APPENDIX F.
RESEARCH PAPER: BARRIERS TO TRIP SHARING IN EMERGING MOBILITY TECHNOLOGIES

Barriers to Trip Sharing
In Emerging Mobility Technologies

Prepared for

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CONTENTS

1. INTRODUCTION

1.1 *Purpose of Report*

The Congestion Management and Shared Ridership Subcommittee is one of the six subcommittees reporting to the Working Group to respond to Senate Bill 19-239. One of its tasks was to identify strategies utilized in other states or countries to reduce single occupancy vehicles (SOV) on the road. The Congestion Management and Shared Ridership Subcommittee requested a report on the best practices for shared trip incentives in peer cities and for the researchers to identify which programs could be applicable to Colorado. This report served as a resource to the subcommittee to advise the Working Group on recommendations about how to incentivize multiple passenger ride sharing for motor vehicles used for commercial purposes and the use of such vehicles as a first and last mile solution for users of public transit. This report focuses on trip sharing which is most compatible with four of the SB 19-239 transportation providers, TNCs, Taxis, Non-Peer Car Share, and Residential Delivery. It does not include car rentals or peer car share, because the number of riders and instances of ride sharing is not typically tracked in the transaction.

1.1.1 Definition of Trip Sharing

This report examines shared trips for both people and goods. Shared trips for people include two categories, shared rides among strangers and carpooling. Shared rides are trips shared with strangers enabled by platforms that connect drivers and vehicles with consumers who want rides at an agreed price.[1] In most cases, these shared rides are facilitated by technology, such as a mobile app. Carpooling is defined as two or more people sharing a ride from their neighborhood to their place of employment.[2]

Shared trips may be planned in advance, as in the case of carpooling with coworkers to a place of employment. A mobile app also allows for shared trips which are real-time or on-demand. Beyond carpooling, shared rides can include vanpooling (sharing a ride in a van by commuters traveling to or from a job center) and private and/or commercially operated shuttles (vehicles that make limited stops, often only picking up specified riders).[3] One example of a shuttle may be from a hotel to an airport destination. This definition does not include rides shared by people who are acquainted, like friends or family and whose trip plan was to already travel together.

As it relates to shared trip possibilities, shared trips for residential delivery of goods is focused on package bundling that has the potential to make residential delivery services more efficient. Package bundling refers to how many packages are delivered by a single "trip" from a distribution center and the number of miles that are traveled per package delivered. Several online retailers offer consolidated package delivery as an option. In addition, several retailers like grocery stores and "big box" stores offer package delivery to local residents.

1.1.2 Role of Emerging Technology in Shared Ride and Residential Delivery Industries

Emerging technology has transformed the shared ride and residential delivery industries. Smart phone technologies, which have gained popularity in the US, have made ridesharing and carpooling an increasingly efficient option.[4] Ridesharing is not a new concept and has evolved from the car-sharing clubs of the 1940s to the technology-enabled ride matching that is popular today. Technology has

revolutionized the ridesharing industry and enabled connections between interested carpoolers through software applications, replacing the traditional, less-efficient ridesharing systems.[5]

1.1.3   Impact of Trip Sharing Programs on Congestion

Trip sharing can decrease traffic congestion in many cases. Carpooling has been shown to reduce traffic congestion, as trips are consolidated to one vehicle rather than each person driving an SOV.[6] One study showed that carpooling can decrease vehicle miles traveled (VMT) by 1%-2%.[7] Furthermore, carpooling reduces the number of cars driving around looking for parking and the actual need for parking at key destinations.[8] However, the degree to which carpooling reduces congestion is contested. One study showed that people tend to replace public transit trips with carpooling, so it leads to a reduction of VMT in only 20% – 30% of cases.[9]

The impact of TNC ridesharing on congestion is uncertain. One study suggests that shared TNC rides puts 2.6 miles on the road for every mile removed, based on the current rate of 20% of trips being shared.[10] Many users switch from non-auto modes to TNC ridesharing and there is added mileage involved with picking up multiple passengers.[11] Some authors argue that TNC ridesharing complements public transit. Toth states that the availability of TNC rideshare encourages people to forego personal vehicle ownership in favor of traveling by a mix of public transportation and shared rides.[12] Uber (a TNC service that operates in Colorado) has made the argument based on data from London, United Kingdom that Uber rideshare trips tend to take riders between their homes and transit stations.[13] The impact will also depend on the prevalence of ridesharing. The city of Chicago has collected data on all TNC rides from November 2018 to September 2019. This data revealed that the percentage of trips with TNCs which are pooled rides ranges from 14% - 22% of all rides.[14]

In terms of residential delivery, some authors argue that residential delivery increases congestion because delivery vehicles are on the road delivering packages. Others argue that residential delivery decreases congestion because the rise of online shopping and food delivery decreases SOV trips. Regardless, using package bundling is shown to reduce VMT, thereby decreasing congestion.

2. TRANSPORTATION PROVIDER SHARED RIDE COMPATABILITY

2.1 TNC (Transportation Network Company)

The TNC category of emerging mobility providers is defined as a mobile phone app service that links an independently contracted driver and a motor vehicle that is used to provide on demand passenger transportation services which are purchased by the rider through the app. Typical TNC providers include Uber and Lyft. These companies use mobile apps to connect with customers with a driver and a vehicle, and the mobile apps often have an option to pool rides in which each independent rider has an option to select a shared trip which is often discounted. TNCs have the ability to track the number of passengers per ride.

2.2 Peer Car Share

The Peer Car Share category includes a peer-to-peer car sharing company. This is another emerging technology, often deployed on a mobile phone app or via a website. The company fosters a business transaction between two people. One person is a vehicle owner who can lease their vehicle to earn income to another person who is the client who rents a vehicle. The app company owns no capital

vehicles. Rather the app company connects independent owners with renters. Examples of peer-to-peer car share company include Turo, Getaround, Drift and Maven. This transportation provider category does not directly facilitate ride sharing. Peer car share companies do not have the ability to track a shared ride

2.3 Non-Peer Car Share

The Non-Peer Car Share category is a car sharing company that does not use a peer-to-peer business model. This is another emerging technology which uses either a website or mobile phone app. This business model is similar to a car rental company in which a non-peer car share company owns a fleet of vehicles which can be leased per day, per hour and even per minute. A non-peer car share company often locates its fleet in various locations within a community, often in public parking locations. This is different than a car rental company which usually locates all of its available fleet in one business location. Examples of this provider category include ZipCar, Car2Go, and We-Cart by Enterprise Rental Car. This category of providers can facilitate ride sharing by partnering with carpooling platforms. Non peer car share companies do not have an ability to track shared rides.

2.4 Taxi

The Taxi category includes companies that provide taxicab service as defined in Section 40.10.1.101 (19) of the Colorado Regulatory Statutes (C.R.S.). Examples of these companies include Freedom Cabs and Green Taxi Cooperative. Under the Colorado Public Utility Commission regulations taxis must request permission from a paying passenger in order to pick up an unrelated second passenger for a shared ride. This is common with taxi rides departing the Denver International Airport in inclement weather, when available taxi cab service providers may be sparse. In addition, taxi companies can subscribe to mobile apps to facilitate shared rides in their taxis. Taxi cab companies have the ability to track their number of passengers.

2.5 Car Rental

The Car Rental category includes rental car companies that rent out a mobile vehicle, such as Enterprise, Avis, or Hertz. These companies typically rent vehicles in increments of days from a central location with a service counter. Often car rental companies are stationed at major airports and transit hubs and their clients may originate from out of town. Some car rental companies have agreements with automobile repair shops and insurance companies. Their clients may be local and are temporarily rental a car while their current vehicle is under repair. This transportation provider category does not directly facilitate ride sharing. Car rental companies do not have an ability to track the number of passengers per vehicle.

2.6 Residential Delivery

The Residential Delivery category includes a motor vehicle used for residential delivery of goods. Examples of this transportation provider category include Uber Eats, Door Dash, and UPS. Some companies own their own fleet of vehicles and their drivers are company employees, such as FedEx. Other companies link a retailer with a contracted fleet provider. Other emerging companies are mobile phone apps which link a contracted driver to an independent retailer for delivery to a customer of the retailer. Delivery companies bundle packages as part of their standard practice. This practice has long been a method for established delivery companies to be more efficient and profitable. The United States Postal Service (USPS) consolidates mail and packages into delivery routes by zip code and Zip+4

code routes; UPS and other residential delivery companies have specific routes and coverage areas that are bundled.

3. EXISTING PROGRAMS IN COLORADO

This section provides an overview of existing shared ride programs in Colorado.

3.1 TNC

- Lyft Line provides shared rides which allow riders to connect with other riders along the route. The goal for Lyft shared rides is to fill empty seats in cars with riders who are going in the same direction. This benefits the rider, as each rider pays a discounted price for the ride, up to 60% less. Shared rides are only for people traveling from Point A to Point B and do not allow for errands, stops, and changes. To increase efficiency, the driver will not wait more than one minute for a rider.[15]

- UberPool matches riders heading in the same direction so they can share the ride and costs. The riders can request a maximum of two seats and the driver will pick up riders along the way. UberPool will take a little longer than a regular ride, but the estimated time of arrival will be shown to the rider in the app. UberPool is not recommended for people traveling with luggage.[16]

3.2 Peer Car Share

No peer car share providers were identified that facilitated ride sharing in Colorado.

3.3 Non-Peer Car Share

No non-peer car share providers were identified that facilitated ride sharing in Colorado.

3.4 Taxi

No taxi providers were identified that facilitated ride sharing in Colorado.

3.5 Car Rental

No car rental providers were identified that facilitated ride sharing in Colorado.

3.6 Residential Delivery

The larger residential delivery providers identified in Colorado include Amazon (Amazon Service Partners and Amazon Flex), Uber Eats, Door Dash, GrubHub, PostMates, UPS, FedEx, Domino's Pizza, Jimmy Johns, Instacart, and Shipt.

3.7 Other

This category comprises public sector Transportation Demand Management (TDM) programs, nonprofit and community platforms, and open source ride share apps.

3.7.1   Public Sector Transportation Demand Management (TDM) Programs

- The WaytoGo program is a program that is administered through the Denver Regional Council of Governments (DRCOG) and its Transportation Management Association partners. The aim of the program is to provide commuting solutions that reduce traffic congestion, improve air quality, and improve the quality of life. WaytoGo has online ride-matching software and app to match drivers and riders who want to carpool or vanpool to the same areas. Another software available on the site is Schoolpool, which connects parents with families in their neighborhood to facilitate shared rides for students.[17]

- CDOT offers limited commuter transit for special events via Bustang Service to destinations such as Estes Park and the Rams Ride for college football games.

3.7.2   Non-Profit and Community Platforms

- University of Colorado Boulder offers a ski bus for students and staff to access ski resorts in the winter.

- Craig's List (craigslist.org) is a classified advertisement website that contains a general resource board where individuals can post requests and find people to carpool with.

- Carpool World (carpoolworld.com) is an international ridesharing website with an active ride-board for people wanting to share rides from Denver metro area to the mountains.

3.7.3   Software Applications to Promote Ridesharing and Carpooling

- Waze (waze.com) is a carpooling app that allows participants to drive and ride with people going the same direction and share the cost of gas and tolls.

- Hytch (hytch.me) is an app that provides incentives to people who share rides through sponsors and employers who pay Hytch users in points that convert to cash.

- Metropia (metropia.com) allows users to create carpooling groups with people they know.

- Share Your Ride (shareyourride.net) provides real-time trip-matching services to allow users to carpool.

- Gondola (ridegondola.com) and SkiCarpool (skicarpool.org) allow users to find rides to ski resorts.

- Moovit (moovitapp.com) uses official transit data plus crowd sourced data to provide the best information about transit routes and is also integrated with TNC apps.[18]

- HeyRide (goheyride.com) provides the user multiple transportation options in one app including TNCs with ridesharing options.[19]

3.7.4   Shuttles

- SuperShuttle allows riders who are traveling the same direction to share a ride. SuperShuttle groups travelers headed in the same direction in the same timeframe. SuperShuttle states that the service is ideal for travelers who have extra time or are traveling on a budget. For riders traveling to the airport, the rider enters their travel time on the company's website and is assigned a pick up time that is typically 2-3 hours before the flight time and then given a 15-minute window for pick up. For

riders traveling from the airport, the rider checks in for their ride via a text message and meets their ride at a designated pick up location.[20]

- Ski Resort Shuttles: There are several shuttles that cater to skiers and provide transportation from airports to ski resorts, mostly along the I-70 corridor. Each of these companies has a web-based booking system and an option to pay for a seat in a car with other riders traveling in the same direction. These companies include Epic Mountain Express, Fresh Tracks Transportation, Peak 1 Express Shuttle and Summit Express.

4. BARRIERS TO IMPLEMENTATION

As the population in Colorado rises and the roads become more congested, many solutions have been proposed to convert SOVs to shared rides. However, it is important for transportation planners to fully understand the trip share customer and the barriers to trip share adoption. This section presents multifaceted barriers.[21]

4.1 Common Barriers for Rideshare

4.1.1 Structural and Temporal

The realities of contemporary work and travel lend themselves to structural barriers that impede ride sharing. Employment sites are more dispersed and more and more companies are allowing employees to work from home or work flexible hours at a place of employment, making ridesharing less feasible. The industries that are more conducive to ridesharing are on the decline in the US, jobs like manufacturing where workers have the same hours of employment or work in standard shifts.[22] This leads to a lower number of carpoolers, hindering matches between passengers and drivers.[23] In the past, carpool programs have overcome structural barriers by implementing designated meeting places, such as a program in Marin County, California in the 1980s where drivers and passengers met at bus stops to share rides. This concept could be applied to the new ridesharing technologies.[24] Carpooling also tends to be more efficient for those traveling long distances to the city and provides a transportation option to those living in the suburbs.[25] The upfront time required for carpooling of arranging the ride share and designating a meeting place may not be worth it to those living shorter distances to work, although emerging technology is making these logistics easier.

4.1.2 Norms and Attitudes

In the US, there are norms and attitudes that hinder rideshare adoption among certain people. These norms and attitudes are the most important factors when a traveler is selecting a mode, and can include convenience, socializing, and privacy.[26] SOV drivers often conduct trip-chaining, or make multiple stops to and from work. This is on the rise and is not conducive to ride-sharing.[27] Even Uber CEO Dara Khosrowshahi recognizes this as a barrier to ridesharing that the company must address, "You share a car with someone else, and it kind of feels a little weird. … and then the question of, 'when exactly am I going to get there?' are real friction points that we have had to fight, and that's why we are investing very heavily in this mode of transport."[28]

Norms and attitudes can help explain the limited participation in ridesharing despite the boom in new apps and programs, because they still require interest, inertia, and commitment. Because of this, only the most motivated ridesharers elect to participate.[29] Eliminating guaranteed ride home programs have little effect on likelihood to carpool.[30]

4.1.3 Safety Concerns

Safety concerns are a barrier to ridesharing, as many people aren't comfortable riding with strangers – people who are unacquainted.[31] There is a perceived risk in having someone you don't know drive a person to his place of residence.[32] A study in Hope Village, a community in Detroit, revealed that physical safety risks associated with unknown passengers and drivers was the residents' greatest concern in choosing rideshare. The residents feared that the shared ride would increase the chance of sharing a car with a criminal and were concerned about being driven by an unregulated driver.[33] However, a study in Hungary had different results, and concluded that the individual-psychological barrier, or distrust of strangers or safety concerns, was of minimal concern of those surveyed.[34] Other safety concerns expressed by some include concerns about the shared ride driver's skills and the vehicle condition.[35]

4.1.4 Economic

Economic benefits are an important factor in choosing a mode of travel. In the US, driving is relatively inexpensive and many Americans can afford vehicles and the costs associated with them. As a result there is less of an incentive for a driver to pick up carpoolers, compared to Europe where gas and other costs associated with vehicle ownership can be triple what they are in the US.[36] In fact, many employers subsidize driving and not carpooling, offering free parking and other benefits that make driving to work the most economical option.[37] A study conducted in Hungary found that economic benefit was the most important factor to encourage more intensive carpooling.[38] However, Neoh et al. found that parking costs and cost subsidies had small effects on likelihood to carpool.[39]

4.1.5 Demographic

Demographic factors appear to correlate to propensity toward carpooling. One analysis showed that women were slightly more likely to carpool than men. Other factors, such as age, income, marital status and household size, had a small effect on carpooling.[40]

4.1.6 Infrastructure

The existing transportation infrastructure has been found to impact ridesharing. Neoh et al. found that reserved parking for ridesharing vehicles and high-occupancy vehicle (HOV) lanes improve carpooling rates. The existing rates of HOV lane usage in Colorado were examined. On average, 17 percent of all Express Lane transactions in 2018 were HOV3+ across the Express Lane Network. An estimated 2.6 million free trips were taken by HOV3+ users in 2018 on US 36 (I-25 to Table Mesa) and I-25 Central, I-25 North, and the I-70 Mountain Express Lane.[41]

Rideshare increases in areas where access to public transportation is low. The effect of distance on carpooling is inconclusive; some authors state that longer distances encourage carpooling and others report that it does not affect mode choice.[42]

4.1.7 Branding and Legibility

The proliferation of rideshare choices, from public programs to private TNCs, may decrease the likelihood of ridesharing. Personal vehicles can now become ridesharing vehicles, which is problematic for the study participants in Hope Village, Detroit. The participants were concerned that ridesharing vehicles were difficult to identify and they would be more comfortable using branded vehicles.[43] In addition, there are many apps that provide an almost identical service, which could result in too few riders or drivers on any one app to match similar trips. Gorringe theorizes that technology may play a critical role in this critical mass barrier and provide interoperability among numerous ridesharing databases.[44]

4.2 Common Barriers for Residential Delivery Trip Share

Some barriers to implementation of package bundling, or "trip-chaining," are summarized below.

4.2.1 Cultural

As the shift from shopping in brick-and-mortar stores to online retailers has occurred, one major source of frustration for consumers is the wait between selecting an item for purchase and its delivery. Traditional brick-and-mortar shopping within a place of business or "mall" results in immediate retention/"delivery" of goods, while online retailers were initially delivering items in 3 or more days. The advent of 2-day, 1-day, or even same-day delivery has helped online retailers address this gap, and has helped online retailers be so successful. However, these fast deliveries also mean that bundling packages and delivery logistics are more difficult. In order to meet promised delivery dates, packages that are in different warehouses cannot typically be bundled without more time.

4.2.2 Logistical

Supply chains must be consolidated to achieve efficiency in package deliveries. With a greater variety of goods being delivered from a greater variety of online retailers located all over the world, logistical challenges will remain.

4.2.3 Food Delivery Timetables

Food delivery is particularly challenging given the time constraints on delivery. Because companies that make these deliveries from restaurants must deliver in a timely manner from a variety of sources, the logistics of linking trips is difficult in order to keep food at its desired temperature and freshness

4.2.4 Independent Contractor Model

Many companies use independent contractors, for whom the competition to deliver an order is demanding. The policies for contractors vary by company; some companies ensure a minimum fee per delivery while others rely on tips.[45] These drivers are often expected to take orders without knowing all the details, like the distance they will need to travel to complete the request.[46] Also one contractor will pick up a package from one retailer and deliver to one customer for more real time delivery. This can result in very inefficient routing because trips originating from one retailer are less likely to be chained.

5. STATE OF THE INDUSTRY

Ridesharing appeals to the public, private, and nonprofit sectors alike, whether the goal is to reduce air pollution, travel for less cost, or make a profit. For that reason, many municipalities, companies, and other entities have adopted innovative programs, partnerships, or technologies to grow the number of people who use ridesharing. This section provides an overview of some of the success stories and best practices from across the country and globe.

5.1 TNC

- TNC App Upgrades to promote shared rides
  TNCs have designed their mobile cellular phone apps to convince users to take shared rides. The option for a shared ride is now on the same screen with the estimated trip lengths and prices. For

one of the TNC companies, when the user is requesting a ride and enters the destination, the app will automatically search for a shared ride possibility and prompt the user if there's a less expensive option to share a ride to the same area. This feature has generated a 5% increase in shared rides.[47]

5.2 Peer Car Share

No peer car share providers were identified that facilitated ride sharing in peer cities.

5.3 Non-Peer Car Share

- University of California (UC) Santa Cruz Partnership with Enterprise
  UC Santa Cruz partnered with Enterprise to provide a way for students traveling in the same direction to connect and select a SUV or van from Enterprise to rent for the shared ride.[48]

5.4 Taxi

- Cab Share New York City
  Shared rides in yellow taxis are being offered through a partnership between two competing ridesharing apps. Via, which runs carpools, and Curb, an app that connects riders to taxis, have teamed up to help the yellow taxi industry provide a transportation alternative and reduce congestion.[49] Another service, called Bandwagon, allows users to share rides from the airport and large events simply by texting their location.[50]

5.5 Car Rental

No car rental providers were identified that facilitated ride sharing in peer cities.

5.6 Residential Delivery

Some research has been conducted in an attempt to determine the benefits of residential delivery package bundling. Achieving these benefits is reliant on several factors that impact the amount of overall travel for goods delivery, including:[51]

- Better bundling and trip optimization thanks to large volumes of goods

- Shorter distances for last mile distribution (making it possible to deliver e.g. by bike)

- Better consolidation, trip optimization, and bundling if delivered to central pick-up points

- Replacement of shopping trips if pick-up point is at a location regularly visited anyhow (e.g. workplace)

- Trip optimization as delivery can be at any time of day

- Assembly of different orders at the pick-up point (replacing a number of single shopping trips)

- Replacement of individual shopping trips by bundled goods transports

- Potential in overall traffic reduction depends on ability to bundle transports, set up efficient delivery trips and make full use of vehicle

The overall supply chain is key to bundling for residential delivery trips. As the number of packages delivered *from* a single point increases, the opportunity to bundle those deliveries increases. Similarly, as the density of deliveries *within* a specific residential area increases, so too will the opportunity to

bundle those deliveries. Again, the USPS is the best example of this because parcels are consolidated in regional and local processing facilities.

Amazon offers its customers the option to pick up packages at Amazon Hub Lockers that are strategically located in places already frequented by customers, like convenience stores, grocery stores, apartment buildings, and malls. This consolidates trips that would otherwise have been made to individual residential addresses. There are Amazon Lockers in more than 900 cities and towns across the U.S.[52] In addition, at checkout, Amazon customers are offered the opportunity to consolidate multiple packages for delivery to the same address at the same day and time.

5.7 Other

- CommuteSmart Alabama
  This regional partnership administered by the Regional Planning Commission of Greater Birmingham includes an online ride-matching service and incentive program to incentivize ridesharing. Commuters who switch from driving alone can receive money and gift cards. There are over 20,000 participants and in 2013, the program reduced VMT in the Birmingham metro area by 15.2 million miles, 10.5 million of the miles through alternative forms of transportation and 4.7 million of the miles through vanpools.[53]

- BlaBlaCar
  BlaBlaCar is a French company that now operates across Europe, Russia, India, and Mexico and facilitates a carpooling through an app that allows passengers to share rides and costs. The trips are inexpensive and the company now has 20 million user accounts and provides 4 million rides a month.[54]

- Gondola
  The Gondola mobile phone app will be deployed for the winter recreational season from 2019 to 2020 in Colorado to match riders with drivers to the Colorado ski slopes.[55] The I-70 Mountain Coalition is endorsing Gondola as a way to reduce congestion on the busy I-70 corridor.[56]

6. SUMMARY OF FINDINGS

This report has provided an overview of transportation providers that provide trip sharing, presented best practices for incentivizing and enabling more efficient travel through trip sharing, and discussed barriers that may impede implementation. As Colorado considers tactics to incentivize multiple passenger ride sharing for motor vehicles used for commercial purposes and the use of such vehicles as a first and last mile solution for users of public transit, the following key takeaways can provide guidance in developing sound recommendations.

6.1 TNC

TNC ride sharing can reduce VMT when used to complement public transit rather than substitute it. Partnerships with TNC companies can potentially increase the number of trips that are taken for first and last mile, such as the recent partnership between Lyft and the Regional Transportation District (RTD).[57] Mobile app design also has the potential to impact user behavior by encouraging TNC customers to opt for a shared ride rather than a private ride. Furthermore, as financial incentives appear to affect mode choice, the State could partner with the TNC companies to provide an even greater discount to shared rides.

1.1 Peer Car Share

Peer car share was found to be incompatible with rideshare, because the number of riders and instances of ride sharing is not typically tracked in the transaction.

6.2 Non-Peer Car Share

Ride sharing in the non-peer car share industry appears to be most effective when implemented among existing transportation networks, such as airports, universities or employers with large campuses. There may be an opportunity to encourage this type of program where people who participate in non-peer car share can opt to notify passengers of available seats. This may be effective at the State's larger universities like Colorado State University and University of Colorado.

1.2 Car Rental

Car rental was found to be incompatible with rideshare, because the number of riders and instances of ride sharing is not typically tracked in the transaction.

6.3 Taxi

Taxis and shuttles have had a longstanding impact on the transportation network and have the potential to harness technology to provide greater access to the services and accommodate multiple passenger rides. Tactics, such as developing mobile apps to request shared taxi rides, can potentially improve the efficacy of taxi rides to reduce VMT. In Colorado, there are many shuttles serving airport travelers and especially tourists visiting ski resorts. There may be opportunities to encourage shuttle companies to broaden the type of services they provide.

6.4 Residential Delivery

One tactic to reduce VMT in residential delivery is to encourage urban distribution centers, defined as "a facility involving the trans-shipment of goods directed to urban areas, aiming to consolidate deliveries, and thus provide greater efficiency in the distribution process by increasing the truck load factor and decreasing the number of trucks used, which help mitigate congestion and air pollution." The likelihood of sellers and retailers to participate in implementing urban distribution centers varies by industry, with companies distributing foods being the most likely and industries with long delivery tours the least likely.[58] The State should focus on the "low-hanging fruit" and begin with incentives to the food distribution industry. In addition, Amazon and others that provide goods from multiple sellers provide the customer the option of having packages shipped separately or in one package. Often, if packages are shipped together, it takes longer for all items to arrive than if they are shipped separately. The State could (1) educate consumers about the carbon footprint of non-consolidated package delivery, (2) incentivize the customer to choose that packages be shipped together, and (3) or encourage the retailer to penalize customers who have packages shipped separately or shipped with same day delivery.

6.5 Other

The public and nonprofit sectors have developed a numerous mobile apps to facilitate carpooling causing a critical mass barrier. This problem could potentially be solved by developing software that creates interoperability among the numerous ridesharing databases. This would allow a user to register for one app but access all the other interested rideshare participants who have registered for different

apps. Also, the State could designate rideshare meeting places with signage in areas of their existing park and rides to make rideshare more convenient and efficient for users.

End Notes

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