UNIFIED VISION FOR OUR MOBILITY FUTURE

As a unified metropolitan region, how might we enable more accessible and effective transportation mobility choices to enhance the quality of our social, cultural, and economic life now and in the future?
WHAT IS THE MOBILITY CHOICE BLUEPRINT?
A COMPREHENSIVE STRATEGY

How to best invest in and incorporate the rapidly changing technology that is revolutionizing transportation mobility options into implementable policies, programs, and projects.
Collaboration of CDOT, RTD, and DRCOG policies, programs, and transportation investments

Pilot projects with private sector partners and continued participation of the business community

Identifying potential for efficient technology-leveraged investments
STUDY SCHEDULE OVERVIEW

**Input**
Gather qualitative and quantitative input, create excitement, share among teams for integrated scenarios.

**Testing**
Integrate learnings, create scenarios. Test options qualitatively and quantitatively.

**Outcome**
Incorporate findings in draft Blueprint recommendations.

**Workshops** – February, April, May, August

**Digital Outreach** – April to November
STUDY COMPONENTS

Mobility Technology
- On Demand
- Shared
- Electric
- Driverless
- Connected

Transportation Agency
- Policy
- Programs
- Pilot Projects
- Funding

Livable Communities
- Health and Wellness
- Social Equity
- Environmental
- Urban Form
- Economic Vitality
WORKSHOP #3 PROCESS

**WHO**
- Two Work Groups
  - Consider 5 Goals

**WHAT**
- Brainstorm Strategies for Mobility Future
- MCB Products
  - Gap Analysis
  - Workshop 1 and 2
  - Ethnography

**HOW**
- **ROI**
  - Level of Effort
  - Impacts and Benefits
- Idea Plotting

**EVALUATION**
- (Summer 2018)

**SCENARIO DEVELOPMENT**
- 2030 RTP Base
- Status Quo (Baseline)
- Test Scenarios (1 or 2?)
COMMUNITY ENGAGEMENT

- Metro Ambassadors
- Ethnography Interviews
- Digital Outreach
LIVABLE COMMUNITIES – W1 RESULTS

• Discussion themes that emerged from three different Activity topics:
  o Importance of safety
  o Opportunity to increase access:
    • Elderly
    • Children
    • Disabled
  o Guard against economic disparities
  o Rural versus urban differences
  o Impact of high convenience on health and wellness
  o Urban form and materiality
  o Environment and livability
METRO AMBASSADORS - PRIORITIES

• Number one priority is “safety” for all users
  o No matter what the scenario, safety should be front and center as the key evaluation criteria

• Ambassadors have and will continue to participate in the workshops and will be asked to review key documents that come out of the study
ETHNOGRAPHY OVERVIEW

Mindsets around Mobility

1. Car Ownership
2. Blurred Lines of Service
3. Getting Worse Before Better
4. Immersive Learning
5. Ties to Wellness

Key Values to Consider

Reliable and Accessible
“I worry about how to get around when my legs stop working – I’m banking on a self-driving car.”

Value of Speed and Time
“When I think about mobility, I think about the time it will take me to get somewhere, not the cost. I’ll pay whatever price to get to where I need to be.”

“My commute on public transit takes an hour, driving takes 25 minutes – but every minute of that is awful.”
Technology Influences

• Value of driver-less cars
• Keep it about the people
• Privacy pirates
• Make life easier and safer
• Lazy like wall-e
• Playing catch up with payment

“We’re 2 years out from buying another car and it will be electric. Environmental impact is a huge part of our consideration and we’ll definitely be sharing a vehicle while also still using public transportation.”

“We will be so interconnected, we won’t be able to do anything ourselves.”

“I have a smart connected vehicle and I still managed to whack off my side mirror when backing out of the garage this morning.”

“I buy the 10-pack book of tickets every week at King Soopers. I have no idea why I can’t buy it online through the app and get the same price, but it’s just become part of my routine now.”
ETHNOGRAPHY - KEYS TO SUCCESS

- Hold Yourself Accountable
- Keep the Humanity
- Communicate the Project
- Educate the People
- Accommodate Pedestrians
- Look to Others
- Quality over Speed
- Be Visionary
- Go Farther and Grow the Existing
# Ethnography vs. Digital Engagement

<table>
<thead>
<tr>
<th>Ethnography</th>
<th>Digital</th>
<th>Similarities</th>
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<tbody>
<tr>
<td><strong>Top Three</strong></td>
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<tr>
<td>Health</td>
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<td>• Health</td>
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<tr>
<td>Safety</td>
<td>Financial wellbeing</td>
<td>• Financial wellbeing</td>
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<tr>
<td>Financial wellbeing</td>
<td>Access</td>
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<tr>
<td><strong>Bottom Three</strong></td>
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<tr>
<td>Culture and community identity</td>
<td>Heritage</td>
<td>• Diversity</td>
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<tr>
<td>Diversity</td>
<td>Opportunities for youth/kids</td>
<td>• Heritage</td>
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<tr>
<td>Heritage</td>
<td>Diversity</td>
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</table>
TECHNOLOGY ASSESSMENTS

- Agency Self-Assessments
- Peer City Review
INNOVATION ADOPTION LIFECYCLE

DENVER

INNOVATION ADOPTION LIFECYCLE
FIVE TECHNOLOGY CATEGORIES

Enabling Technologies:  
Fundamental elements for other technological implementations.

Safety:  
Focused directly upon improving the safety of a component(s) of the transportation system.

Monitoring and Detection:  
Various methods and approaches for detecting vehicles and/or incidents as well as monitoring roadway.

Operational Optimization:  
A set of technologies designed and deployed to improve the management of the transportation system through optimizing vehicle travel throughout a corridor.

Mode/Travel Demand Change:  
Facilitate the use of modes other than personally-owned vehicles (POVs) for travel.
TRANSPORTATION TECHNOLOGIES – W1

• Technology application:
  o Automated and on-demand transit
  o Integrated trip planning and fare system
  o MaaS/ridesharing coordination
  o Autonomous vehicles
  o Connected infrastructure and vehicles
  o Electric vehicles and charging stations
  o Smart signals **
  o Curb/travel pricing **
  o Traffic management **

• Perceived barriers:
  o Existing systems have lower barriers to implementation **
  o Existing systems can be optimized on shorter adoption timeframes **
## TRANSPORTATION TECHNOLOGIES - W1

### Agency Deployment

<table>
<thead>
<tr>
<th></th>
<th>Most viable</th>
<th>Agency interest in investment</th>
<th>Most challenging to implement</th>
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<tbody>
<tr>
<td>AV microtransit</td>
<td>★★★</td>
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<tr>
<td>Smart parking</td>
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<td>Smart signals</td>
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<tr>
<td>Smart street lights</td>
<td>★★★★☆☆☆☆☆☆☆★</td>
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<td>★</td>
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<tr>
<td>Smart mobility hubs</td>
<td>★★★★☆☆☆☆☆☆☆★</td>
<td>★★★★☆☆☆☆☆☆☆★</td>
<td>★★</td>
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TRANSPORTATION TECHNOLOGIES – W1

- Technology application by Transect:
  - AV Microtransit
    - Last-mile connectivity in Suburban and General Urban Zones
  - Smart Mobility Hubs
    - Good application in Suburban, General Urban and Urban Center Zones
  - Smart Street Lights
    - Good application across all zones but Rural
  - Smart Signals
    - Good application across all zones but Rural
    - Could be strong technology in Urban Center and Urban Core Zones
  - Smart Parking
    - Strong in Urban Core Zone; limited elsewhere
TECHNOLOGY NEEDS

• Expand Enabling Technologies
  o Fiber Optic Connections
  o DSRC Investments
  o Leverage Private Investments in 5G technology
• V2I Connected Vehicle Pilots
So what does it all mean?

The Denver region is not necessarily leading in implementing transportation technologies, but neither is it significantly lagging behind comparable regions of the country.
TRANSPORTATION AGENCY ASSESSMENTS

- Agency Interviews
- Peer City Review
EXISTING INNOVATIVE PROGRAMS

• CDOT
  o Numerous programs
  o Road X

• DRCOG
  o Smart Region Initiative

• RTD
  o Mobility Summit
TRANSPORTATION AGENCY - W1

• Suburban Zone and General Urban Zone
  o Self-routing buses
  o Taxing and pricing AV/CVs to reduce congestion and deadheading
  o Storing/staging of AVs and CVs
  o Conduct/document pilot projects

• Urban Center and Core Zones
  o Curb lane management
  o Pricing schemes
REGIONAL COORDINATION NEEDS

- Regional Transportation Technology Compact
- Establish Regional Transportation Technology Collaborative (Public/Private)
- Expanded Central Data Center
REGIONAL POLICY NEEDS

- Shared Technology Procedures
- Develop AV, CV, TNC and Micro-transit Policies
- Incentivize electric vehicles
- Incentivize walking, biking, flex hours
- Reduce parking requirements, consider maximums
SCENARIO DEVELOPMENT

- DRCOG 2030 RTP
- 2030 Status Quo Scenario
- Test Scenarios
SCENARIO DEVELOPMENT

- “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 “Supporting Performance-Based Planning and Programming through Scenario Planning”, April 2016
# WORKSHOP 3 PROCESS

<table>
<thead>
<tr>
<th>WHO</th>
<th>WHAT</th>
<th>HOW</th>
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<td>DRCOG Metro Vision</td>
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<td>Idea Plotting</td>
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**EVALUATION**
(Summer 2018)

**SCENARIO DEVELOPMENT**
- 2030 RTP Base
- Status Quo (Baseline)
- Test Scenarios (1 or 2?)
VISION

Our metropolitan region employs a full array of flexible technology and services to maximize access to mobility choices connecting people of all ages, incomes and abilities to jobs, recreation, healthcare, amenities and other daily activities, enhancing and protecting our quality of life now and in the future.
The metropolitan agencies will collaborate, in partnership with community, nonprofit, and private sector leaders, to carefully consider a range of effective and efficient solutions to the challenges and opportunities presented by emerging mobility technologies.

We will provide recommendations to encourage the most effective technologies and approaches, maximizing mobility to meet our long-term goals of enhanced quality of life and increased economic vitality across the metropolitan region.
<table>
<thead>
<tr>
<th>GOALS</th>
<th><strong>Community Enhancement</strong></th>
<th>There is a disconnect between the human experience and technology that could further disenfranchise mobility challenged populations and disrupt our livable spaces.</th>
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<tbody>
<tr>
<td><strong>Mobility Options</strong></td>
<td>Single occupant vehicles across all AV and CV technologies will remain the preferred mode of travel, reducing the incentive for agencies to invest more in alternative modes.</td>
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<td><strong>Environmental Quality</strong></td>
<td>A growing population resulting in increasing VMT will outpace the potential offsetting benefits of new technologies, including electric vehicles</td>
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<td><strong>Safety</strong></td>
<td>A lack of common platforms reduces the safety effectiveness of new technologies. Distrust of unproven technologies impedes adoption.</td>
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| **Mobility Efficiency** | Public sector agencies are challenged to make changes and slow to invest public dollars in technologies that may become outdated. Challenges include:  
- A forum is lacking to plan for and implement regional infrastructure that supports operations technology.  
- Without connection to public objectives, new technology from the private sector will focus on maximizing revenues and minimizing other investments. |
**QUADRANT FRAMEWORK**

<table>
<thead>
<tr>
<th>Public Policy Related to Travel Choice</th>
<th>Public &amp; P-P Investments</th>
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<tr>
<td>Proactive Policy Direction</td>
<td>Market-based</td>
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<td>Passive Policy Direction</td>
<td>Partnership-oriented</td>
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- **Status Quo Scenario**
## REGION TRANSECT

<table>
<thead>
<tr>
<th>Travel Options</th>
<th>Rural</th>
<th>Suburban</th>
<th>Urban</th>
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<tbody>
<tr>
<td>Active Transportation</td>
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<tr>
<td>Autonomous Vehicles</td>
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<td>Connected Vehicles</td>
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<td>Ride-hailing</td>
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<td>Ride-share</td>
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<td>Electrification &amp; Fuel</td>
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<td>Internet Trip Substitutions</td>
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<tr>
<td>Mobility Gap</td>
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<tr>
<td>Other</td>
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GEOGRAPHY OF THE TRANSECT
PROBLEM STATEMENT

- Problems Challenging Blueprint Goals
- Population Growth
- Mobility Choice Factors
REGIONAL GROWTH

Denver Metro Population by Age Group

- Age 75+
- Age 55 - 75
- Age 35 - 55
- Age 15 - 35
- Age 0 - 15

2015

2030
MOBILITY FACTORS

• FACTOR: Autonomous Driving Technology
  • Autonomous driving technology (Level 3 and Level 4) will continue to develop, and could be included in anywhere from 2% to 50% of the vehicle fleet by 2030.
  • CHALLENGE: Autonomous and semi-autonomous vehicles may result in more vehicle miles traveled, worsen congestion, and increase inequality.
  • OPPORTUNITY: Capitalize on the safety and mobility potential of autonomous driving technology to reduce crashes and congestion.
FACTOR: Connected Vehicles

New vehicles have connected technology installed that has the potential to interact with infrastructure and the surrounding environment.

CHALLENGE:

- Consolidated data hubs pose a risk of significant damage from hackers
- Public agencies are struggling to manage data collected from embedded technologies and connected vehicles

OPPORTUNITY:

- Increased efficiencies in management and analytics through data centralization
- Promotion of information sharing to spur innovation
- Data can be used to increase safety and efficiency of transportation
MOBILITY FACTORS

• FACTOR: Ridehailing Adoption
  • Ridehailing and Ridesharing will continue to grow in popularity.
  • CHALLENGE:
    • An increase in ridehailing mode share will result in increased VMT, curb space management problems, increased congestion, and mobility equity issues.
    • Combined with autonomous vehicles, Ridehailing services may become so inexpensive that they make traditional transit non-competitive, and cause worse congestion with additional vehicles and VMT.
  • OPPORTUNITY: Ridehailing could bring down individual transportation costs, solve first/last mile public transportation issues, and provide mobility options to segments of the population who cannot otherwise afford or operate a car.
**MOBILITY FACTORS**

- **FACTOR: Electrification and Fuel Economy**
  - The vehicle fleet will continue to become more fuel efficient, and the portion of electric vehicles will increase.

- **CHALLENGE:**
  - As the cost/mile to operate a vehicle drops, people may choose to live further from work, or make other longer trips, increasing VMT.
  - Electric vehicles disrupt the traditional funding model.
  - Additional charging infrastructure needed and increased strain on electrical grid
  - **OPPORTUNITY:** Create a more sustainable transportation system and bring individual transportation costs down.
MOBILITY FACTORS

- **FACTOR: POTENTIAL INCREASE IN VMT**
  - Segments of the population that had limited mobility in the past gain access
  - **CHALLENGE**: Increase may lead to added congestion and strain on existing infrastructure
  - **OPPORTUNITY**: Increase social equity of transportation and improve quality of life

Source: The Clockspeed Dilemma, November 2015, KPMG
MOBILITY FACTORS

- **FACTOR: Multiple Transit Agencies**
  - Regions and states have multiple agencies working on transportation and mobility.
  - **CHALLENGE:** The multiple agencies may not share the common objectives, leading to competition for funding, lack of knowledge sharing across projects, and slow speed to technology adaption.
  - **OPPORTUNITY:** Develop innovative cross-regional agency that manages a common set of mobility and transit objectives with sufficient power and funding to advance and advocate strategies. Such an agency can implement a streamlined procurement process to facilitate private sector partnerships.
MOBILITY FACTORS

• **FACTOR: Alternative Freight**
  Retail delivery is shifting from large store shipments to personalized, more frequent deliveries from smaller hubs. People will use the internet to make more of their “trips,” rather than driving in a vehicle.

• **CHALLENGE: A larger increase in freight with demand for faster and more localized delivery causes a strain on infrastructure. Potentially greater adoption and start-up costs associated with adopting ahead-of-curve technologies, like autonomous vehicles.**

• **OPPORTUNITY: Develop policies for efficient use of roadways and labor, potentially limiting daytime deliveries and busy corridors or limited diesel use. Create urban consolidation centers where multiple carriers deliver goods and benefit from consolidation.**
MOBILITY FACTORS

• **FACTOR: Embedded Technology**
  
  Increased adoption of embedded sensors to understand asset usage, performance and maintenance requirements.

• **CHALLENGE:** Obsolescence risk must be assessed to determine if leapfrogging is a better strategy. There is a cost to manage and effectively integrate embedded technologies to realize expected return.

• **OPPORTUNITY:** Agencies can have a better understanding of unplanned and upcoming maintenance requirements, provide greater safety features, and improve customer experience.
MOBILITY FACTORS

• FACTOR: Traditional Transit Ridership
  • Traditional transit is losing market-share nationwide despite public support.
  • CHALLENGE: On-demand vehicles and other mobility options may provide superior mobility and cost less than traditional transit service.
  • OPPORTUNITY: Transit systems, by adapting and improving quality, can still effectively move people through the network and use technology developments to improve service. Partnerships with TNCs can improve transit options.
• FACTOR: Mobility Gap of Disadvantaged 
  New mobility technologies displace traditional modes that serve fringe populations.

• CHALLENGE: The mobility divide may increase due to the increasing needs of smartphones and/or credit cards to access transportation services, and displacement of traditional transit services.

• OPPORTUNITY: Policies to improve the mobility choices for the disadvantage can be adapted such as partnerships with companies such as VIA.
MOBILITY FACTORS

• FACTOR: Insufficient Funds
  • Funds will continue to be insufficient.
  • CHALLENGE: Population in Denver grows to 3.9 million people in 2030, but revenues are inadequate for transportation investments. The revenue model has become ineffective with decrease in personal car ownership and switch to electric vehicles.
  • OPPORTUNITY: Redesign revenue sources and evaluation public private partnerships that transfer risk to the private sector.
WORKSHOP 3 INSTRUCTIONS
Thank You for Your Participation!