WHAT IS SCENARIO PLANNING?

“Scenarios are stories about the future that planners develop to consider and prepare for possible challenges and opportunities. Scenario planning helps transportation agencies work with stakeholders and the public to establish a vision and implement a strategic plan for success in uncertain times. Well-crafted scenarios inspire critical thinking about issues and events that could significantly affect a region’s economy, environment, and quality of life.”

—FHWA, June 2016

The scenarios presented here are accompanied by a list of approximately 40 tactical actions. These actions suggest ways the region’s public agencies and private sector can work together to commit varying levels of investment and policy toward achieving a desired future. It’s likely that the most effective balance of actions does not represent only one scenario, but rather a combination of ideas.

THEMES & OUTCOMES

How should we respond to the technological and societal forces already impacting our transportation system? In order to answer this question, we must start by understanding what makes our region unique and what our collective goals are for the future.

DRCOG’s Metro Vision works to articulate that shared regional vision, identifying several overarching themes and desired outcomes. By weighing the tactical actions and scenarios developed during the Mobility Choice Blueprint process against the relevant Metro Vision themes and outcomes, useful input to the larger regional conversation about the future of our transportation system is offered.

The snapshots on the following pages view the scenarios across the regional area land-use types (shown in the map below) and through the lens of the following adapted Metro Vision themes and outcomes:

- A connected multimodal region
- A safe, reliable, & well maintained transportation system
- A clean and resilient natural environment
- A healthy, inclusive, active community
- Economic vitality via infrastructure investment
The Denver metro area makes limited or uncoordinated efforts and investments to prepare for emerging mobility systems and technologies. Without a clear, coordinated public sector response, the private sector is left largely alone to implement new services and facilities, which continue to develop and be adopted at a rapid pace.

**Shared Mobility**
- Without a consistent regulatory framework, the public adopts micromobility services (such as scooters or e-bikes) in a piecemeal fashion.
- Ridehailing and vehicle-sharing companies do not share data with travelers or the public agencies, creating inefficiencies of roadway use and increasing congestion.

**Traveler Information and Payment**
- Mobility Information apps improve substantially, but remain uncoordinated in the competitive marketplace.
- Private companies introduce mobily payment systems, but cannot integrate all forms of mobility with public transit options.

**Transportation Systems Optimization**
- As more vehicles come equipped with connected capabilities, traffic management centers are slow to adapt and do not realize possible safety and congestion relief opportunities.
- Traffic signal coordination grows slowly and does not realize system-wide efficiencies.

**Freight and Delivery**
- Without a clear, coordinated regulatory framework, private companies use big data to improve logistics without ensuring equity.
- Increases in online shopping, rapid delivery and drone delivery services add to safety concerns, as well as congestion impacts on roads, sidewalks, and in the air.

**Vehicle Technology**
- Connected vehicles equipped with new operating systems create unpredictability and therefore contribute to more congestion in a system still dominated by traditional vehicles.
- Cost and travel time efficiencies associated with shared-ownership and some driverless vehicles leads to a spike in vehicle miles traveled (VMT).

---

**Impacts to Average Trip Time Across the Region**

<table>
<thead>
<tr>
<th>Shorter trip time*</th>
<th>Longer trip time*</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Compared with existing regional planning forecasts</td>
<td></td>
</tr>
</tbody>
</table>

---

**Note:** Dots indicate pervasiveness of a given emerging mobility system on a scale from one to three.
SCENARIO 2: MILE HIGH FORWARD

Moving forward with innovative program development, interagency coordination, and pilot testing and implementation, the Denver region uses a balance of investments and judicious regulations to integrate emerging mobility technologies, maintaining community visions and improving mobility for all.

Shared Mobility
- New regulations enable the equitable use of ridehailing and ridesharing services, significantly decreasing the number of households without mobility options.
- Microtransit pilot and demonstration projects integrate directly with the transit network, enabling greater door-to-door trip flexibility.

Traveler Information and Payment
- Coordinated systems provide intuitive, simple access to real-time information for the entire door-to-door trip.
- Integrated payment system across modes for public and private sectors make it easier to plan trips involving multiple services.

Transportation Systems Optimization
- Traffic management centers are integrated and enhanced to take advantage of V2X, reducing the number of severely congested lane miles across the system.
- Smart parking systems encourage more efficient use of park and ride and other public parking options, decreasing deadheading.
- Corridor management on critical highway connections prioritizes high-occupancy vehicles.

Freight and Delivery
- Coordinated efforts across sectors improve the efficiency of automated package delivery.
- Delivery parking pilot projects begin to minimize conflicts and improve roadway operations and curb-space use.

Vehicle Technology
- Connected vehicles integrate with the region’s strategic V2X upgrades to reduce crashes and improve operations.
- Regulatory incentives such as zero occupant vehicle fees work together with coordination of private fleets to encourage vehicle use shared by multiple occupants.

Improved Air Quality: An app-based regional rewards program encourages ridesharing and off-peak travel, reducing roadway congestion.

Diversified Economy: Shared vehicle operations and ownership allow personal expenditures on discretionary items.

Reliable System: Thoughtful regulation and incentives encourage TNCs to use designated pickup and dropoff locations, resulting in fewer disruptions to other traffic.

Alternate Modes: Updated state statutes and regional coordination enable cities to effectively manage micromobility services, making them easier to use and less disruptive.

Active Community: Implementation of new detection tools enhances safety for bicycles and pedestrians and encourages travel by alternate modes.

Impacts to Average Trip Time Across the Region

Note: Dots indicate pervasiveness of a given emerging mobility system on a scale from one to three.
SCENARIO 3: MILE HIGH BOLD

By pushing boundaries and taking a chance on bold programs that work to break down traditional silos, build new partnerships, and prioritize impactful and innovative applications of emerging technologies, the Denver region moves more quickly toward reshaping its mobility systems.

Shared Mobility
- Intersectoral partnerships allow for the integration of new ridehailing, car sharing, and microtransit services, improving overall regional access and encouraging shifts to non-SOV modes.
- Regulatory encouragement and public subsidy incentivize ridehailing fleets to provide equitable service.

Traveler Information and Payment
- Regional agreements create simpler access to services and more universal trip information.
- A single-account payment system, interoperable within the Denver region, allows for trip planning across those services that agree to participate.
- Integration across the range of mobility systems gives public agencies the leverage necessary to prioritize equitable, comprehensive travel information, expanding options.

Transportation Systems Optimization
- A regional data platform enables coordination and consistency while minimizing security vulnerabilities.
- Vehicles are dynamically routed to minimize travel times and to optimize the regional transportation system, with the consequence of encouraging more overall trips.
- Transit operators benefit from smart arterial management that prioritizes high-occupancy vehicles.

Freight and Delivery
- Proactive policies define methods and systems for personal package delivery that minimize disruptions for other travelers.
- Private sector partners play an ongoing role in the creation of regulations to encourage and employ technological improvements.

Vehicle Technology
- A road usage charge program helps to offset lost revenues resulting from declining gas tax revenue, allowing for greater investments in reshaping roadway space.
- The majority of fleets convert to electric vehicles, improving regional air quality.
- Regulation and economics encourage shared vehicle service membership and create pressure to abandon private vehicle ownership.

Supporting Active Choices: Widespread access to door-to-door mobility services encourages people of all abilities to visit public spaces.

Vibrant Economy: Shared mobility leads to additional discretionary income that can be invested or spent on other living or recreational activities.

Reducing Crashes: Smart corridors leverage the advantages of connected vehicle technology, creating a more safe and predictable environment for all travelers.

Creating Open Spaces: By enabling the widespread adoption of shared mobility fleets, the region is able to rethink spaces currently used for parking.

Connected System: Adoption of new transportation infrastructure technologies and regional interoperability minimizes the space needed for vehicles.

Impacts to Average Trip Time Across the Region

Note: Dots indicate pervasiveness of a given emerging mobility system on a scale from one to three.
DRAFT Rev. October 9, 2018

QUANTITATIVE SCENARIO ANALYSIS
Developing a modified travel demand model to forecast the impacts of new technologies and a changing society.

DRDCOG’s FOCUS travel demand model allows the traditional pathways to generate a travel forecast for the region using measures such as vehicle miles traveled (VMT) and daily trips across various modes. Through an assessment of technological and societal trends at a regional, national, and international scale, Mobility Choice approximated impacts across the model’s measurable variables in each of the three scenarios. The information on this page offers a snapshot of how the transportation system could perform across different regional land-use transitions and travel modes. This analysis reveals some of the trade-offs associated with the different scenarios and further illustrates the need for a coordinated regional approach to rethinking mobility.

Baseline Demographic Information

<table>
<thead>
<tr>
<th>Variables</th>
<th>2015</th>
<th>2030</th>
<th>PERCENT INCREASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION*</td>
<td>3.1</td>
<td>3.9</td>
<td>26%</td>
</tr>
<tr>
<td>DAILY PERSON TRIPS*</td>
<td>11.7</td>
<td>14.5</td>
<td>24%</td>
</tr>
<tr>
<td>DAILY VMT**</td>
<td>78.8</td>
<td>97.9</td>
<td>24%</td>
</tr>
</tbody>
</table>

*In millions | ^2030 Trend scenario

Travel Demand Model Input Assumptions
Based on Literature Review and Regional Analysis

Model Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Trend</th>
<th>Forward</th>
<th>Bold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ride Hailing Person Trips</td>
<td>4%</td>
<td>8%</td>
<td>15%</td>
</tr>
<tr>
<td>Ride Sharing Person Trips</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Walking &amp; Biking Person Trips</td>
<td>No Change</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Smart Corridors - 5% Speed Increase</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Microtransit Rail Lines Served</td>
<td>No Change</td>
<td>2</td>
<td>All</td>
</tr>
<tr>
<td>Driverless Cars Market Share</td>
<td>0%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Transit Prioritization Corridors</td>
<td>0</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Potential Impacts of Emerging Technologies

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Urban Core</th>
<th>Urban Center</th>
<th>Suburban</th>
<th>Ex-Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ride Hailing</td>
<td>↑↑↑↑↑</td>
<td></td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
</tr>
<tr>
<td>Ride Sharing</td>
<td>↑↑↑↑↑</td>
<td></td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
</tr>
<tr>
<td>Walking &amp; Biking</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>N/A</td>
</tr>
<tr>
<td>Smart Signals</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>N/A</td>
</tr>
<tr>
<td>Transit Priorities</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>N/A</td>
</tr>
<tr>
<td>Driverless Cars</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
<td>↑↑↑↑↑</td>
</tr>
</tbody>
</table>

Initial Travel Demand Model Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Scenarios</th>
<th>Trend</th>
<th>Forward</th>
<th>Bold</th>
<th>SUPPORTS METRO VISION GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-SOV MODE SHARE TO WORK</td>
<td>23.9%</td>
<td>23.8%</td>
<td>24.4%</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>DAILY VMT/CAPITA</td>
<td>24.8</td>
<td>25.5</td>
<td>26.1</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>PEAK VS OFF-PeAK TRAVEL TIME VARIATION*</td>
<td>1.29</td>
<td>1.27</td>
<td>1.26</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>PERSON DELAY PER CAPITA (MINUTES PER DAY)</td>
<td>11.2</td>
<td>11.3</td>
<td>11.2</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>TRAFFIC FATALITIES (GOAL) (PER YEAR)</td>
<td>&lt; 100</td>
<td>&lt; 80</td>
<td>&lt; 60</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>HOUSEHOLDS WITH MOBILITY CHALLENGES</td>
<td>71,400</td>
<td>44,300</td>
<td>43,800</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>SEVERELY CONGESTED LANE MILES</td>
<td>2,435</td>
<td>2,410</td>
<td>2,350</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>WALK TRIPS (PER DAY)</td>
<td>1,293,000</td>
<td>1,396,000</td>
<td>1,566,000</td>
<td>↑</td>
<td></td>
</tr>
</tbody>
</table>

*Note that these numbers will change based on the final tactical actions recommended by the Blueprint.

Travel Demand Model: Key Takeaways

- Operations improvements on major corridors increases traffic and average speeds.
- Prioritization of transit vehicles across the signal system and the integration of microtransit boosts overall transit ridership.
- Ease of access to ridehailing provides new mobility to non-driving populations; VMT increases slightly as a result.
- Ridehailing increases VMT due to deadheading (travel without a passenger).
- Enhanced safety from connected vehicles in optimized systems as well as improved facilities increases walk and bicycle trips.
- Ride sharing reduces SOV travel slightly.

A Spectrum of Results: The travel demand model shows how choices at the institutional level could impact the way people move across our region in the near future. It is important to note that the magnitude of these impacts is not fixed to three points represented by three distinct scenarios. Instead, the model shows a range of outcomes that shift depending on the choices we make as a region. The key takeaways shown below refer to general trends observed in the model as we assume more aggressive use of policy, investment, and partnership tools available to the region’s public agencies.