all ages including elderly, as well as all modes including paratransit and micromobility. The document seems transit-intensive right now, and transit has been struggling for a decade. Be careful in implying that transit is the future. Be sure to address the relationship between institutional levels. Language and positioning around that needs to be in context of roles– people thinking Federal government will pass through states and go directly to local governments. Also, safety obviously is a huge issue and could be stronger in the presentation.

- In terms of moonshot goals, it is important and valuable to land on goals that are specific, clear, and measurable. This framework makes sense, and the two goals that are front of mind for me and my organization are zero-emissions transportation system and vision zero. Those are clear and measurable. You can set a track and see if you're getting there or not.

- Would include multimodal as an intentional "orbit" or goal area. It is not always perceived that multimodal is the goal if it is not stated.

- Adaptability is key. Our planning horizon is so short today. The last thing we want to do is take a guess at where we'll be in 50 years and start working towards that and have guessed wrong. What we're really asking folks to do as an industry is to rethink the lens through which we're doing what we're doing. The message is that "I want you to work on what we can be versus what we are." We should be mindful of operations versus planning roles. A healthy DOT has that healthy balance of day-to-day operations and

the planning voices at the table around what we can be. Each of these planning areas in the draft vision is intentionally broad, which is good. We are living a lot of these every day and it comes down to asking teams to think differently about how they make those decisions. We are managing a system in a dynamic playing field. This means not being afraid to take a step back, or take a few steps back, to better deliver on community goals.

- The ultimate moonshot for us would be an equitable system. Didn't see this in our goals. If we start with that premise, the rest flow from this.

Discussion: How could your organization or industry contribute towards achieving this vision?

- Echo the comment about messaging and that transportation agencies would bristle if the document suggested we have not been working towards some of these goals. Other thoughts:

  o Who's going to watch the shop? The private sector has been shifting the landscape and changing options. Who is going to watch out for the folks who don't have the finances or the voice to articulate their needs? Organizations need to stay grounded and watching out for the greater good.

  o Agree the comments on adaptability.

  o If don't have a way to measure this, we won't make progress. How do we make sure we have data on all these goals?

  o Collaboration is important: how do we merge our collective moonshots and not be so worried about state boundaries? Regional/state/multimodal partnerships.

- The conversation about where we could be in the future could be supported through MPOs. MPOs are functions of the federal government. Their job is to think about the 30-year plan. MPOs strengthening partnerships to support DOT partners. The structures are there but we need to use them better.

- Workforce development will be important. Transportation is more than civil engineers these days – and there is a much more diverse workforce. There is more of a disconnect between the academic community and real work than there has been in the past. People are interested in publishing papers and not interested in real world. Doesn't feel that there is a "deep bench."

- Echoing some of the thoughts from the Vision Retreat: an aspirational goal is to accomplish more by DOING less. Focus on our agencies' strengths then delegate (and oversee) the rest. If planning or outreach is not a strength of a particular DOT, the MPOs are built-in regional partners that can be treated as extended staff for DOTs.

- As leaders in this industry, we have to make sure we're giving our teams permission to think differently. We need to be thinking about workforce skills that we're going to need in 10 or 15 years. What tools and skillsets do we need? Toll authorities could be in a position to try things at a smaller scale and be a testbed. Would like to see a stronger relationship between toll authorities and DOTs and to try things together.

Discussion: How could state DOTs work more effectively with your organization or industry towards this vision?

- We are seeing a need for more data sharing and transparency. We also are seeing a need for centering deeper partnerships in communities. The connection between public input and outcomes is important and small organizations do not have the capacity to do that. We need to give them a clear pathway to directly shaping project outcomes.

- Agree with comments about public engagement and being clear about how communities' input will be incorporated. Need incentives for working together.

- Can state DOTs have a more open mind about what MPOs can do and what skillsets they can bring to the table. A lot of the planning work that DOTs do could be better done by MPOs, especially the environmental work.

- How do we measure or perceive an MPO's ability to do more? Thinking about some MPOs in my state that don't have the capacity, and others that do.

- Look at their experience and background and willingness to do other things. Every MPO isn't able to do some of these things. Some don't have the budget or the staff.

- MPO long-range plans could be a good stand-in for whether they have the capacity to do broad-based analysis of systems and handle the complexity required to address these issues.

- STIPs and TIPs are nominally improvement programs, bit it is difficult for the public to understand what the priorities actually are. We tried to sift through the spending priorities by sifting through STIPs. These documents should be more user-friendly and understandable.

- Important to continue to work borders as mentioned before - because people don't think about state/county/city borders.

What's Next?

Julie Lorenz (Kansas DOT): We will convene the group again in 2023 for review and comment. We will begin looking at pilot projects. We welcome thoughts on how AASHTO engagement can be of value to you as well as what voices are missing? Several takeaways from today's conversation: We can learn. One thing we can learn is this spirit of entrepreneurship. We also need different skillsets- for example, behavioral psychology and recognizing how people react to systems. If we're going to have a high-tech system, we're going to have a high touch system and a good understanding of how systems exist within the human ecosystem.

Jim Tymon (AASHTO): Appreciate the comment about the different levels of performance at MPOs. The same goes for state DOTs. Appreciate everyone taking time to participate in today's conversation.

NCHRP Project 20-24(138)
Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

WASHTO Board Presentation Summary
Thursday, October 6, 2022

WASHTO Board Members
Kristina Swallow, Director, Nevada DOT (WASHTO President)
Carlos Braceras, Executive Director, Utah DOT
Joel Jundt, Secretary, South Dakota DOT
Luke Reiner, Director, Wyoming DOT
John Selmer, Director, Nebraska DOT

Additional Attendees
Shawn Wilson, Secretary, Louisiana DOTD and AASHTO President
Julie Lorenz, Secretary, Kansas DOT
Steve Hale, Director of Communications, Kansas DOT

NCHRP 20-24 (138) Project Team members
Kirk Steudle (CAVita, Principal Investigator
John Kaliski (CS), Project Manager
Susan Martinovich (HNTB)
Leah Pickett (CS)

1. Project Overview

Julie Lorenz introduced the project and discussed the concept of a national vision for transportation. Secretary Lorenz provided an overview of the development of the vision framework and the input received from different stakeholders during the process. Secretary Lorenz described the relationship between the components that the group would review and discuss today:

- A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals.
- One or more "moonshots" or breakthrough ideas for collective action toward the vision.
- A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

Secretary Lorenz encouraged everyone to recognize that DOTs have broader goals than just being road builders, but also emphasized these actions are designed to be broadly applicable to each DOT's unique needs and operating contexts. She encouraged participants to think of this initial framework not as an anchor, but a milestone. The intent of the regional workshops is to gather additional input as the project team prepares to bring a vision to the full AASHTO Board in October.

Shawn Wilson provided an update on the follow-on call with the Challenge Network, noting that meeting validated the work the team has done thus far.

2. Discussion

- The final document should tie the vision to freight as well as people – thinking about mobility as the movement of "people and the things that people need."

- The spectrum of actions should include meaningful smaller changes that agencies can implement.

- We should ensure we use words that work for multiple states and do not get interpreted in a political way.

- The visioning document has come a long way and given the nebulous challenge of this effort, we should be pleased with the result so far.

Kirk Steudle encouraged the group to let the project team know of any concerns with specific language in the document.

Shawn Wilson closed out the discussion by encouraging DOTs to advance a vision as an industry. While the issues that were discussed are prevalent at the federal level, it is important for DOTs to not wait for elected or appointed leadership to give direction. Secretary Wilson encouraged using the Challenge Network to galvanize people outside the industry around the goals expressed in the vision.

3. Next Steps

The project team is available for individual briefings for CEOs who were not able to attend the Vision Retreat, participate in the prior round of interviews, or attend the WASHTO meeting.

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NCHRP Project 20-24(138)
Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure – Phase I

MAASTO Board Presentation Summary
Thursday, October 13, 2022

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MAASTO Board Members
Nancy Daubenberger, Commissioner, Minnesota DOT (president)
Jim Gray, Secretary, Kentucky Transportation Cabinet
Julie Lorenz, Secretary, Kansas DOT
Scott Marler, Director, Iowa DOT
Jack Marchbanks, Director, Ohio DOT
Patrick McKenna, Director, Missouri DOT
Omer Osman, Secretary, Illinois DOT
Michael Smith, Commissioner, Indiana DOT
Michigan Craig Thompson, Secretary, Wisconsin DOT

Additional Attendees
Mikel Derby, Government and Community Relations Lead, Iowa DOT
Renee Jerman, State and Federal Compliance Officer, Iowa DOT
John Moore, Assistant State Highway Engineer, Kentucky Transportation Cabinet
Eric Mullen, Administrator, Asset Management & Policy Division, Michigan DOT
Zachary Rable, Asset Management & Policy Division, Michigan DOT
Joel Skelley, Director of Policy, Kansas DOT
Jay Wunderlich, Director, Governmental Relations, Missouri DOT

NCHRP 20-24 (138) Project Team members
Kirk Steudle (CAVita), Principal Investigator
John Kaliski (CS), Project Manager
Susan Martinovich (HNTB)

1. Project Overview

Julie Lorenz introduced the project and discussed the concept of a national vision for transportation. Secretary Lorenz provided an overview of the development of the vision framework and the input received from different stakeholders during the process. Secretary Lorenz described the relationship between the components that the group would review and discuss today:

- A compelling vision of what transportation can deliver for Americans, initially expressed as a series of visionary/aspirational goals.
- One or more "moonshots" or breakthrough ideas for collective action toward the vision.
- A spectrum of actions for individual DOTs to undertake in support of the vision, recognizing the diversity among the 50 states.

Patrick McKenna said the vision and implementation ideas had been evolving during the past few months. The intent today is to get additional input from the MAASTO Board in preparation for the AASHTO Board's consideration of a resolution at its annual meeting in October to endorse the vision and move into implementation.

2. Discussion

- It will be important for implementation to recognize the differences among states- for example, some states have a climate plan or an energy office, but others do not.

- Implementation could help identify and share best practices among states.

- It will be important to determine how the moonshot concepts move forward, recognizing that not all of them are created equally.

- Phase 2 can refine these concepts with more data. As an example, the concept of lighting up the Interstates with fiber and other technologies may be something we could accomplish by 2030. The immediate step might be to find out where the gaps are. The use of Interstate right of way could accelerate closing broadband gaps, but this might remain a challenge in some urban areas.

- Phase 2 also should help develop more tools for state DOTs, including implementation practices and communication tools such as presentations and one pagers.

- Flexibility will be important to allow states to advance good practices for their particular situations.

3. Next Steps

The project team is available for individual briefings for CEOs who were not able to attend the Vision Retreat, participate in the prior round of interviews, or attend the MAASTO meeting.

APPENDIX K

Vision Framework and Resolution

PHASE 1

WHY ADVANCE A VISION FOR TRANSPORTATION NOW?

Nearly 70 years after the initial segments of the Interstate Highway System were built – and nearly 140 years after the first automobile hit the streets – **it is time for us to set the vision for the next era of transportation, including individual and collective actions state departments of transportation (DOT) can take to achieve that vision.**

The United States is changing as we near our 250th anniversary. Our population is becoming older and more diverse, with significant variations in growth rates among regions. We remain the largest economy in the world – yet more than two out of five households struggle to afford basic necessities and increasing numbers of Americans have limited access to jobs, health care, education, and healthy food.

Our transportation system faces a confluence of challenges. We are emerging from the COVID-19 pandemic with significant uncertainty about how people will live, work, and travel and rolling disruptions to global supply chains. We also face the largest increases in traffic fatalities in more than 70 years and continued increases in the frequency and severity of extreme weather and other disaster events.

At the same time, we enjoy unprecedented opportunities. The accelerating pace of technological change – from automation to connectivity to energy - is transforming our lives, including how and when we travel. Shifting demographics and emerging technologies also support new ways of interacting, engaging, and collaborating. Additionally, the combination of the largest federal infrastructure act in a generation and billions of private investments in new technologies and business models provides the resources to approach longstanding challenges in a new manner.

AASHTO has initiated a multi-year visioning process

Phase 1 will culminate in AASHTO Board consideration of the vision framework and an accompanying resolution at its meeting in Orlando in October 2022 after considerable outreach with state DOT chief executive officers and partners.

Phase 2 will begin in early 2023 and include developing specific moonshots and a range of implementation actions state DOTs can take to realize the vision.

Source: Getty Images.

NCHRP 20-24(138) Collective and Individual Actions for State Departments of Transportation Envisioning and Realizing the Next Era of America's Transportation Infrastructure - Phase I

For more information about the project, visit: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5102

1

VISION FRAMEWORK

WHY THE STATE DEPARTMENTS OF TRANSPORTATION?

The state departments of transportation (DOT) can play a unique role defining and advancing a vision for the future. State DOTs provide the perspective of each state while working closely with the federal government and local partners to achieve local, statewide, and national goals. State DOTs can address the distinct needs and preferences of every community – from urban to rural – and balance these needs with interregional and global flows of trade, travelers, and investment.

We have learned that we accomplish more working together. We operate within our political and physical contexts while recognizing transportation does not end at a city, county, or state border. We serve our states and communities more effectively when we collaborate with partners outside of transportation – such as health and human services organizations or private sector technology providers – so our decisions support the broader goals of our states and communities.

We are prepared to move toward a new vision because of the foundation we established over the past few decades. All state highway departments have transitioned into multimodal departments of transportation. All states advanced asset and performance management capabilities and expanded their emphasis on freight and operations. In addition, after more than a decade of research and testing, we are now deploying automated, connected, electric, and shared vehicles along with other emerging technologies. Our states are demonstrating we can be laboratories for mobility with new partnerships.

We are prepared to implement a new vision because we are designed for action. We are the get-it-done/fix-it departments in our states. We pave potholes, replace traffic lights, and enable people and goods to move on a routine day and during extreme weather events and other disruptions. We have tremendous ability to deliver, coordinate, and convene – and **we believe we can do tremendous good for the people we serve**.

We are committed to work toward a new vision to deliver a brighter future for the people we serve. Growing polarization and declining trust in our civic institutions makes it difficult to seize opportunities or address the challenges facing our nation. This generational investment in infrastructure provides the opportunity not only to repair Americans' roads and bridges, but also to restore Americans' faith in the institutions that deliver this system. A collective vision maximizes the impact of taxpayer dollars and demonstrates how states large and small can work together to improve lives.

HOW DID WE DEVELOP THIS VISION?

This framework is the product of research by the National Cooperative Highway Research Program (NCHRP) 20-24 (138), including a synthesis of external trends and uncertainties shaping the future of transportation; interviews with state DOT leaders, partners, and thought leaders from other industries; and a two-day Vision Retreat involving 17 state DOT chief executive officers and 29 thought leaders from partner organizations and other industry sectors. The framework also reflects extensive engagement with the chief executive officers or leadership teams of all 52 state DOTs, as well as briefings to the Association of American State Highway Transportation Officials (AASHTO) Board of Directors and the boards for the four AASHTO regions.

> **We are prepared to implement a new vision because we are designed for action.** We are the get-it-done/fix-it departments in our states. We pave potholes, replace traffic lights, and enable people and goods to move on a routine day and during extreme weather events and other disruptions. We have tremendous ability to deliver, coordinate, and convene – **and we believe we can do tremendous good for the people we serve.**

2

WHAT IS OUR VISION?

Our vision is for a transportation system focused on **connecting communities**, **moving people and goods**, and **meeting customer needs** at all scales – from local to global – delivered as a partnership between state DOTs and other public, private, and civic organizations.

This vision builds on our progress during the past few decades. It continues our evolution from building and maintaining state highways to managing a **comprehensive, multimodal transportation system** that supports community and economic development goals.

This vision also extends beyond serving the users of the system to more broadly serving **all customers -** the people and businesses who are impacted by transportation. It means focusing on how transportation impacts our daily lives as we commute to work, bring children to school, bring elderly parents to medical appointments, enjoy our outdoors, visit family and friends in other communities, and obtain food, clothing, and supplies. It also means eliminating disparities in affordability and service across communities and demographic groups and providing all Americans with access to opportunity.

A community-centered transportation integrates modes and services to enable seamless end-to-end trips at all scales:

- **Within communities** – connects people to jobs, services, and recreation through local street networks, sidewalks, trails, micromobility, and other human-scaled transportation.

- **Between communities within a region** – connects people to jobs, education, health care, and other services in both urban and rural areas through options including regional roads and transit, water, and air.

- **Between regions within a megaregion** and **between megaregions within the United States**– connects workers, goods, and information at the scale of the economy through high-speed ground, water, and air transportation.

- **Between U.S. and global trading partners** – connects trade, visitors, and information through world-class seaports, airports, spaceports, border crossings, and other gateways integrated with the surface transportation system.

Ultimately, community-centered transportation means viewing transportation through the lens of how it can enhance and sustain what makes a community special: a sense of **security** and **stability**, a sense of **connectivity**, and a sense of **belonging**. Transportation is not the end – it is a means to creating the communities of our dreams and places where people can thrive.

Our vision includes **six aspirational goals** that describe how the transportation system should function. These are intended as shared values for all state DOTs. Each state DOT may define success and define progress on each goal in a unique way.

VISION

COMMUNITY-CENTERED TRANSPORTATION

A transportation system focused on connecting communities, moving people and goods, and meeting customer needs at all scales, from local to global – delivered as a partnership between state departments of transportation and other public, private, and civic sector partners.

ASPIRATIONAL GOAL	*OUTCOME*
SAFE & SECURE	No fatalities or serious injuries to people using all modes of the transportation system; the transportation system has limited vulnerability to criminal activity, terrorism, and cyberattack and is not a conduit for human trafficking, smuggling, or spread of disease
ACCESSIBLE & AFFORDABLE	Affordable and convenient transportation options to access jobs, health care, education, food, recreation, and other services for all people and families, regardless of geographic location, age, ability, or socioeconomic status
SEAMLESS & RELIABLE	Convenient, human-centered choices available on demand to move both people and goods from origin to destination, with minimal delay and quick transfers between modes and systems
HEALTHY & THRIVING	Transportation investments that help grow prosperity and improve the health of all Americans
CLEAN & SUSTAINABLE	Zero net emissions of greenhouse gases and air quality pollutants, and enhancement of the natural environment
AGILE & RESILIENT	Communities protected against and able to adapt to and recover from extreme weather and climate trends, service disruptions, and other risks; transportation agencies able to adapt to risks, disruptions, and uncertainties

PHASE 2

WHAT MOONSHOTS CAN WE ACHIEVE?

Our vision will be built upon several bold ideas – or "**moonshots**" - delivered through the end of this decade and beyond through collective action among a large number of state DOTs and other partners. We are committed to further refining these concepts in Phase 2 and exploring how to advance the most promising ideas. We recognize, as in the first moonshot, these bold goals will focus and mobilize the best of our energies and skills.

WHAT IF WE...	*WHAT MIGHT WE DO?*	*GOALS SUPPORTED*
Make aggressive progress toward Vision Zero; reduce highway fatalities by xx percent by 2030	• Advance systemic solutions involving engineering, technology, behavioral change, and community design to reduce fatalities to levels not seen since the post-World War II era • Advance targeted solutions for pedestrians, bicyclists, and other vulnerable road users	• Safe & secure • Accessible & affordable • Seamless & reliable • Healthy & thriving
Source: Getty Images.		
Work with partners to reduce the share of households who cannot afford basic survival costs by xx percent by 2030 through enhanced transportation accessibility and affordability	• Build and strengthen non-traditional partnerships with health, human services, and workforce development organizations • Close critical gaps in access to jobs, health care, education, recreation, and other services • Provide more mobility options for households - including the option to not travel • Increase the affordability of transportation	• Accessible & affordable • Seamless & reliable • Healthy & thriving
Source: Getty Images.		

WHAT IF WE…	WHAT MIGHT WE DO?	GOALS SUPPORTED
Create a mobility marketplace so transportation works for our customers	• Enable customers to choose the travel option(s) they want and need, including aspects like safety, convenience, accessibility, affordability, efficiency, and sustainability • Make it easy for people to budget and pay for the transportation services they consume • Ensure all customers can access mobility information and options, including customers who do not have access to a smart device, bank account, or credit card	• Safe & secure • Accessible & affordable • Seamless & reliable • Healthy & thriving • Clean & sustainable

Source: Getty Images.

Change how we operate and manage the transportation system	• "Light up the Interstates" - deploy and enhance a nationwide digital infrastructure to support mobility and connectivity needs, using Interstate highway right of way as a starting platform • Deploy "Transportation 4.0" - including vehicle automation, connectivity, and artificial intelligence - to enhance safety, mobility, and access through public/private collaboration • Advance human-centered, machine-enabled transportation to enhance safety, mobility, and access, as well as options to substitute communications for travel	• All goals

WHAT IF WE...	WHAT MIGHT WE DO?	GOALS SUPPORTED
Improve energy efficiency and reduce transportation emissions xx percent by 2030	• Deploy a nationwide network to use electricity and alternative fuel sources for transportation • Improve energy efficiency and reduce emissions throughout the transportation system lifecycle, from construction to operations • Use the transportation system to generate and store energy, such as solar highways and pavement sensors	• Affordable & accessible • Seamless & reliable • Healthy & thriving • Clean & sustainable • Agile & resilient

Source: *Getty Images.*

Rethink how we connect communities and regions	• Develop more options for how we connect communities, regions, and megaregions to meet customer needs, including next-generation transit, advanced air mobility, and high-speed ground transportation • Create "Interstate 2.0": rebuild critical corridors with advanced design and materials and multiple modes and uses; close connectivity gaps on highway, rail, water, and air to support interstate commerce • Use corridor rights of way as pathways for mobility, energy, water, broadband, and other systems	• All goals
Prioritize strategies and investments to strengthen communities	• Build and sustain diverse, inclusive partnerships reflecting community visions and needs at all scales • Make major transportation decisions in collaboration with community visions and customer needs • Focus planning processes, performance measures, and investment decisions on building and sustaining communities • Balance the needs and preferences of multiple scales of communities and customers impacted by transportation decisions, from local to global	• All goals

VISION FRAMEWORK

HOW DO INDIVIDUAL STATE DOTS MOVE TOWARD THE VISION?

Each state DOT can take actions to advance the vision in ways that work for them today and in the future. A spectrum of actions will be developed that addresses the levers of change available to a state DOT including both external and internal actions. For each lever of change, a spectrum of actions from modest to transformative change will be identified in Phase 2, building on the examples below. For some DOTs transformative change already is happening; for others, a modest change may be a challenge. Through these levers of change, each individual state DOT will advance the vision, producing collective national impact. Beyond these specific examples, each state DOT will identify additional actions that will challenge and evolve their departments and programs.

LEVER OF CHANGE	*EXAMPLE ACTIONS*		
	MODEST CHANGE	*SIGNIFICANT CHANGE*	*TRANSFORMATIVE CHANGE*
EXTERNAL LEVERS			
Partnerships	Support nontraditional partnerships (for example, serving on housing coalition or public health working groups)	Establish working groups to maintain regular engagement with nontraditional partners	Share planning and delivery responsibilities with MPOs, RTPOs, and local governments; assist with transportation needs for health care or social service partners
Communications & customer service	Establish and maintain regular stakeholder and customer service engagement channels via multiple media	Deepen understanding of needs of specific customer groups, such as asset-limited, income-constrained, employed households	Establish mobility manager functions to incentivize, develop, fund, and advance customer-focused services
Land use coordination	Review transportation impacts of proposed land use changes and consider community impacts of transportation investments during the planning process	Incorporate local and regional land use planning objectives and related policies such as housing into long-range transportation planning process	Play active role in shaping land use decisions, functioning as a long-term planning arm for the state in partnership with local governments
Multi-state or megaregional coordination	Meet regularly with neighboring states to coordinate on common initiatives	Align investments and operations on multi-state corridors to meet customer needs	Develop multi-state compacts to advance solutions benefitting multiple states

VISION FRAMEWORK

INTERNAL LEVERS			
Policies & regulations	Review and modernize existing rules and processes to reflect emerging mobility	Strengthen tools and processes for benefit/cost analysis, tradeoff analyses, and risk analyses	Develop policies to leverage and share technology, data, and private investments while focusing on public good
Plans & programs	Increase emphasis on community vision/values in planning process	Enhance community engagement at all phases of planning; flag community-priority projects for incorporation into programs	Redesign the planning process with community vision at the center
Assets & right of way	Maintain assets in state of good repair; identify potential vulnerabilities to extreme weather or other risks	Incorporate resilience considerations into asset management decisions and right of way management plans	Strategically assess function of existing right of way and assets; make decisions to renew, repurpose, decommission, or relocate
Investments	Rightsize project designs to reflect customer needs	Establish an ROI framework with broad-based analysis of transportation's outcomes, including community impacts	Establish cross-sector partnerships with public and private entities to pool resources for investments that integrate transportation with other critical infrastructure
Technology & data	Continue research and testing of new technologies and data sources	Establish data sharing agreements with private sector and local governments	Create "Transportation 4.0" technology partnerships with multi-use corridors or toll authorities as testbeds
Human resources	Strengthen staff recruitment, development and retention; update core competencies with greater emphasis on customer service and innovation	Deepen skills in behavioral psychology, data analytics, and emerging technology	Adapt recruiting and retention strategies to evolve the DOT workforce to be more representative of the people we serve
Organization & governance	Strengthen cross-functional teams and break down internal silos	Create offices of strategic planning/management or innovation strike teams	Reorganize DOTs to function like private enterprises, while working for the public good

Policy Resolution PR-1-22
Title: Development of a National Vision for the Future of Transportation and Individual and Collective Actions for State Departments of Transportation to Make Progress toward the Vision

Whereas, transportation in the United States often has advanced through shared purpose among the states, the federal government and other public and private sector partners and commitment to bold actions – from the transcontinental railroad to the Panama Canal to the Interstate Highway System to the moon landing;

Whereas, shifts in demographics, economics, development patterns, environmental conditions, technologies and other trends are changing demand for moving people and freight; the mobility options available to serve residents, visitors and businesses; and the capacity of transportation agencies to carry out their mission;

Whereas, the need to advance a shared vision for the future of transportation is becoming increasingly urgent as transportation agencies respond to changes in travel behavior and supply chain disruptions following the COVID-19 pandemic; sharp increases in traffic fatalities; growing gaps in access to jobs and essential services for many Americans; and increases in the frequency and severity of extreme weather events and other disruptions;

Whereas, the state departments of transportation can play a unique role defining and advancing a vision for the next era of transportation because of their ability to address both local, statewide, and multistate perspectives; their ability to collaborate across boundaries and with partners outside of transportation; and their ability to deliver programs to meet the needs of their communities;

Whereas, the American Association of State Highway and Transportation Officials (AASHTO) in its 2021-2026 Strategic Plan committed to a vision for the organization of "providing improved quality of life through leadership in transportation," including the goals of safety, mobility and access for everyone; national transportation policy leadership; and organizational excellence with world class services;

Whereas, National Cooperative Highway Research Program (NCHRP) project 20-24 (138) conducted research in support of describing a national transportation vision, including a review of prior eras of transportation in the United States, examples of transformative change in other industries and trends and uncertainties shaping the future of transportation;

Whereas, NCHRP 20-24 (138) engaged subject matter experts and thought leaders throughout a range of sectors in shaping the future vision for transportation, through interviews and participation in a two-day "Vision Retreat" in March 2022; and

Whereas, the leadership of the 52 state departments of transportation participated in the development and refinement of the vision framework developed through NCHRP 20-24 (138) through participation in interviews, the vision retreat and workshops for the boards of directors of AASHTO, the Mid America Association of State Transportation Officials, the Northeast Association of State Transportation Officials, the Southern Association of State Highway and Transportation Officials and the Western Association of State Highway and Transportation Officials; now, therefore, be it

Resolved, that AASHTO and its member departments adopt the transportation vision framework developed under NCHRP project 20-24(138), which is that the next era of transportation in the United States should focus on connecting communities, moving people and goods and meeting customer needs at all scales, from local to global – delivered as a partnership between state departments of transportation and other public, private, and civic sector partners;

Resolved, that the shared, aspirational goals for the next era of transportation should provide for community-centered transportation that is safe and secure, accessible and affordable, seamless and reliable, healthy and thriving, clean and sustainable, and agile and resilient;

Resolved, that the state departments of transportation should work toward implementation of this shared vision through individual actions that are appropriate for the context of each state; and

Resolved, that the NCHRP 20-24 panel will identify tools and resources for member DOTs to advance this vision and report to the Board periodically on progress toward this vision.

Approved by the AASHTO Board of Directors
October 23, 2022