Exploratory Planning for Uncertain Times
NCAMPO Conference| April 25, 2019

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Explain the past → Predict the future

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Technology Advances

Changing Values

Globalization

UNCERTAINTY

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Exploratory Planning for uncertain times

Demographic

Economic

2040 Future

Technology/ Mobility

Environment/ Energy

What is the range of outcomes?

What are the risks?

What are the opportunities?

Normative scenarios envision what SHOULD happen?

EXPLORATORY scenarios ask what COULD happen?

What SHOULD Happen?

How should we grow?

How should we invest?
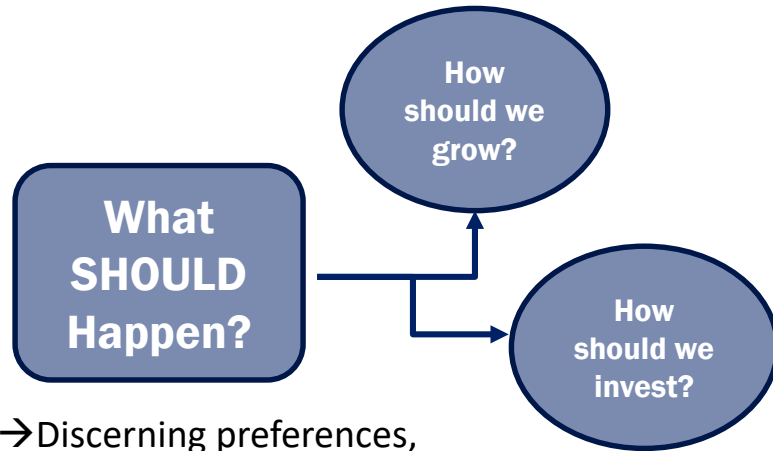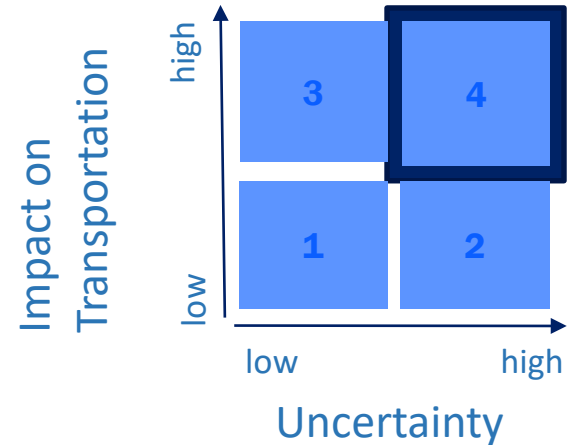
→Discerning preferences, articulating values, shaping vision, strategizing preferred outcomes

What COULD Happen?

What if we grow much faster or slower?
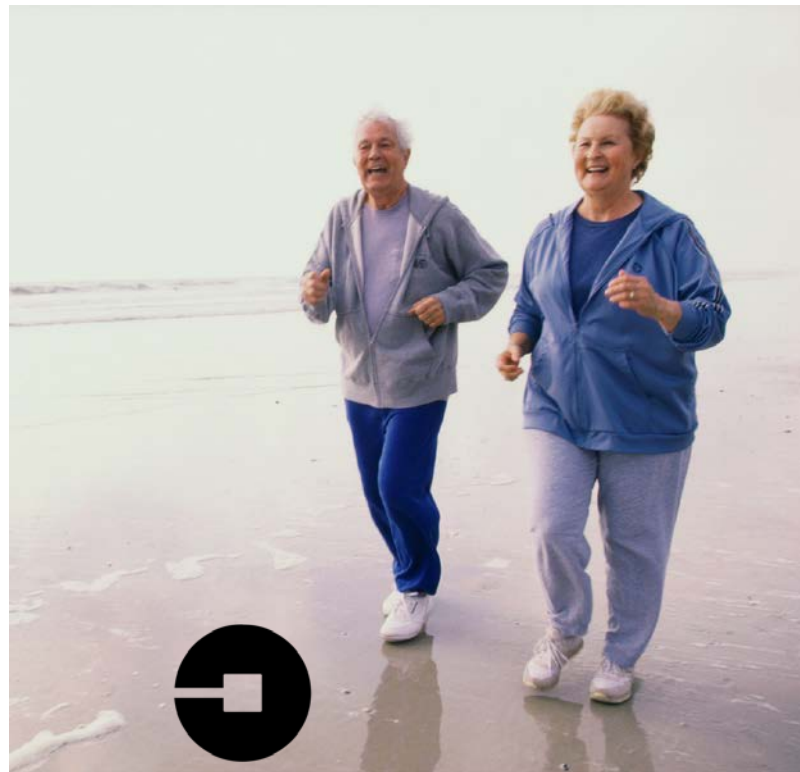
How might new technologies change the game?
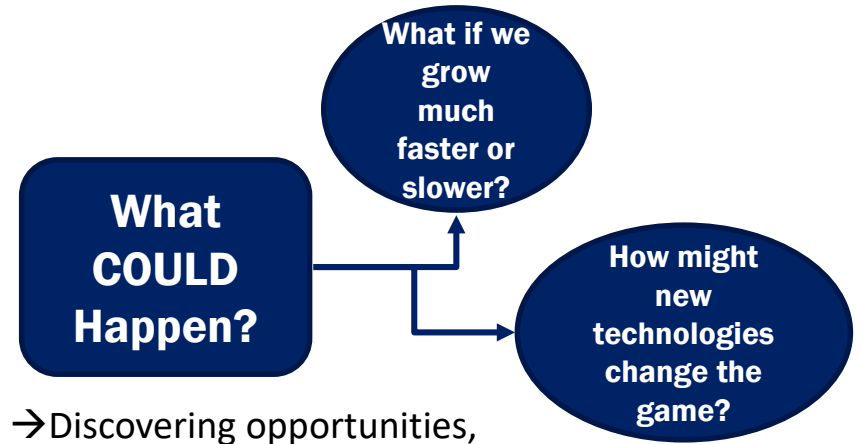
→Discovering opportunities, identifying risks, shaping tactics, optimizing chances of success
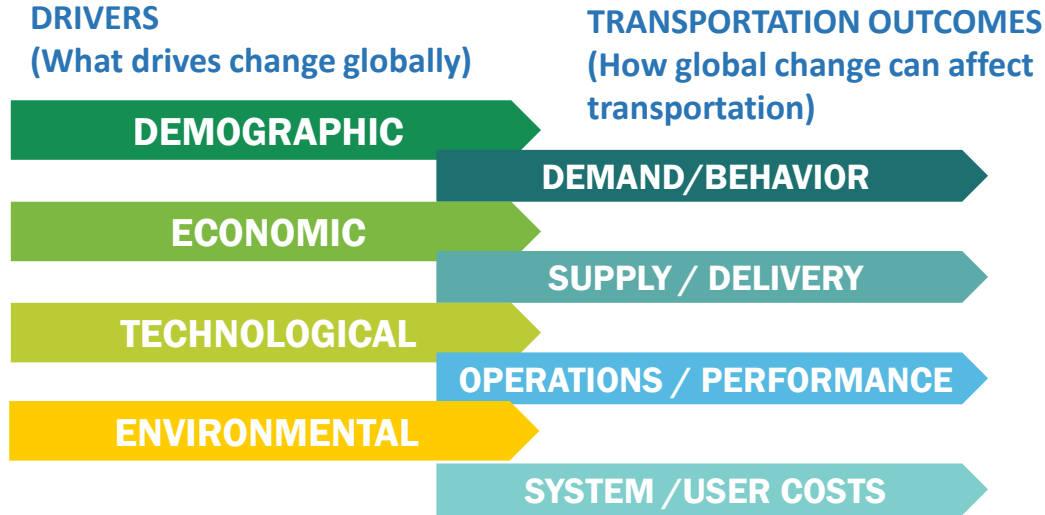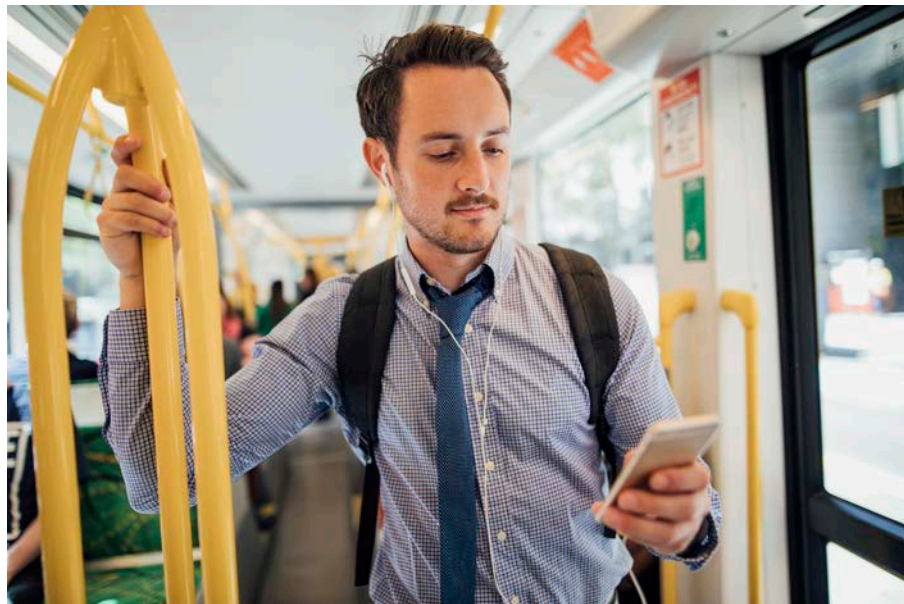
DRIVERS
(What drives change globally)

TRANSPORTATION OUTCOMES
(How global change can affect transportation)

DEMOGRAPHIC

DEMAND/BEHAVIOR

ECONOMIC

SUPPLY / DELIVERY

TECHNOLOGICAL

OPERATIONS / PERFORMANCE

ENVIRONMENTAL

SYSTEM /USER COSTS

Impact on Transportation

high

low

3	4
1	2

low   high

Uncertainty

We Make a Difference

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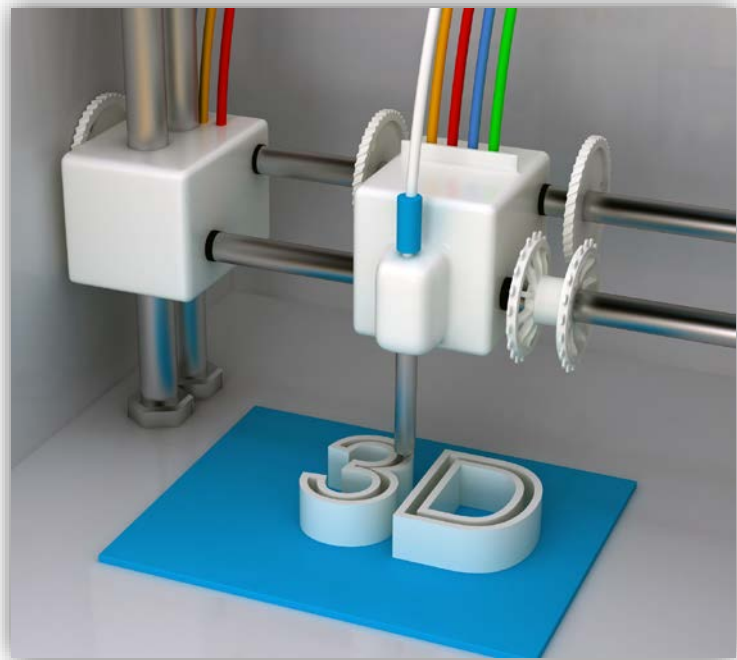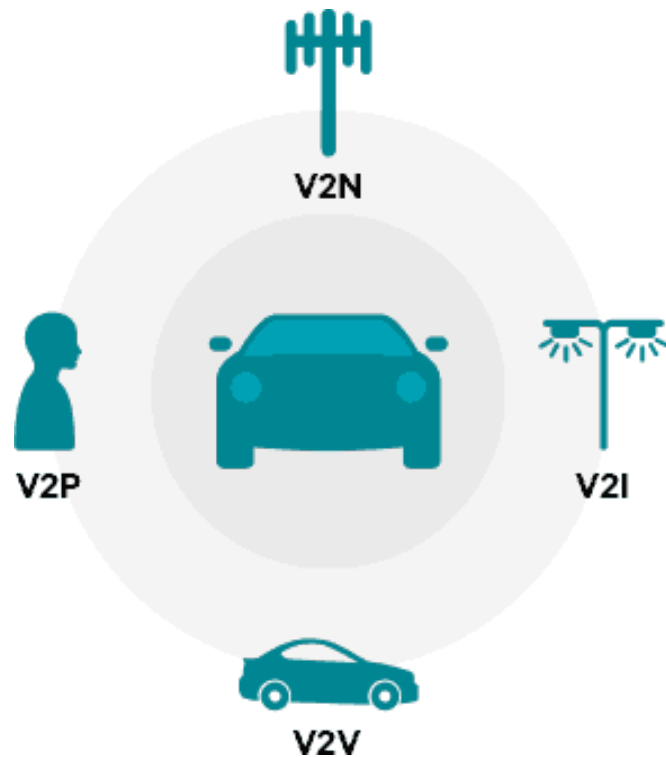
Sea Level Rise

Severe Weather

Electric Vehicle Implementation

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Drivers – External factors that are uncertain and important

If we assume this happens….

+

Levers - investments and policies that we affect

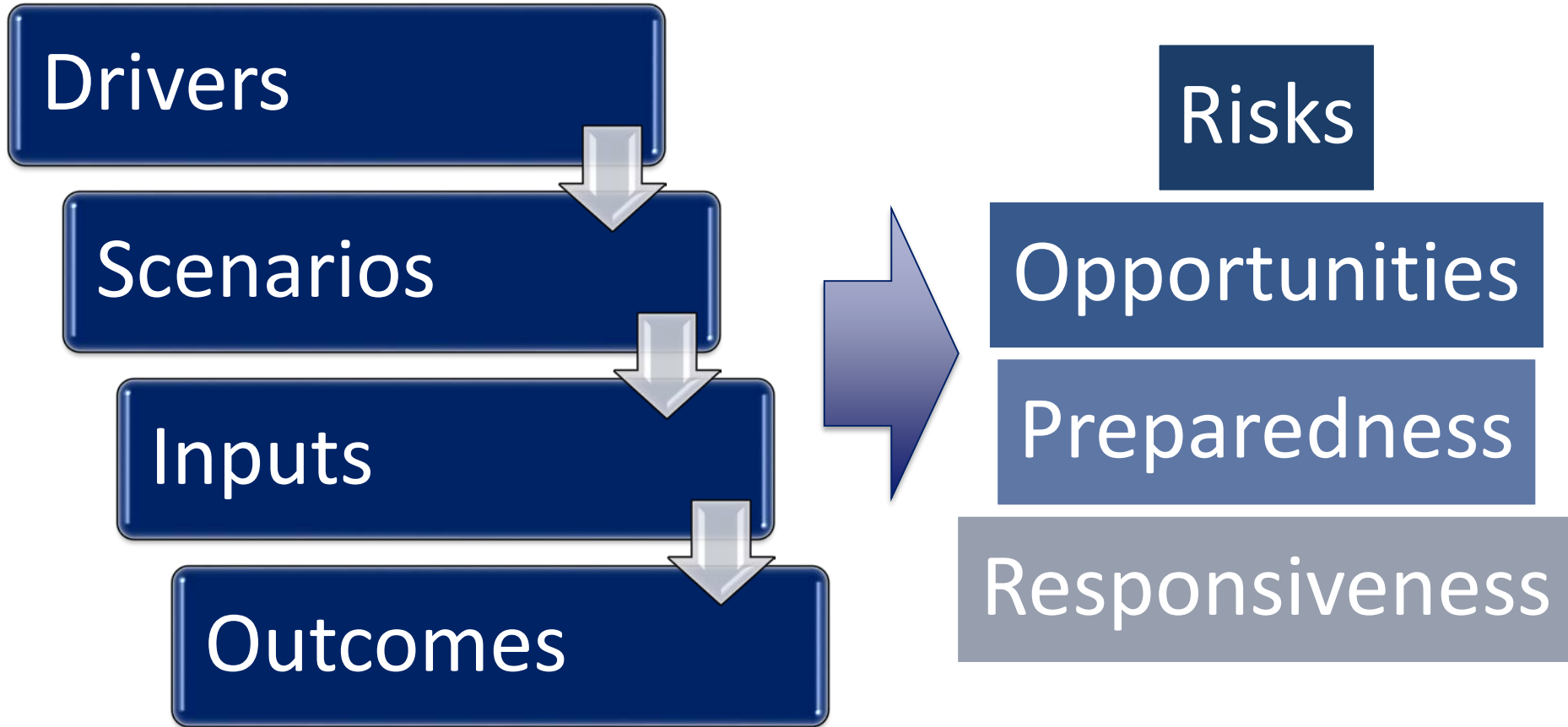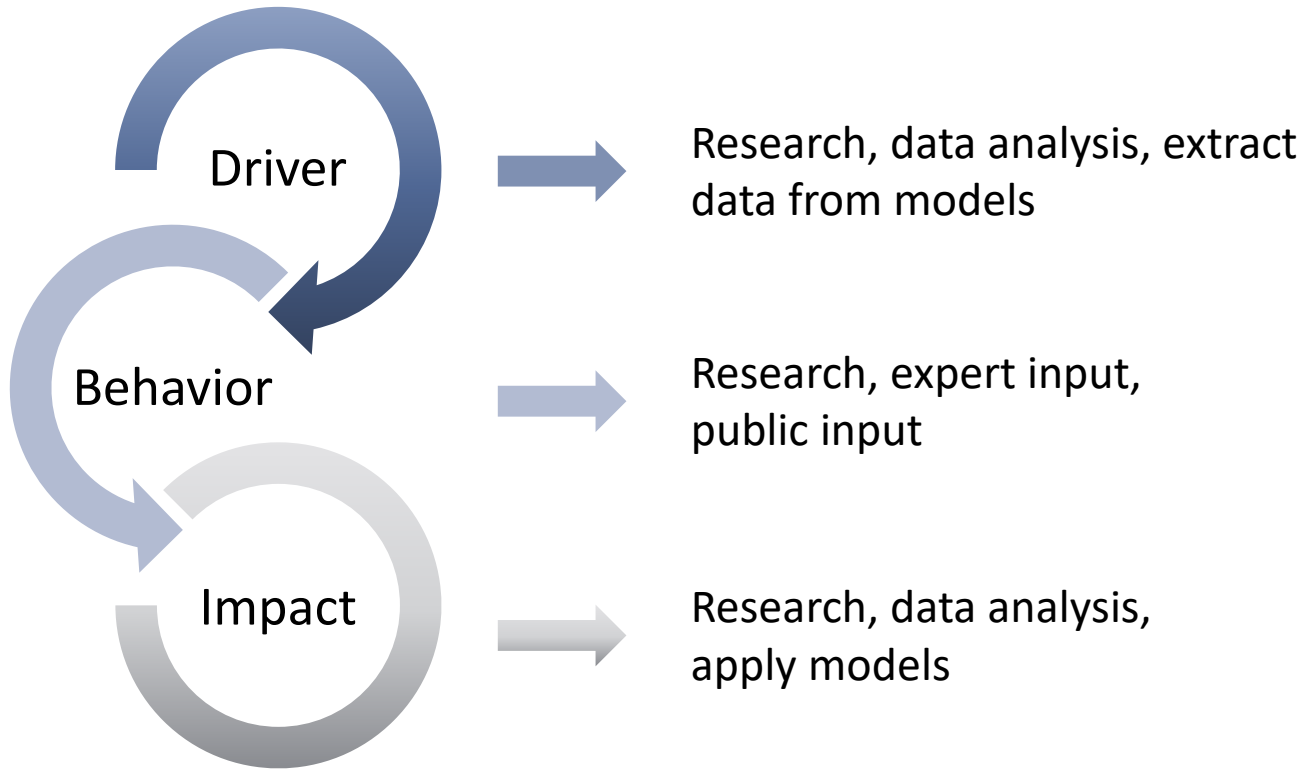*And if these types of public policies and investments are made ….*

=

Outcomes - measurable results that matter to us –

Then these are the outcomes that could occur.

Drivers → Scenarios → Inputs → Outcomes

Risks
Opportunities
Preparedness
Responsiveness

Driver → Research, data analysis, extract data from models

Behavior → Research, expert input, public input

Impact → Research, data analysis, apply models

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Research Drivers → Refine Scenarios
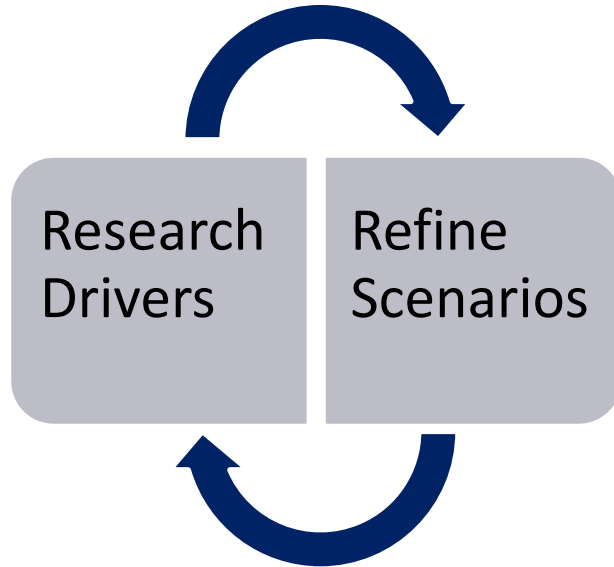
- Iterative Process
- Adapt to achieve:
  - Internal consistency
  - Range of outcomes

Preparing for Uncertainty: Building and Evaluating Exploratory Scenarios

Honing in on the purpose of your scenario planning
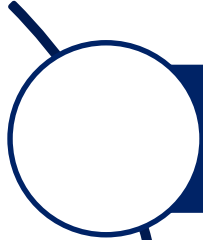
What investments are you concerned about?
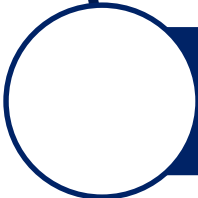
What policies do you need to develop and manage?

What risks and outcomes are of concern?

Filters to keep in mind

Is it related?

Can we influence it?

Will it produce variation in the outcomes?

Can we use data to form assumptions?

Distinguish cause from effect

Exploratory Planning Toolkit

DRIVERS

DATA TO LEVERAGE IN SCENARIO DEVELOPMENT

Demographic

Economic

Environment/ Energy

Technology/ Mobility

GENERATIONS

Baby Boomer   Generation X   Millennial   Generation Z

INDUSTRY MIX
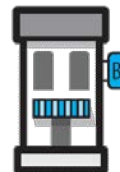
SYSTEM & USER COSTS

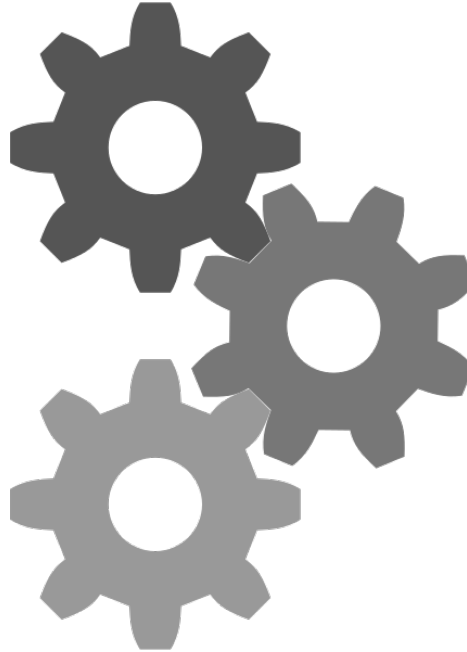SYSTEM DEMAND & PERFORMANCE

DRIVERS

Demographic

Economic

Environment/ Energy

Technology/ Mobility

LAND USE-TRANSPORTATION CONNECTION

PLACE TYPES

V6 – Multimodal Urban

V5 – High Density Suburban

V4 – Multimodal Suburban

V3 – Small Town/Suburban

V2 – Low-Density Suburban

V1 – Rural

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Two Key Criteria to Define Placetypes

1

People + Jobs Per Acre (Density)

2

Transit Accessibility
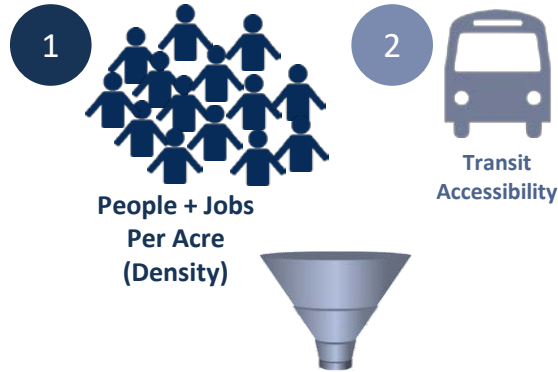
The Placetypes reflect areas with noticeable differences in travel behavior as it relates to land use patterns.

V1 – Rural

V2 – Low-Density Suburban

V3 – Small Town/ Suburban

V4 – Multimodal Suburban

V5 – High Density Suburban

V6 – Multimodal Urban

Source: VTrans2040

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VTrans2040 Placetypes

- V1 - Rural
- V2 - Low Density Suburban
- V3 - Small Town/Suburban
- V4 - Multimodal Suburban
- V5 - High Density Suburban
- V6 - Multimodal Urban
- PDC Boundaries
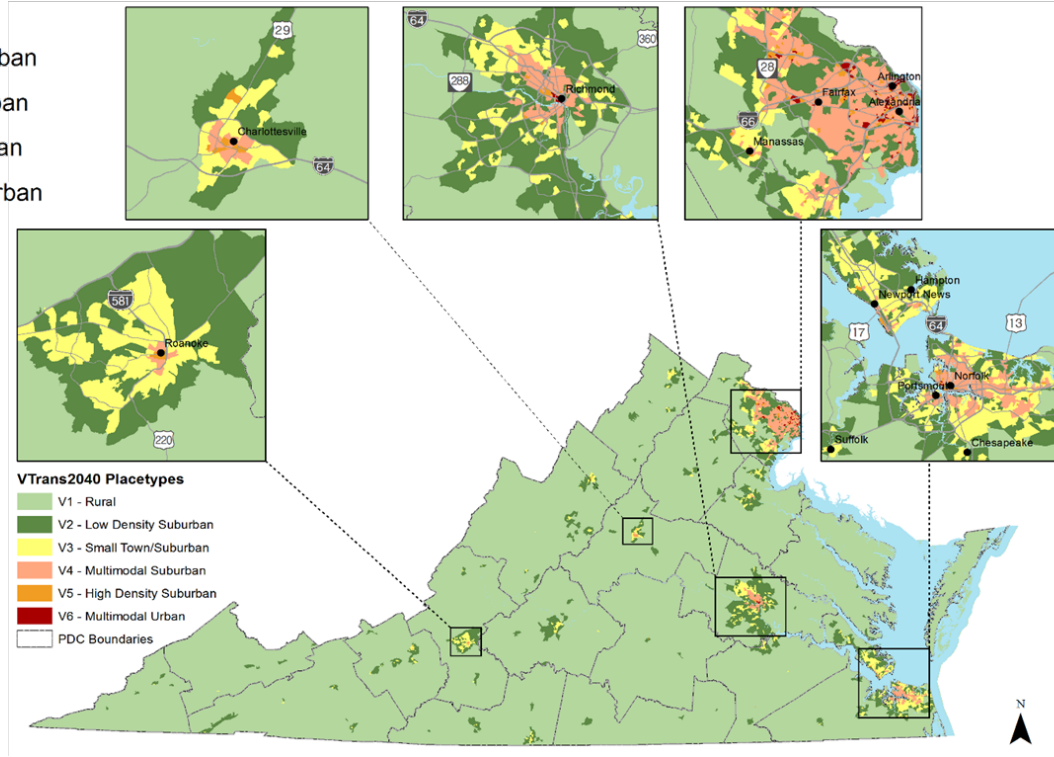
Differentiate:
- Mode Split
- Demographics
- Trip Rates
- Technology Implementation

Source: VTrans2040

What are the critical distinctions in your community types and how might you measure them?

- Travel modes

- Walkability

- Trip generation

- Jobs/housing balance

- Commute length

Analytical Process Starts with Economic Forecasts

Scenario Assumptions

Research on Drivers

Employment Forecasts
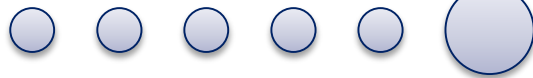
Study Area Context
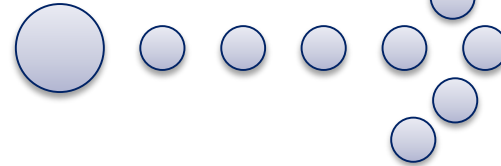
Inputs by Scenario

Scenario Planning Process

Jobs
- Sectors
- Freight Characteristics

Population
- Balanced to Jobs
- Generations

Allocation

We Make a Difference
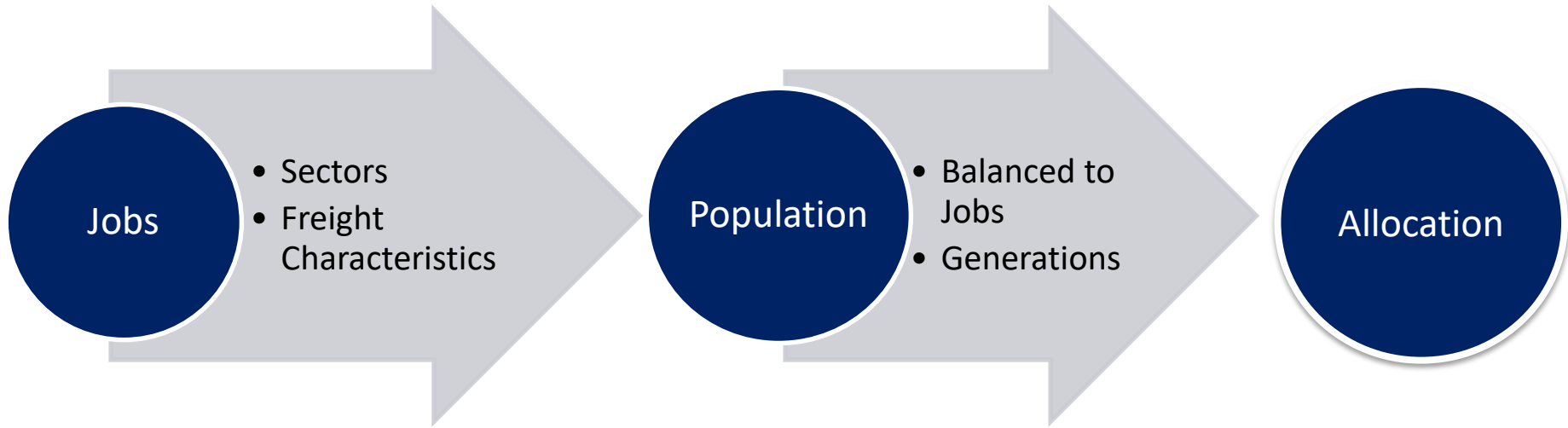
Example Exploratory Scenarios

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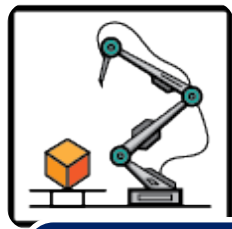
High Growth Industrial
- Less Urban
- Higher VMT Assumptions

Industrial Renaissance

High Growth High Tech
- More Urban
- More Multimodal

Techtopia

Moderate Growth
- Older Demographics
- Walkable Places

Silver Age

Reduced Growth
- Federal Spending Reduced
- Slower adoption of technology

General Slowdown

Source: VTrans2040

2040 population allocation by placetype

V1 – Rural | V2 – Low-Density Suburban | V3 – Small Town/Suburban | V4 – Multimodal Suburban | V5 – High Density Suburban | V6 – Multimodal Urban | V7 – High Density Urban*

*V7- New Placetype introduced for Scenario 2, reflecting densities comparable to those in San Francisco, CA and Washington, DC

	V1 – Rural	V2 – Low-Density Suburban	V3 – Small Town/Suburban	V4 – Multimodal Suburban	V5 – High Density Suburban	V6 – Multimodal Urban	V7 – High Density Urban*
Industrial Renaissance							N/A
Techtopia							
Silver Age							N/A
General Slowdown							N/A

Key:

Baseline - - - - Increase

Baseline - - - - Decrease

27
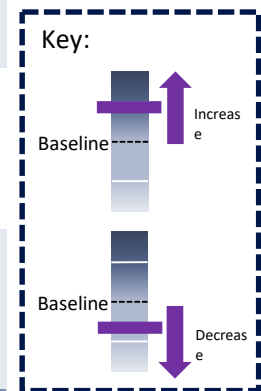
Incorporating Technology Drivers

Mobility As A Service
- Level of Implementation
- User Cost

Connected & Automated Vehicles
- Effect on Demand
- Effect on System Performance
- Effect on Mode Choice

Vary by Scenario and Place Type to Generate Outcomes
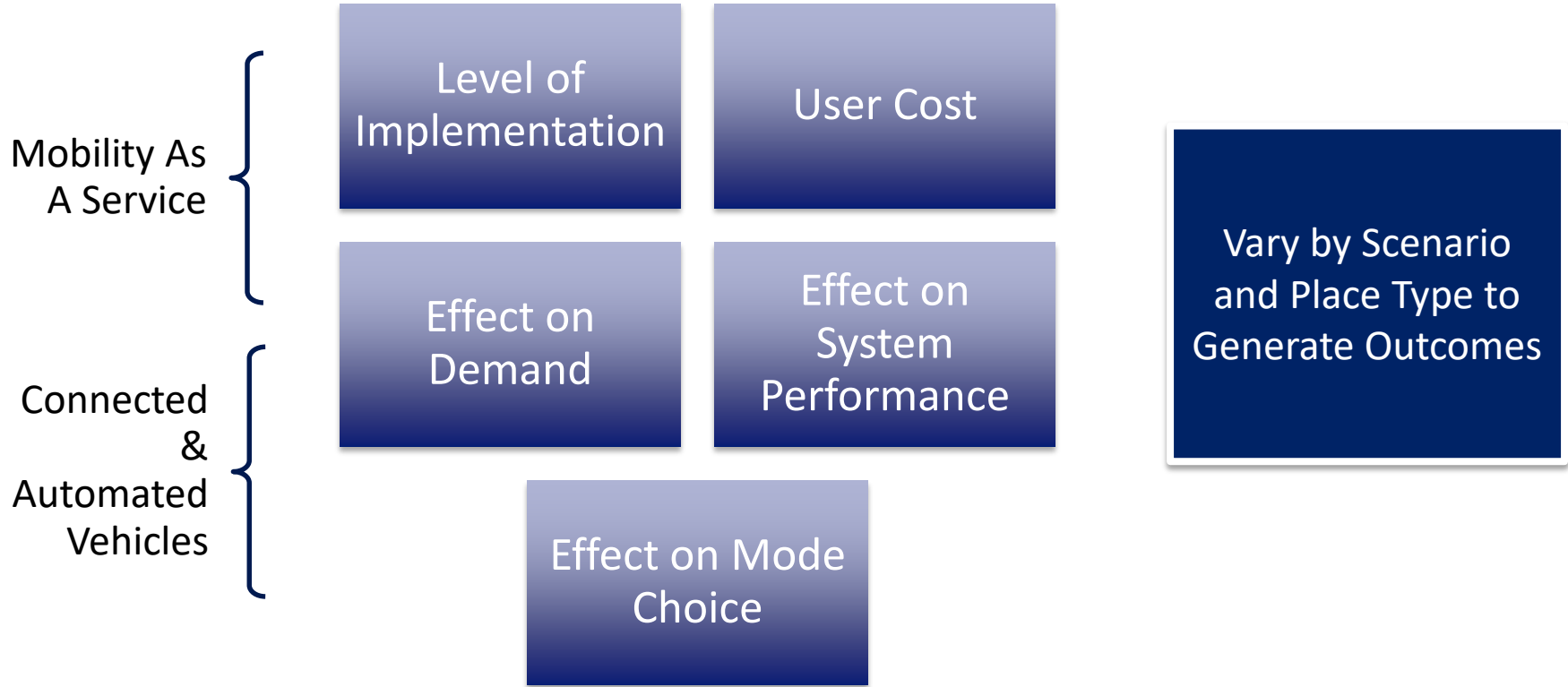
Chart: Baseline technology assumptions by placetype

% Automation [1] (yellow line):
- V1 Rural: 75%
- V2 Low Density Suburban: 77%
- V3 Small Town/Suburban: 80%
- V4 Multimodal Suburban: 83%
- V5 High Density Suburban: 86%
- V6 Multimodal Urban: 90%

% Mobility on Demand [2] (blue line):
- V1 Rural: 50%
- V2 Low Density Suburban: 65%
- V3 Small Town/Suburban: 70%
- V4 Multimodal Suburban: 75%
- V5 High Density Suburban: 85%
- V6 Multimodal Urban: 90%
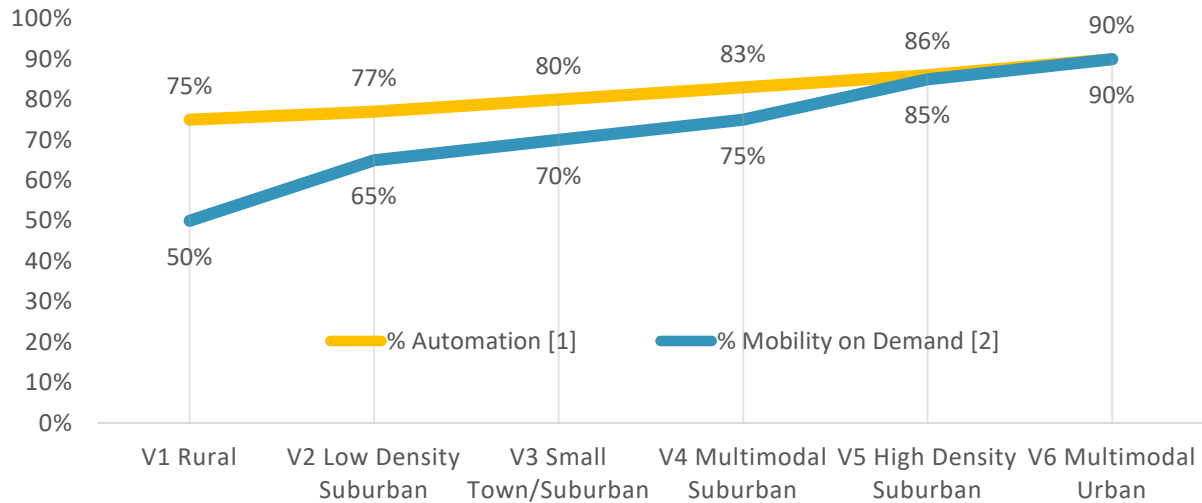
V2V connectivity. I-95 Corridor Coalition

[1] [2] Information above was inspired by public input

Induced Mobility

ZOV Trips

Longer Commutes

Induced Mobility

Short Trips

Parking

Transit in 2040

Transit could become more affordable, available and conventional as a result of:
- AV/CV technology
- Electric charging
- More streamlined/efficient network

Sion, Switzerland
Source: Swisspost

Autonomous transit is already being tested around the world

National Harbor, Maryland
Source: CBS Washington

Las Vegas, Nevada
Source: vegasexperience.com

Helsinki, Finland
Source: New York Times

CAV Capacity Benefits
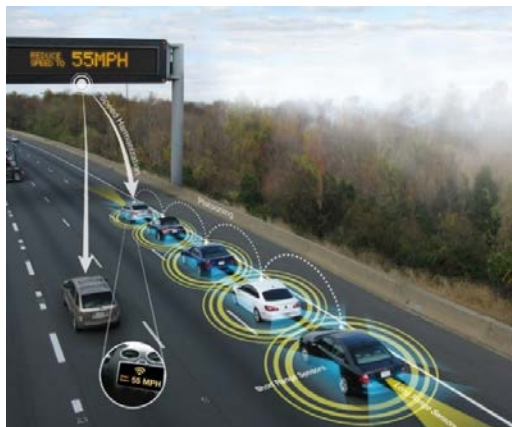
Vehicle Platooning. Source: USDOT

V2V connectivity. I-95 Corridor Coalition

Although VMT is expected to increase, vehicle technology & infrastructure improvements will help increase travel efficiency and throughput (effectively increasing roadway capacity)

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Technology's most significant capacity/through-put benefits will likely occur on *interstates and arterials*

VDOT's interstate and arterial network was classified *by VTrans Placetype* to help capture the extent of technology benefits across the Commonwealth

Source: VTrans2040

Roadway Network Classified by Placetype

- V1 - Rural
- V2 - Low Density Suburban
- V3 - Small Town/Suburban
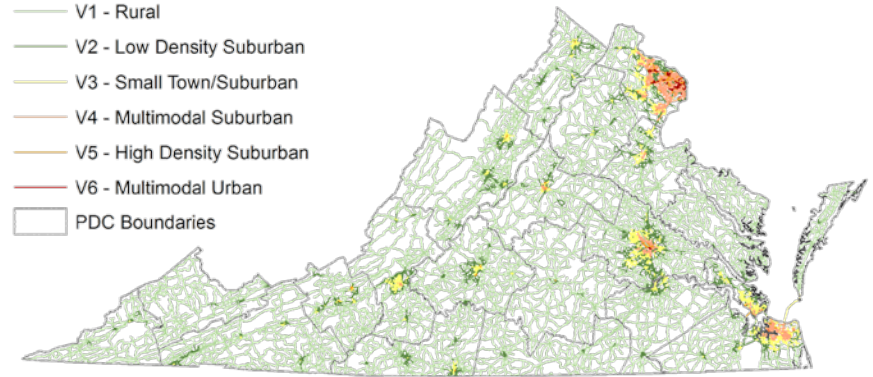- V4 - Multimodal Suburban
- V5 - High Density Suburban
- V6 - Multimodal Urban
- PDC Boundaries

Interstates and Arterials by Placetype (2014)

Placetype	Interstates as % of total network	Arterials as % of total network	Total
V1 Rural	4%	16%	20%
V2 Low Density Suburban	7%	24%	31%
V3 Small Town/Suburban	7%	30%	37%
V4 Multimodal Suburban	7%	31%	38%
V5 High Density Suburban	12%	35%	47%
V6 Multimodal Urban	10%	31%	42%

Same chain-of-logic approach

- Example - EVs
  - Will they affect behavior as a result of User costs?
  - Will they affect land use or other factors integral to behavior and system performance?
  - As an output, what happens to revenue sources?

Processing Results

SKETCH PLANNING

- Relative increases and decreases

- Ranges of potential outcomes

- Qualitative findings

INTEGRATED SCENARIO MODELING

- Quantitative results

- Mappable results

- Greater insight into congestion and secondary effects
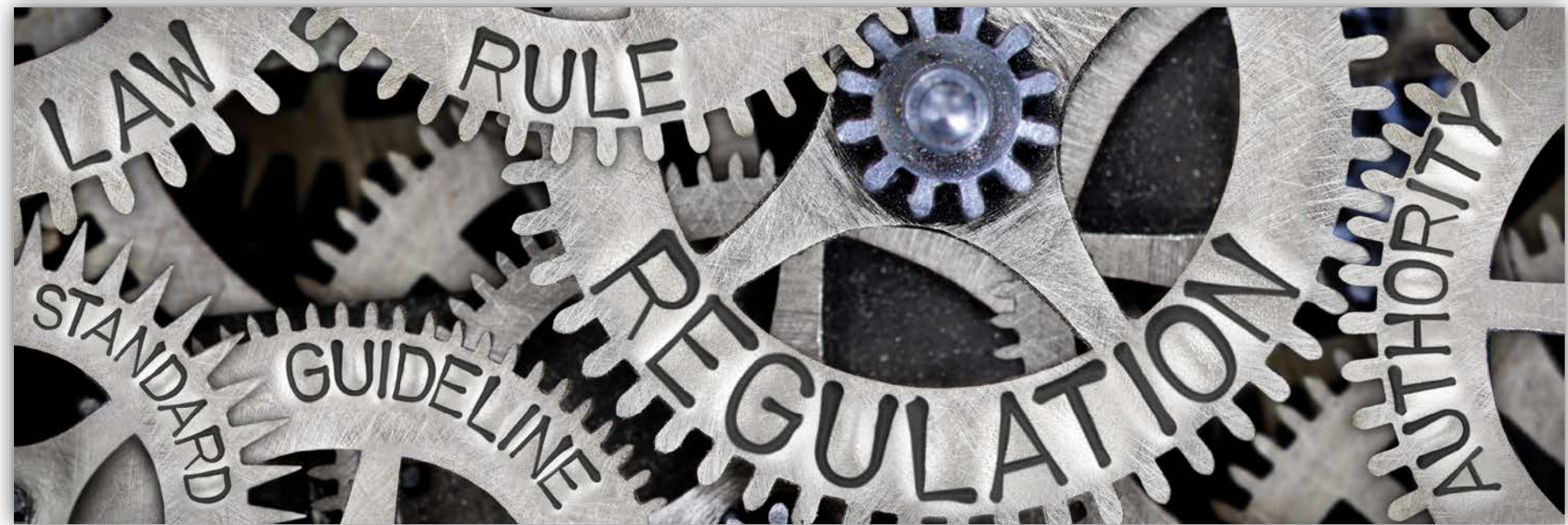
Have the Discussion!

Envisioning the Future in Small Towns …

1 Smaller vehicle, flexible-route transit service

2 Mobility-on-demand services, like bikeshare and carshare

3 Pedestrian/bike-friendly intersections that alert vehicles/motorists of pedestrian and cycling activity

4 Designated pick-up and drop-off areas for autonomous vehicles

5 "Smart intersections", equipped with sensors that seamlessly relay traffic and safety information to motorists

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| Risks | Opportunities |

Safety

Security | Mobility

Funding | Data

We Make a Difference

- FHWA "Next Gen" Scenario Planning Guidebook
  - forthcoming 2019
  - https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/
- Transportation Research Board (NCHRP 896)
- State of Maryland/University of Maryland
- State of Oregon/University of Oregon
- HRTPO Scenario Planning
  - https://www.hrtpo.org/page/scenario-planning-/
  - Coming soon: Scenario Planning Page on www.connetorstudy.org

Questions and Discussion

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