Analysis of Non-SOV Transportation Programs and Contribution to a Socially Just Transportation System in Boulder, Colorado

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Abstract:

I began working David Ciplet and the Just Transition Collaborative (JTC) in the Fall of 2016. JTC focuses on engaging in community partnerships, projects, and research to advance environmental justice in the transition to a sustainable economy. Boulder has made a climate commitment which is guiding many policies. This commitment includes four components: 100% renewable electricity generation by 2030, 100 megawatts of local renewable energy generation by 2030, an 80% reduction in community GHG emissions by 2050, and an 80% reduction in emissions from city organizations by 2030.

Plans for meeting these goals could follow two main scenarios:

1. The City of Boulder meets the goals through benefiting some individuals and not others. The focus is the end result, and not the means to get there.
2. The entire community benefit's from meeting the goals. This scenario has an emphasis on the means (or the benefits to each individual) rather than only the end result of the goal.

While both situations can successfully meet Boulder's climate commitments, I am interested in advocating for the second scenario. I believe everyone in the community can benefit from strategic planning which incorporates equity into new policies and implementation.

My analysis looks specifically at non-single occupancy vehicle (SOV) transportation programs in Boulder. I contacted and researched each program to gain an understanding of how they aim to meet certain needs for individuals.

Each transportation option addresses different social rights which increase individuals access. Interestingly, I also found a feedback loop of *how* transportation routes are planned. Many locations to access transportation routes are based on existence of other access points. This creates a centralized transportation system where some regions of the city have more access to transportation options than other regions.

This feedback loop, which I call "cyclic transportation planning," highlights the necessity to plan critically and understand if Boulder is to reach the climate commitment goals, the transportation system will need to expand to reach critical populations who are currently excluded from many non-SOV transportation options.

Within the literature, there is not a comprehensive report on transportation systems from a social rights perspective, nor is there information on cyclic transportation planning. This report contributes both of these components to existing transportation literature.

Keywords: transportation, equity, single occupancy vehicle, cyclic transportation planning

Preface:

I began this project with the Just Transition Collaborative and David Ciplet (Dave) at the University of Colorado, Boulder. For two years a team of students and I worked with Dave to create usable reports which will inform the city on equity based policies surrounding transportation, green jobs, and in-home energy use. We worked under the name Brink Lab, which is one component of the JTC. Ivonne Morales and I wrote the transportation report, part of which I have used in this thesis.

After many iterations of the analysis for each topic, we chose to focus on a social rights perspective which elaborates on specific programs. Over the years we continued to restructure our reports. Initially, we looked at each goal Boulder has set and analyzed them from an equity framework. This report addresses each transportation program from a social rights framework. The journey between this first iteration and the model used in this report have offered me time to deeply understand the fundamentals of the transportation system in Boulder. While it was challenging to repeatedly change the report, I am confident that the model proposed here is a usable report of current systems in Boulder. We have not found any reports which address each program in Boulder from a social rights perspective. This contribution to the literature on Boulder's transportation systems will hopefully inform the city on future policies in a unique and condensed manner.

Further, I address what I call "cyclic transportation planning". This idea has not been presented in prominent transportation literature. "Cyclic transportation planning" offers a valuable addition to existing literature and explains many spatial transportation distributions in a tangible manner.

Without Dave's commitment to social justice and ongoing work to illuminate, and hopefully restructure parts of our systems, I would likely not have learned nor contributed to the critical work of chipping away at the current unsustainable nature of our transportation system.

I would also like to acknowledge my partner in the larger transportation report used for the Brink Lab and JTC. Ivonne Morales contributed much of the information on RTD as well as many components of the work surrounding the current state of Boulder.

I would also like to thank Dale Miller and Beth Osnes for their continued support throughout my planning, writing, and editing process.

Using the information and analysis from this thesis, I plan to publish a shorter report with Dave and the JTC for the City of Boulder to use as they rewrite the Transportation Master Plan in 2018.

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Introduction

This report explores the state of transportation in the City of Boulder as we transition to a low-carbon economy fueled by the Climate Commitments proposed in December 2016. I refer to transportation options which reduce the necessity for fossil fuels, including public transportation, ridesharing, cycling, walking, and educational programs surrounding transportation. The report begins with an overview of key terms and addresses how Boulder's transportation policies affect people in and around the city. By identifying each of the current transportation plans in Boulder, I highlight the key programs which aim to specifically reduce carbon emissions or improve transportation. This report analyzes the effectiveness of these programs in advancing social rights based on key indicators from the transportation and rights literature. From these criteria, I draw conclusions and recommendations for each program as well as recommendations for the overall transportation plans in Boulder. This report is intended to encourage the City of Boulder to reduce fossil fuel reliance while simultaneously improving accessible transportation for all users in Boulder.

Background

According to Boulder's Climate Commitment, transportation in Boulder accounts for 31 percent of emissions (City of Boulder, 2017, p. 6). With a goal of an 80 percent reduction in GHG emissions by 2050 (from 2005 levels), Boulder needs to take significant steps towards emissions reduction in all sectors, including transportation (City of Boulder, 2017, p. 6).

On average, transportation is the second highest consistent cost for families (after housing), and accounts for as much as 30 percent of spent household income for low-income families (Viadyanathan, 2016). Yet, many transportation systems are designed with limited input

and consideration of marginalized individuals and communities who have the most at stake in terms of how public and private dollars are spent.

Based on literature analysis of capabilities and social rights, I have assigned key indicators to measure how programs specifically contribute to individual's capacity in using accessible transportation. These indicators include the right to affordable, inclusive, accessible, ecologically sustainable, healthy, and safe transportation, as well as the right to accessible transportation information. These indicators are identified from Todd Litman's (2017) "Evaluating Transportation Equity" report as well as the Governors' Institute on Community Design's report on Performance Management (2017).

Both reports highlight the importance of destination oriented indicators. Governors' calls this type of measurement "destination access". Destination access is the "degree to which the transportation system provides people with access to jobs, school, healthcare, recreation, and other resources and essential services" (Governors, 2017, p. 32). In short, destination access measures how easy it is for people to get the places they need to go.

Litman (2006) describes a similar idea to destination access. Litman calls destination access *accessibility* based transportation. He emphasizes the importance of planning based on an accessibility framework versus a *mobility* based transportation framework. Currently, most transportation policies are based around *mobility*, or physical travel, which measures transportation effectiveness in vehicle miles traveled (VMT) and speed of travel. Mobility prioritizes getting somewhere far away as quickly as possible. This planning can lead to funding road expansion while emphasizing cars and independent vehicles. However, if we look at transportation policy from an *accessibility* perspective rather than *mobility*, we can rationalize funding alternative forms of transport. Accessibility refers to "people's ability to reach desired

services and activities" (Litman, 2006, p. 6). By focusing on accessibility, policy can be based on affordability, quality of transport options, and improvements to non-vehicle modes of travel. Accessibility also includes placing necessary services, such as grocery stores and schools, near the individuals who needs such services. Another component of accessibility is inclusivity. Disabled, low income, elderly, students, non-drivers, non-English speakers, and other disadvantaged populations can all benefit from accessibility based policies which prioritize ease and efficiency of travel. While improving transportation speed and mobility is important, accessibility based policy can address deeper challenges behind transportation and prioritize efficiency over distance traveled.

Many cities are already planning with a destination oriented/accessibility based approach. For example, Austin, Texas created goals in 2012 based on accessibility performance. Examples of these goals include measuring the percent increase of households within one half-mile of high capacity transit or the percentage of households within one half mile of medical services. If Austin had focused on mobility, as opposed to accessibility, they may have prioritized reducing congestions through adding additional car lanes to existing highways. Another example of accessibility based policies is the Southern California Association of Governments (SCAG). Some of their indicators include goals such as the travel time to work based on an "improvement over base year" (Governors', 2017, p. 30). While this could encourage road expansion, SCAG is working to make non-SOV commutes faster and cheaper than traditional SOV travel.

This report will begin with a literature review which addresses transportation in relation to social rights and capabilities. Next, it will analyze the social rights and opportunities associated with transportation programs in Boulder, Colorado. This report will then expand on each indicator and outline achievements and gaps of each program. It will end with

recommendations for Boulder's transportation system as a whole. I will address how the current transportation options in Boulder perpetuate cyclic transportation planning where individuals who have the fewest viable transportation options are continually denied access even as transportation system expands. I will offer a set of recommendations for growth in social rights oriented transportation. Following the analysis of current systems, I will address the future of transportation in Boulder with the increase in technology such as self-driving cars and automated systems. The conclusion of this report will raise social rights questions as future technology changes transportation.

Key Terms

Social Rights:

Social rights are defined as rights which arise inherently as a human. Typically, these can include the right to safety, shelter, health, food, and happiness.

Transportation Rights:

In addition to the previously mentioned rights, I assume access to transportation is a social right. Individual should be able to reach destinations needed to complete daily tasks and reach necessary services. I will explore how policies and programs offer citizens access to transportation. I consider the right to affordable, inclusive, accessible, ecologically sustainable, healthy, and safe transportation each critical for individuals today. This means all people deserve fair access and use of the broader transportation system. I will also address the accessibility of information about transportation systems.

Single Occupancy Vehicle (SOV):

A single occupancy vehicle is any vehicle driven by one person. This report focuses specifically on non-SOV transportation.

Vehicle Miles Traveled (VMT):

Vehicle miles traveled is a traditional method of measuring transportation systems. VMT can be in relation to each vehicle, each person, or various totals to indicate the distance traveled.

Literature Review

Rittel and Webber (1973) explore what they call a "wicked" problem. Transportation systems can be seen as wicked problems because they are unique, there is no ultimately correct solution, and most attempts to change the system affect the system and its users directly. Rittel and Weber claim some problems are "tame" and can be solved using the scientific method. However, trying to tame "wicked" problems can lead to ineffective or negative results. It is important to recognize transportation is a wicked problem. I have worked to contribute to the literature on transportation, while recognizing the deep complexity of the problem. Particularly from a social rights perspective, it is imperative to work to quantify how effective a system is and strive to improve it. At the same time, by recognizing the complexity of the problem and knowing it is not quickly solved, we can see the solutions as steps towards a more just system and not as an absolute solution which will solve all problems.

This report addresses seven different categories of social rights, which are used as indicators to analyze how non-SOV transportation systems in Boulder offer such rights to certain populations. The indicators are a combination of work from Litman (2017) and reports by Governors' Institute (2017) which outline different ways to measure the effectiveness of a transportation system.

Amartya Sen (1979) outlines a capability approach in relation to social rights. He claims resources only lead to utility with a certain set of personal utilization functions (Sen, 1979). For example, if a resource is a bicycle, it can only be of utility if the person has a certain set of functioning's such as physical ability, location, social environment, and a reasonable destination. Without these functionings, a bicycle will not be useful. This idea leads directly to planning with resourcism—meaning we should plan transportation for people who have more needs from the beginning, instead of addressing people who have different needs after the system is in place. For example, this is applicable for disabled populations. If transportation systems are focused on allowing people with a range of disabilities to use them, the system will inherently work for able bodied people as well. In terms of new technologies, one example which exemplifies this idea is the Easy Mile automated electric vehicle. These vehicles are focused on making first and last mile connections for users. The vehicles are wheelchair accessible, can pick people up near a home/car/work, and have proper space to accommodate a number of individuals with disabilities. In turn, these vehicles are not only usable for many disabled people, but also accommodate able-bodied people. Sen's analysis outlines an important component of transportation rights. The conventional transportation systems which focused on VMT and increasing speeds do not consider the range of needs in a community. Within policy creation, it is important to account for people with the most challenges, not only the average user

Another idea outlined by Sen (1979) is evaluating success based on both "actual achievements and effective freedom (capability)" (Sen, 1979). I apply this to the social right to reasonable transportation. While a transportation system may effectively reduce emissions, and help meet Boulder's climate commitment goals, the effective freedoms it produces are also important. In short, the means and the ends need to be considered. New policies and

implementation should not only seek to reduce emissions for the sake of the climate commitment, but should do so in a way which offers more people additional rights.

Methods

Based on this understanding, I chose to frame my analysis on Amartya Sen's capabilities approach as well as Todd Litman's transportation study recommendations. The City of Boulder encourages alternative transportation methods on the GO Boulder resources page for transportation. They advocate for walking, biking, using public transportation, carpool/vanpool, ridesharing, and outline other educational transportation programs.

In this analysis, I use seven indicators to analyze transportation options (non-single occupancy vehicles) in Boulder. The seven indicators are detailed below:

Indicator	Question
Affordable	How does the cost of using the transportation system compare to SOV use? Does the government directly contribute to reduce this cost? *-Personal Spending* *-Government Spending*
Inclusive	Does the transportation system take steps to ensure a wide variety of users can participate? *-Disabled* *-Low-income* *-Less accessible location (distance from other people, roads, services)* *-Non-driver* *-Under 18* *-Elderly* *-Language barrier*
Accessible	Does the transportation system offer access to basic or essential needs? (Litman, 2017) *-Emergency services (non-ambulance)* *-Public service* *-Utilities* *-Health care*

	-Food and clothing *-Education* *-Employment* *-Postal services*
Ecological	Is the transportation system currently taking steps to be more sustainable? *-Minimizing SOV travel* *-Reducing emissions from SOV travel* *-Electric or hybrid vehicles* *-Shortening VMT*
Healthy	Does the transportation system emphasize health for its users? *-Fitness* *-Improved health from pollution reduction*
Safety	Does the transportation system emphasize user and bystander safety? *-Safer than SOV travel*
Accessible Information	Is the information about using the transportation system accessible? *-Language* *-Option to call* *-Option to book online* *-Option to book in person* *-Access to subsidizes* *-Advertising**
Offers Just Employment	Are the employees of the transportation system treated fairly and paid a livable wage?**

*Advertising of services is a critical component of making information accessible. This report will not address how people learn about services, subsidies, or opportunities within transportation. However, there is a need for further research on this topic.

** This report does not explore transportation employment; however, it is a key indicator for transportation rights. There is a need for further research on just employment.

Using these indicators, I measured specific components of each category. The list within each indicator is taken from Litman's report as well as my understanding of transportation needs after talking with people involved in transportation in the City of Boulder

If the transportation organization meets or exceeds this component, it is bolded. If the transportation organization does not meet this component, the term is not in bold and

represents a potential opportunity for expansion. I researched (primarily online) and talked with employees from each program in order to understand which social rights indicators the program is meeting. Following each table, I elaborate on the indicators to highlight the details of certain systems.

Each transportation program will not meet all indicators; however, as an entire transportation system, the City of Boulder should aim to reach all indicators to create a robust system which meets as many needs as possible

Evaluation of Current Programs in Boulder

Public Transportation

Public transportation in Boulder includes Regional Transportation District (RTD) buses which charge set fares, run on fixed routes, and are available to the public. There are a variety of programs which offer passes for bus use. Currently, there are more than 90,000 passes distributed in Boulder County. RTD has 125 different bus routes to help people reach their destinations.

	Affordable	Inclusive	Access	Ecologically Sustainable	Healthy	Safe	Accessible Information
Traditional fare-based trip	**-Personal spending** *-Government spending*	**-Disabled -Low-income** *-Less accessible location* **-Non-driver -Under 18 -Elderly -Language barrier**	*-Emergency services* **-Public service -Utilities -Health care -Food and clothing -Education -Employment -Postal services**	**-Minimizing SOV travel -Reducing emissions from SOV travel -Electric or hybrid vehicles (partial) -Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-Language -Option to call -Option to book online -option to book in person** *-access to subsidizes/ offers*
Employee Eco Pass	**-Personal Spending -Government Spending**	**-Disabled -Low-income**	*-Emergency services* **-Public service -Utilities**	**-Minimizing SOV travel -Reducing emissions**	*-Fitness* **-Improved health from**	**-safer than SOV travel**	**-Language -Option to call -Option to book online**

		-Less accessible location **-Non-driver -Under 18 -Elderly -Language barrier**	**-Health care -Food and clothing -Education -Employment -Postal services**	**from SOV travel -Electric or hybrid vehicles (partial) -Shortening VMT**	**pollution reduction**		**-Option to book in person** *-Access to subsidizes/ offers*
Neighborhood Eco Pass (NECO)	**-Personal Spending -Government Spending**	**-Disabled -Low-income** *-Less accessible location* **-Non-driver -Under 18 -Elderly -Language barrier**	*-Emergency services* **-Public service -Utilities -Health care -Food and clothing -Education -Employment -Postal services**	**-Minimizing SOV travel -Reducing emissions from SOV travel -Electric or hybrid vehicles (partial) -Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-Language -Option to call -Option to book online -Option to book in person** *-Access to subsidizes/ offers*
College Eco Pass	**-Personal Spending -Government Spending**	**-Disabled -Low-income** *-Less accessible location* **-Non-driver -Under 18 -Elderly -Language barrier**	*-Emergency services* **-Public service -Utilities -Health care -Food and clothing -Education -Employment -Postal services**	**-Minimizing SOV travel -Reducing emissions from SOV travel -Electric or hybrid vehicles (partial) -Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-language -option to call -option to book online -option to book in person** *-access to subsidizes/ offers*
Discount Card	**-Personal Spending -Government Spending**	**-Disabled -Low-income** *-Less accessible location* **-Non-driver -Under 18 -Elderly -Language barrier**	-Emergency services **-Public service -Utilities -Health care -Food and clothing -Education -Employment -Postal services**	**-Minimizing SOV travel -Reducing emissions from SOV travel (partial) -Electric or hybrid vehicles -Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-Language -Option to call -Option to book online -Option to book in person** *-Access to subsidizes/ offers*
Guaranteed Ride Home	*-Personal Spending* **-Government Spending**	**-Disabled -Low-income** *-Less accessible location* **-Non-driver -Under 18 -Elderly** *-Language barrier*	*-Emergency services -Public service -Utilities -Health care -Food and clothing -Education* **-Employment** *-Postal services*	**-Minimizing SOV travel -Reducing emissions from SOV travel** *-Electric or hybrid vehicles* **-Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	*-Safer than SOV travel*	*-Language* **-Option to call** *-Option to book online -Option to book in person -Access to subsidizes/ offers*

The following section will outline each of the five different payment methods for RTD use with different passes and fare structures. Once RTD users reach the bus, their experience is similar regardless of the fare. Therefore, I will differentiate between fare options but generalize the user experience for all ridership after the user has paid for the service.

Traditional Fare-Based Ridership

RTD charges $2.60 for local trips, $4.50 for regional trips, and $9.00 for airport trips. Bus users can pay for individual trips with cash, use a day pass for all-day access, or load bus trips onto a MyRide card. One-way fares include a transfer, which are good for a one-way trip within 3 hours on another bus or train. Frequent bus users can purchase passes or ticket books. These include monthly passes, annual ValuPass, 10-ride ticket books, and day passes. Ticket books can be purchased online, through an RTD sales outlet, or a participating King Soopers, or Albertsons/Safeway stores.

Employee EcoPass

The employee Eco Pass offers unlimited rides on bus and rail lines for one year as well as access to the Guaranteed Ride Home program (addressed below). Employers can buy Employee Eco Passes for their employees. The employer can pay the entire price of the pass, or share the cost with employees. Costs vary based on the location of the business and the number of employees receiving a pass. Go Boulder and Boulder Transportation Connections offer up to a fifty percent reimbursement for the first year of a company's Eco Pass contract and twenty-five percent for the second year. The twenty-five percent reimbursement is also available for the first three years if the contract is over $10,000. If a company has anywhere from one to ten

employees, a $60 reimbursement is available per employee for the first year and $30 per employee the second year.

Neighborhood Eco Pass (NECO Pass)

Eco Passes are also available to residents within the RTD district through the Neighborhood Eco (NECO) Pass program. A NECO Pass is a discounted pass for unlimited rides on all bus and rail services. This pass cannot be purchased by individual residents but instead must be purchased by neighborhoods. Any resident can participate in this program (single-family home, apartment, condo, etc.) if their neighborhood chooses to pursue a NECO pass. In 2016, forty-nine neighborhoods in the City of Boulder offered transit passes to nearly 6,700 households.

College Eco Pass

Universities have the option to purchase college passes for their students. These passes provide students unlimited access to bus and rail rides. As of 2017, The University of Colorado at Boulder and Naropa University together have about 36,000 of their students enrolled in the Eco Pass program as of 2017. This pass program makes up about forty percent of the transit passes distributed in Boulder County.

Special Discount Card

Seniors 65+, individuals with disabilities, Medicare recipients, and students ages six through nineteen are eligible to receive a fifty percent fare reduction through RTD's Special Discount Card (SDC) programs. The reduction applies to local, regional, and airport fares and includes cash fares, ticket books, my ride, and monthly passes. Trainers and aides of eligible riders can ride for free with individuals at no cost. Seniors (65+) are not required to go through an

application process unlike the other eligible individuals. All other recipients must apply in person to obtain the 50% discount card.

Elaboration:

Affordable: The RTD system offers users a less expensive transportation option than most SOV travel. Different programs offer varying levels of affordability. These differences are outlined below.

Traditional Fare-Based Ridership:

Cash fares, ticket books, or passes with pre-paid rides are more affordable than SOV vehicle use. However, these fares are still restrictive for some users who would benefit from access to one of the following Eco Passes.

Employee Eco Pass:

The Employee Eco Pass is valid only if the user is a full-time employee and their employer chooses to offer the pass. This pass is beneficial for people who can access bus routes, but may not be used by individuals who cannot easily reach bus stops or have other circumstances which prevent them from using the bus. Boulder Transportation Connections has said that businesses who provide their employees with Eco Passes see a greater percentage of bus ridership than businesses who do not provide Eco Passes.

Neighborhood Eco Pass (NECO):

The NECO pass cannot be purchased by individuals, it must be purchased by neighborhoods for the residents. Any resident can participate in the program (single-family home, apartment, condo, etc). In 2016, forty-nine neighborhoods in the City of Boulder offered transit passes to nearly 6,700 households. However, the price of the pass

varies greatly ($150-$900 per household) and is dependent on how many household want to pay for a NECO Pass. Go Boulder and Boulder Transportation Connections offer a reimbursement of fifty percent for each household for the first year a neighborhood receives the pass. The contract price from RTD is dependent on the number of household in a neighborhood, not the number of household that want to participate. This disproportionally effects individuals who live in smaller neighborhoods and may prevent them from buying a NECO Pass bundle altogether.

College Eco Pass:

Purchasing the College Eco Pass is included in student fees at both University of Colorado, Boulder and Naropa. Many students do use the Eco Pass; however, some students do not use the pass and end up paying for a service they do not use. According to RTD, the total revenue from the College Eco Pass is greater than the cost if each ride had been a cash fare. This pass disproportionally effects students, greatly benefiting some, and disadvantaging others who must pay for the service regardless if they use it or not.

Special Discount Card:

The special discount card offers eligible recipients (seniors, individuals with disabilities, Medicare recipients, elementary, middle, and high school students ages 6-19 with a fifty percent fare reduction on local, regional, and airport cash fares, ticket books, MyRide passes, and monthly passes. This program offers a viable cheaper option for residents in Boulder who qualify for a reduced rate.

Inclusive: Many residents and visitors of Boulder can use the RTD system. Anyone who lives near a bus station can access the service. People who are in less-accessible locations may not be able to realistically or easily utilize the RTD network. For people near a bus stop, the buses can

accommodate individuals who are disable, low-income, non-drivers, minors, elderly, and individuals who face a language barrier are likely to be able to use the bus. The RTD website is offered in eleven languages and can help users understand how to use the system.

Access: The bus system in Boulder offers access for most services including public services, utilities, health care, food and clothing, education, employment, postal services, and some social events. RTD services are generally slower than SOV travel and may not be viable options for non-ambulance emergency services.

Ecologically Sustainability: When used as an alternative to SOV travel, buses minimize SOV travel, reduce emissions from SOV travel, and shorten total city VMT. RTD has some hybrid buses which, if charged using renewable electricity, can be more ecologically sustainable than non-hybrid buses.

Health: Bus travel does not directly improve fitness, but it may encourage people to walk or bike to reach a bus stop which could improve individual's health. If buses are replacing SOV travel and therefore reducing emission, they can contribute to a healthier community due to decreased local, regional, and global pollutants from emissions.

Safe: Buses are generally safer than SOV travel (Insurance, 2016).

Accessible Information: Different programs offer varying levels of accessible information. These differences are outlined below:

Traditional Fare-Based Ridership: The RTD website is available in eleven languages, there are offers to call or book online. For standard passes, RTD is a generally accessible service.

Employee Eco Pass:

The Employee Eco Pass program has its own website which is only available in English. This could prevent employers or employees from using the program.

Neighborhood Eco Pass (NECO):

The NECO pass program requires significant time and energy from residents who must volunteer to manage the program. Two to three individuals must be willing to coordinate the program for their respective neighborhood. They must promote the program to collect enough pledges to reach the minimum contract price, distribute surveys, collect and track payments, and distribute the Eco Passes. These requirements can dramatically limit neighborhood inclusion. Volunteers must take time out of their days to volunteer as the program managers. Neighborhoods with low-income residents or neighborhoods with family households are less likely to implement this program into their neighborhood since work or family care may be a higher priority.

College Eco Pass:

Students at CU and Naropa are given a bus pass when they enter the university. There is online information for students on how to use the bus system. Information is available in many languages and students can also call RTD to learn more about the bus system.

Special Discount Card:

Seniors (65+) can pay a half price fare by presenting their government issued ID card as a proof of age. This method works well for seniors who have a government issued ID card but excludes those who may not have this card. For individuals who are not seniors, the discounted fare cards are challenging to acquire. Obtaining a discount card does not cost the user; however, individuals must travel to offices in either Denver or downtown Boulder during limited hours to get a card. In Boulder, the office is only open on

Mondays from 12:00-2:00 and not on any government holidays. To obtain the card, the user needs a valid government issued photo-ID card. While the discounted fare system does allow more users to access the bus system, the methods needed to obtain he card can be limiting. Many qualified individuals (low-income, students, disabled, Medicare recipients) are likely either in school or work during the Monday time slot to obtain a card. Disabled people may not be able to access to office and low-income individuals are likely to be working at this time.

Recommendations:

- Explore alternate options for neighborhoods to obtain an Eco Pass. Look to simplify the sign-up process.
- Expand the fleet of hybrid/electric vehicles and work to source electricity from renewable resources.
- Ensure the Special Discount Card is accessible (expand hours the office is open, option to call in and get card, online option to get card).

Guaranteed Ride Home

The Guaranteed Ride Home program provides a free taxi ride for employees when a personal or family emergency/illness arises while an employee is at work. The program covers trips to the employee's residence or car. Intermediate stops like picking up a child from school or stopping at a pharmacy for a prescription on the way home are allowed through this service. The program provides a solution for those who avoid taking the bus, carpooling or biking in fear they have no way home if an emergency were to arise.

Elaboration:

Affordable: This program utilized government funds to directly encourage people to use non-SOV transportation options.

Inclusive: Most people who work in Boulder can utilize this service. Individuals who do not speak English may have a challenging time using this service because most of the information and contact information is only available in English.

Access: This service is only for people who work in Boulder, and can only be used to help people home from work.

Ecologically Sustainability: This program could encourage people to use non-SOV transit which would reduce transportation emissions. However, when an individual uses the service, they are not reducing their emissions or VMT for that day.

Health: Guaranteed Ride Home can encourage more non-SOV use and decrease emissions, leading to greater local, regional, and global health.

Safe: A taxi is not safer than other standard SOV travel.

Accessible Information: Guaranteed Ride Home is booked through calling or emailing a member of the city staff. This is accessible for English speakers who can reach a phone or email while at work.

Ridesharing

Ridesharing is an arrangement where passengers and a driver coordinate to drive somewhere together. Some ridesharing is free and some costs a fee. Often, ridesharing is coordinated by a website or an app. Accessible ridesharing means affordable modes of transportation, such as ridesharing, receive adequate support and are well planned to create a supportive system

(Litman, 2017, p. 12). Ridesharing is particularly important for disadvantaged people who may not have alternative transportation options.

	Affordable	Inclusive	Access	Ecologically Sustainable	Healthy	Safe	Accessible Information
Carpool (as promoted by the City of Boulder)	**-Personal spending -Government spending**	**-Disabled -Low-income -Less accessible location) (some) -Non-driver** *-Under 18 -Elderly -Language barrier*	*-Emergency services -Public service -Utilities -Health care -Food and clothing -Education* **-Employment** *-Postal services*	**-Minimizing SOV travel -Reducing emissions from SOV travel** *-Electric or hybrid vehicles* **-Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	*-Safer than SOV travel*	**-Language (partial) -Option to call -Option to book online** *-Option to book in person -Access to subsidizes/ offers*
WaytoGo Vanpool	**-Personal Spending -Government Spending**	**-Disabled -Low-income** *-Less accessible location* **-Non-driver** *-Under 18 -Elderly -Language barrier*	*-Emergency services -Public service -Utilities -Health care -Food and clothing -Education* **-Employment** *-Postal services*	**-Minimizing SOV travel -Reducing emissions from SOV travel** *-Electric or hybrid vehicles* **-Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	*-Language -Option to call* **-Option to book online** *-Option to book in person* **-Access to subsidizes/ offers**
eGo Carshare	**-Personal Spending -Government Spending**	**-Disabled (some) -Low-income** *-Less accessible location -Non-driver -Under 18* **-Elderly (some)** *-Language barrier*	*-Emergency services* **-Public service -Utilities -Health care -Food and clothing -Education -Employment -postal services**	*-Minimizing SOV travel -Reducing emissions from SOV travel* **-Electric or hybrid vehicles (some) -Shortening VMT**	**-Fitness -Improved health from pollution reduction**	*-Safer than SOV travel*	*-Language* **-Option to call -Option to book online -Option to book in person -Access to subsidizes/ offers**
Via Mobility Services	**-Personal Spending -Government Spending**	**-Disabled -Low-income -Less accessible location -Non-driver** *-Under 18* **-Elderly -Language barrier**	*-Emergency services* **-Public service -Utilities -Health care -Food and clothing -Education -Employment -Postal services**	*-Minimizing SOV travel -Reducing emissions from SOV travel* **-Electric or hybrid vehicles** *-Shortening VMT*	*-Fitness -Improved health from pollution reduction*	**-Safer than SOV travel (some)**	**-Language -Option to call -Option to book online -Option to book in person -Access to subsidizes/ offers**

Carpool

The carpool program in Boulder is run by Boulder Transportation Connections. Individuals are encouraged to carpool with co-workers or people living nearby who commute to similar destinations. As stated by Boulder Transportation Connections, carpooling can lower the cost of gas, lessen traffic congestion, lower pollution and reduce wear on a vehicle. My Way to Go is a database which connects those who need rides or can give rides to other commuters. For commuters who live in the Northern Front Range, SmartTrips carpool matching is available. Zimride is advertised as an additional database available for commuters from CU, Boulder County, NIST, or NOAA.

Elaboration:

Affordable: Carpooling can decrease personal spending on travel. Boulder offers existing two-person carpoolers an incentive to add a third person. However, the City of Boulder does not allocate funds to help subsidize carpooling for the commuters. Boulder does offer services through Boulder Transportation Connections which helps people connect with other commuters. Government funds do support carpooling through the use of HOV lanes which can shorten travel time.

Inclusive: Any neighborhood can participate in carpooling. The Boulder Transportation Connections website helps connect people with peers to carpool. In Boulder, the website is set up primarily for commuting to work. This can include commuters who may be disabled, low-income, live in relatively isolated locations, and non-drivers. Since this program is focused on commutes to work, it does not include retired elderly populations or non-working adolescents. The website is only available in English, meaning non-English speakers may not be included in

carpooling through Boulder Transportation Connections. Many carpools are set up through businesses working directly with Boulder Transportation Connections. This often introduces commuters to the carpool process and can cater to their specific needs more readily than the website.

Access: Carpooling is primarily intended for work commutes and does not address the need to access other services.

Ecologically Sustainable: Carpooling can reduce SOV trips, reduce emissions due to eliminating cars on the road, and reduce VMT. There are no regulations around carpooling with more efficient or electric vehicles.

Healthy: Carpooling has the potential to reduce emissions and contribute to a healthier community by reducing local and global pollutants.

Safe: Carpooling is not safer than driving other single occupancy vehicles.

Accessible Information: The Boulder Transportation Connections website is not available in any languages beside English. This limits access for non-English speakers who may benefit from carpool services. The MyWaytoGo website, where individuals can find a carpool, is available in English and Spanish.

<u>Recommendations:</u>

- There are no cases of subsidies for carpooling in electric vehicles. Boulder could look to using the $20/month subsidy for carpoolers who drive a vehicle with a certain level of efficiency. This would not only reduce the number of cars on the road, but further reduce emissions due to greater fuel efficiency.
- Offer the Boulder Transportation Connections website in various languages.
- Expanding Guaranteed Ride Home for carpoolers.

WaytoGo Vanpool

WaytoGo Vanpool is run by the Denver Regional Council of Governments, and a group of Transportation Management Associations including Boulder Transportation Connections. The service is utilized throughout the Denver Metro area for residents to commute to work faster and easier. Vanpool also works to reduce emissions from transportation by reducing the number of vehicles on the road. Collectively, vanpool riders reducing pollution by 1.5 million pounds annually. GO Boulder is currently offering a $20 per rider per month reimbursement for current and new Way to Go vanpool riders. Vanpooling is also a federal tax-free commuter benefit. Passengers share a van, driven by a certified driver, and each pay a low monthly fare. In Boulder, most Vanpools are set up when businesses contact Boulder Transportation Connections and ask for a vanpool option specifically for their company. Boulder Transportation Connections tailors the vanpool to the needs of the employees. In general, Boulder Transportation Connections retains most vanpool and carpool users when they focus on improving connections for a specific business.

Elaboration:

Affordable: Vanpool is supported directly by city funding through subsidies. The cost to join vanpool is lower than SOV travel, and therefore may decrease the amount of money spent on commuting. The City of Boulder subsidizes vanpool by paying users $20 a month. Way to Go offers subsidies for vanpoolers for up to 60% of the cost to their van.

Inclusive: Vanpool is accessible for some disabled, some low-income, and some non-drivers. The location of the van pick-up will change how inclusive it is. Often, vanpool and carpool are

set up at the same time through Boulder Transportation Connections – this increases the number of people who can commute to work using non-SOV travel. Further, Vanpool can help connect people outside of Boulder on their commute into Boulder. Non-Boulder-resident commuters are a critical population to target as Boulder looks to reach the emissions goals.

Access: Vanpool is intended for commuting to work and does not offer services to alternative locations. Way to Go does offer Guaranteed Ride Home for Vanpool users. If an emergency arises for a commuter, they can call a free taxi to take them home. This service can be used for unexpected schedule changes, illness, or other unforeseen circumstances.

Ecologically Sustainable: Assuming Vanpool replaces SOV travel, it will reduce emissions and decrease VMT.

Healthy: Carpooling has the potential to reduce emissions and contribute to a healthier community by limiting local and global pollutants from SOV travel.

Safe: Vans are statistically safer than lighter weight cars (Insurance, 2016).

Accessible Information: The Boulder Transportation Connections website is not available in languages other than English. This limits access for non-English speakers who may benefit from vanpool services. The My Way to Go website, where individuals can find a Vanpool, is available in English and Spanish. Vanpool offers $20/month subsides for users. This subsidy is available once users sign up for the service.

<u>Recommendations:</u>

- Ensure the Way to Go website is available in languages other than English.
- On the Way to Go website, advertise a link to Regional Incentives on the first page of the website to ensure people can find information which may encourage them to use the Way to Go services.

- Ensure users can contact city representatives in languages other than English, advertise this is an option.
- Begin introducing electric or more efficient vans into the Vanpool fleet to further reduce emissions.

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eGo Carshare

eGo Carshare is a local non-profit organization which serves the Denver-Boulder metro area. eGo allows users to only pay for a car when they need to drive. Boulder Transportation Connections endorses eGo as a viable option for Boulder residents. eGo allows members to choose the vehicle which suits their needs and pay a mileage and time-based rate to use it.

Elaboration:

Affordable: In the past, eGo has offered subsidized rates (50% off the services) for residents living in Affordable Housing and linked with Boulder Housing Partners. eGo received a grant from Denver Regional Council of Governments through the Congestion Mitigation Air Quality program to subsidize the rates for users. The grant money has been used up; however, eGo worked to grandfather in the users who initially benefited from the grant. These users are still receiving the discounted rate, paid for by eGo. In the near future, eGo may need another grant or source of funding in order to continue serving the Affordable Housing grandfathered users. At this time, eGo is not able to bring in additional users into the subsidized program because they no longer have grant money to subsidize the cost. In addition to this program, eGo has worked with Boulder Housing Coalition to waive the monthly membership fee on the Free-Wheeling plan which also helps people use the service who may not have the money to pay full price. In Longmont, eGo previously worked on a pilot program to offer a discounted rate for senior

citizens. While these programs are no longer active, eGo is looking for more opportunities to include low-income residents, senior communities, or residents who do not have access to viable transportation options. Most of their subsidized programs are offered from the help of grants which can offset the costs to users. In addition to a subsidized cost, eGo users tend to pay less for transportation than people who own a car. eGo does offer discounted rates for businesses.

Inclusive: eGo offers a viable transportation for some people in the community. eGo can be used by people located near a car, who have the means to make it to the car, and who can afford the car. Specifically, eGo could help some disabled drivers, low-income individuals who may not own their own car, and some elderly citizens who can access the car.

Accessible: eGo is convenient to users who are near the car or have viable transport options to reach the car. The locations in Boulder, Denver, and one in Longmont are centrally located and therefore exclude people farther away from the center of town. For example, most eGo locations are between Broadway and 30th, stretching from North to South Boulder. eGo chose these locations based on a variety of factors including density of members, access to bus routes or bike routes, and population density. Many communities east of 30th St could benefit from eGo Carshare; however, they do not have easy access to the service because there are not only fewer cars, but also fewer ways to reach potential cars (bus routes, bike paths, sidewalks, transportation hubs). Once users reach the car, eGo can assist users in most transportation needs including: public services, utilities, health care, food and clothing, education, employment, and postal services. Since eGo requires advanced booking, it cannot be used to access non-ambulance emergency services.

Ecologically Sustainable: eGo promotes a healthier community by using efficient vehicles and encouraging alternative types of transportation to reducing emissions. Further, roundtrip

carsharing like eGo can replaces personal vehicles per vehicle in a fleet (Shaheen & Martin, 2011). In terms of VMT, carshare does not necessarily limit SOV use or emissions from SOV trips. The eGo program has found evidence that users increase time spent walking, biking, and using public transit since joining the carshare program. This could indicate that users are limiting the number of VMT. eGo also found a decrease in private car use once users began using carshare. eGo's vehicle fleet is more efficient than the national average. In 2013, eGo claimed a fleet average or 34.6 mpg while the "real world" average of cars sold in the US was 24.8 mpg in 2013 (eGo, 2017).

Healthy: eGo has reported increased walking and biking once users joined eGo (eGo, 2017). This can contribute to a healthier lifestyle for users. Further, if the eGo fleet is more efficient than the national average and eGo is replacing private car use, rather than supplementing use, a reduction in emissions will also contribute to a healthier community.

Safe: eGo is not considered safer than typical SOV driving.

Accessible Information: The information on the eGo website is clear and accessible to an English speaker. The website is not offered in other languages which may prevent potential users from signing up to use eGo. There is no one in the eGo office who speaks Spanish and can help translate information for potential users. eGo bases their car distribution partially on membership, if non-English speaking communities cannot sign up, they may not be considered for needing a car near their neighborhoods.

<u>Recommendations:</u>

- Continue pursuing grants to offer a discounted rate for low-income individuals.
- Ensure low-income neighborhoods have the same or more access to car stations as high-income neighborhoods.

- Continue purchasing efficient vehicles and add electric vehicles to the fleet of eGo cars.
- Offer the eGo website in English as well as Spanish. Ensure at least one employee at eGo speaks Spanish.
- As an organization, eGo could allow individuals to spend less on transportation and reduce household spending. However, eGo does not currently offer specific rates based on need or income level.

Via Mobility Services

Via is a private, nonprofit organization which offers accessibility for customers with mobility limitations. Via runs in the Boulder-Denver area and is funded by donations, the City of Boulder, and various corporate sponsors. Via is offered to seniors, people with disabilities, and individuals with permanent or temporary mobility limitations. Via offers a Paratransit program which provides on-demand, call-up, door-to-door services within 19 communities in five counties in Colorado. Via offers a Travel Training program for anyone in the Denver metro area who is interested in learning about their transportation options, and a Mobility Options Information and Referral Program to anyone in Boulder County of surrounding communities. The fares are $3 within town, $2 within small towns like Nederland, and $6 to travel between towns.

Elaboration:

Affordable: Via has many government subsidies and discounted services for individuals who cannot pay. The qualifications for a decreased rate are broad and encompass a wide range of individuals who may qualify based on finances, experience cultural isolation, physical or mental impairments, language barriers, or social/geographic/racial/ethnic isolation. Via's policies are

equitable in their understanding of the wide range of reasons an individual may need or benefit from reduced fares. Further, the City of Boulder's contribution to Via has increased each year since 2002 which reflects the increased need for equitable transportation funding. Via offers discounted rates, as subsidized by the city, which benefit a variety of individuals and therefore reduce household spending for those who need monetary assistance.

Inclusive: Via services reach across five counties including Boulder county. Via connects people with the services they need and includes a variety of neighborhoods who have different needs. Via serves disabled, low income, spatially isolated, non-drivers, the elderly as well as people who are culturally isolated or language isolated.

Accessible: Via assist users in most transportation needs including: public services, utilities, health care, food and clothing, education, employment, and postal services. Via is not catered to serve people in non-ambulance emergency services.

Ecologically Sustainable: Via should be recognized for their sustainable building and commitment to a varied fleet of vehicles which use hybrid electric, compressed natural gas, clean diesel and conventional gasoline. Via's varied fleet mirrors what many companies should strive to do with their fleet of vehicles as we transition away from fossil fuels and to renewable energy sources.

Healthy: Via does not directly benefit user's health through their service. The use of efficient vehicles may reduce emissions which contributes to a healthier community. This could also be counteracted if VMT are increased in order to pick people up more than the gain in emissions reductions.

Safe: The larger vehicles Via uses may be safer than small cars. Via services may encourage elderly citizens to use accessible public transportation rather than drive. This is particularly important for elderly people who may be unfit to drive.

Information Access: In terms of information access, booking through Via works primarily through phone. The receptionist speaks both English and Spanish, with allows more people who may need Via to use the service.

Recommendations:

- Continue adding electric vehicles to the Via fleet and sourcing energy from renewable resources when possible.
- Ensure vulnerable communities have access to Via's services when planning which communities are serviced.

Cycling Programs

The City of Boulder promotes various cycling programs which cater to diverse needs. Boulder offers bike paths, educational cycling programs, and temporary bike programs for residents and visitors.

	Affordable	Inclusive	Access	Ecologically Sustainable	Healthy	Safe	Accessible Information
BCycle	**-Personal spending** **-Government spending**	*-Disabled* **-Low-income** *-Less accessible location* **-Non-driver** **-Under 18** **-Elderly** **-Language barrier (partial)**	*-Emergency services* **-Public service utilities** **-Health care** **-Food and clothing** **-Education** **-Employment** **-Postal services**	**-Minimizing SOV travel** **-Reducing emissions from SOV travel** *-Electric or hybrid vehicles (n/a)* **-Shortening VMT**	**-Fitness** **-Improved health from pollution reduction**	**-Safer than SOV travel**	*-Language* **-Option to call (for help)** **-Option to book online** *-Option to book in person* **-Access to subsidizes/ offers**

Community Cycles	**-Personal Spending** **-Government Spending**	*-Disabled* **-Low-income** **-Less accessible location** **-Non-driver** **-Under 18** **-Elderly** **-Language barrier**	*-Emergency services* **-Public service utilities** **-Health care** **-Food and clothing** **-Education** **-Employment** **-Postal services**	**-Minimizing SOV travel** **-Reducing emissions from SOV travel** *-Electric or hybrid vehicles (n/a)* **-Shortening VMT**	**-Fitness** **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-Language** **-Option to call** *-Option to book online (n/a)* **-Option to book/use in person** **-Access to subsidizes/ offers**
Living Labs	**-Personal Spending** **-Government Spending**	*-Disabled* **-Low-income** **-Less accessible location** **-Non-driver** **-Under 18** **-Elderly** **-Language barrier (partial)**	*-Emergency services* **-Public service utilities** **-Health care** **-Food and clothing** **-Education** **-Employment** **-Postal services**	**-Minimizing SOV travel** **-Reducing emissions from SOV travel** *-Electric or hybrid vehicles (n/a)* **-Shortening VMT**	**-Fitness** **-Improved health from pollution reduction**	**-Safer than SOV travel**	**-Language** **-Option to call** **-Option to book online** **-Option to book in person** **-Access to subsidizes/ offers**

BCycle

BCycle is a nonprofit bike share system which allows users to rent and return bikes at various locations around Boulder. BCycle has 43 stations in Boulder and 300 bikes in use. The bikes are available to rent 24 hours a day, 365 days a year.

Elaboration:

Affordable: BCycle offers discounted rates for students, but no discounts for other populations. However, BCycle works to keep their service a relatively cheap option. Their fees are generally less than bikeshare in other cities and cheaper than owning a vehicle. In the past, BCycle worked to offer free passes to a Boulder Housing Partners low-income community in North Boulder. The station was not successful and there was low-uptake of the free passes. BCycle does work to offer their services to the most people through keeping credit card security low to ensure this will not prevent use. Historically, BCycle created a payment card for people without credit cards; however, no one used this service. CU students are offered free passes through the

Environmental Center. BCycle is a relatively affordable transportation option with subsidies from federal grants, often with a city fund-match.

Inclusive: BCycle is accessible to many low-income individuals, non-drivers, people under 18, some elderly individuals, and some non-English speakers. All bike stations are located in the city of Boulder, Denver, and one station in Gunbarrel. This limits who can use BCycle. However, BCycle emphasizes their bikes can be used for first and last mile travel as well as for quick trips once people are in Boulder/Denver/Gunbarrel.

Accessible: BCycle bikes can be used to access many necessities including public service utilities, health care, access to food and clothing, education, employment as well as postal services. BCycle is not intended to provide non-ambulance emergency services for users.

Ecologically Sustainable: BCycle offers a sustainable solution for many commuters. Bikes have zero emissions when they are used and when used as an alternative to cars, can reduce SOV transportation, reduce VMT, and reduce transportation emissions.

Healthy: Biking is generally a healthy transportation option. Cycling can improve health and general well-being. Further, there are no direct fossil fuel GHG emissions released from using a bike which can improve local, regional, and global health.

Safe: In terms of safety, cycling can be dangerous, particularly with users who may not ride often. However, cycling is statistically less dangerous than SOV use (Insurance, 2017). BCycle does not include helmets in the rental which does put BCycle users at a greater risk than riders who do wear a helmet. BCycle has said they anticipated not having helmets would emerge as a problem. However, they have not heard concerns from users and do offer information on where to obtain a helmet rental in town. BCycle has also not heard concerns about bike path safety from users.

Accessible Information: While the website is clear, it is only available in English. In order to be more inclusive, the website should be offered in a variety of languages to allow the maximum number of users. BCycle has worked to make the information at stations usable primarily through icons to alleviate some of the language barriers which may prevent use.

Recommendations:

- Introduce the student pass for high school students as well as low income individuals.
- Introduce a payment plan for the Republic Rider Pass to allow low-income individuals or students to participate. Ideally, offer a payment plan for the $88 plan as well as the $40 plan.
- Continue to expand BCycle stations to other cities surrounding Boulder to connect the county.
- Ensure the BCycle website is available in English as well as Spanish. Since BCycle has had concerns around Asian population using the program, offer instructions in the applicable languages.

Community Cycles

Community Cycles is a non-profit cycling advocacy organization. They offer used bikes and bike parts to community members at lower costs than bike shops. Community Cycles also advocates for people who ride bikes in Boulder County through annual surveys, attending community meetings, and supporting bicycle friendly county planning. Additionally, community members can either join Community Cycles to learn to care for their own bikes and use the tools available in the shop, or attend workshops to learn to care for their bikes. Community Cycles also

organizes an annual holiday kids bike giveaway to low-income children. Community Cycles organizes Boulder's Walk and Bike Month. They also maintain business bike fleets, sponsor an Earn-Your-Bike program, and teach safe cycling to students and other community members.

Elaboration:

Affordable: Community Cycles provides the community with accessible and inexpensive options to obtain a bike. There are not different rates for certain people, but they do offer a variety of options to obtain a bike such as the Earn a Bike Program as well as the bike gifting program for children. Bikes from Community Cycles can also be maintained at the shop for a significantly lower cost than typical bike shops. This further decrease transportation spending. In the 2017 election, if passed, ballot measure 2M and 2N would help fund a new Community Cycles location in Boulder Junction.

Inclusive: Low income individuals, those who live in places without alternate transportation options, non-drivers, youth, and some elderly can benefit from Community Cycles' services. Community Cycles strives to offer inexpensive options for people to obtain and use their own bike. Additionally, they understand some people can more easily work for bikes rather than buying bikes directly and value this as a method of obtaining a bike. Community Cycles visits schools in Boulder and educates kids about bike safety. They share information about safe cycling and cycling advocacy throughout the community. In order to be inclusive in their planning processes, Community Cycles has listened to the community and adapted their programs accordingly. Based on community needs, they have adopted programs to support at risk and disable youth, homeless individuals, unemployed individuals, children, low-income households, and ex-convicts. Community Cycles also employs disabled and at-risk youth to

support them in working for a bike in addition to teaching them skills that may be useful in other jobs.

Accessible: Bikes can be used to access many necessities including public service utilities, health care, access to food and clothing, education, employment as well as postal services. Bikes are not generally used to provide non-ambulance emergency services for users.

Ecologically Sustainable: Biking is a sustainable form of transportation and when Community Cycles connects people with bikes, users are ideally less likely to drive or rely on fossil fuel dependent sources of transportation. Bikes have zero emissions when they are used and, when used as an alternative to cars, can reduce SOV transportation, reduce VMT, and reduce transportation emissions.

Healthy: Biking is generally a healthy transportation option. Cycling can improve health and general well-being. Further, there are no direct GHG emissions released from using a bike which can improve local, regional, and global health.

Safe: Cycling is statistically less dangerous than SOV transportation (Insurance, 2017). Community Cycles offers bicycle safety classes/clinics and sells helmets to keep riders safe.

Accessible Information: Community Cycles offers services to many Spanish speakers; however, the website is only available in English which limits the number of people who can benefit from the services. Users can learn about Community Cycles online, in person, or on the phone.

<u>Recommendations:</u>

- Continue advocating for helmet use and work to offer new helmets to the community.
- Offer the website in languages other than English.

Living Labs

Living Labs is a program initiated in 2013 as part of the Transportation Master Plan update. This program created various bike lanes with different levels of separation from traffic, then requested information from users on the effectiveness. Living labs is now working to implement the results. As of 2017, the program has been tested and evaluated, the current bike lane protectors remain in place

Affordable: Living labs is funded by the City of Boulder. The program strives to encourage safe cycling. When individuals choose to bike, they save money on transportation compared to driving.

Inclusive: Low income individuals, those who live in places without alternate transportation options, non-drivers, youth, and some elderly can benefit from Living Labs. The pilot projects are relatively condensed near downtown Boulder, but the city intends to use the new information to expand safer bike lanes throughout Boulder. All three of the pilot projects (Baseline, Harvard and Folsom) were near downtown where there is more population density and more affluence than neighborhoods further from downtown.

Accessible: Bikes can be used to access many necessities including public service utilities, health care, access to food and clothing, education, employment as well as postal services. Bikes are not generally used to provide non-ambulance emergency services for users. Living labs encourages bike use through creating safer bike lanes to encourage cycling.

Ecologically Sustainable: Biking is a sustainable form of transportation. Living Labs works to encourage cycling as a safe and efficient form of transportation. When cyclists feel safer on the road, they are less likely to drive or rely on fossil fuel dependent sources of transportation. Bikes

have zero emissions when they are used and, when used as an alternative to cars, can reduce SOV transportation, reduce VMT, and reduce transportation emissions.

Healthy: Biking is generally a healthy transportation option. Cycling can improve health and general well-being. Further, there are no direct fossil fuel GHG emissions released from using a bike which can improve local, regional, and global health.

Safe: Cycling is statistically less dangerous than SOV transportation (Insurance, 2017). Living labs is working to close this gap by gathering data and community input on various types of bike lanes.

Accessible Information: The City of Boulder website is only available in English. The language barrier prevents non-English speakers from contributing their opinions of the bike lanes to the city.

Recommendations:

- Ensure new bike lanes are not only around the central hub of Boulder. Address the spatial considerations of connecting the rest of the community with usable bike lanes.
- Make sure the City of Boulder website is available in languages other than English.

Pedestrian Programs

Boulder has many sidewalks and paths which connect people with their destinations on foot.

	Affordable	Inclusive	Access	Ecologically Sustainable	Healthy	Safe	Accessible Information
Boulder Walks	*-Personal spending* *-Government spending*	*-Disabled* **-Low-income** *Inaccessible location* **-Non-driver** **-Under 18**	*-Emergency services* *-Public service* *-Utilities* *-Health care*	**-Minimizing SOV travel** **-Reducing emissions from SOV travel**	**-Fitness** **-Improved health from pollution reduction**	**-Safer than SOV travel**	*-Language* *-Option to book in person* *-Option to book in person*

		-Elderly *-Language barrier*	*-Food and clothing* *-Education* *-Employment* *-Postal services* **(all partial)**	*-Electric or hybrid vehicles* **-Shortening VMT**			*-Access to subsidizes/ offers*

Boulder Walks

Boulder Walks is a community organization which encourages walking as a travel option for residents. Through supporting pedestrian planning activities, Boulder Walks supports health and encourages personal connection for residents. Walk with a Doc is an event recently adopted by Boulder Walks. This event allows people to walk with health care professionals who talk about specific health topics while walking with their community. In Boulder, this effort is led by Boulder Community Health.

Elaboration:

Affordable: Boulder Walks does not receive any funding from the city, state, or national level. Boulder Walks also does not have any costs for its members.

Inclusive: Boulder Walks is available for low-income, non-drivers, and people under 18. This group primarily consists of individuals who are passionate about health and alternate forms of transportation.

Accessible: Boulder Walks events do not directly connect people with the necessary places they need to go. Walking can, however, be a viable option for accessing some basic needs.

Ecologically Sustainable: Walking, when used as an alternative to driving, is more ecologically sustainable than SOV driving.

Healthy: Walking is a form of fitness and promotes a healthier lifestyle. Additionally, when used as an alternative to driving, walking can reduce emissions which improves overall community local, regional, and global health.

Safe: Walking is statistically less dangerous than SOV travel (Insurance, 2017)**.**

Accessible Information: The Boulder Walks online information is not available in languages other than English.

Sidewalk Repair Programs

The Sidewalk Repair Programs include the Annual Sidewalk Repair Program, the Miscellaneous Sidewalk Repair Program, as well as the Missing Sidewalk Links Program. The various sidewalk repair programs are important to address. This section of the report will outline some primary benefits and concerns of the programs without a table.

The Annual Sidewalk Repair Program targets a specific area in Boulder to repair the sidewalk and install pedestrian access ramps, cost is shared with the adjacent property owners. Owners do not pay more than $450 of the cost, and can pay in monthly installments, with interest over two years. Pedestrian ramps are installed at no extra cost. The City of Boulder will assess which sidewalks in the city need to be repaired and approach the homeowners to shares some of the cost. Benefits of this program include maintaining working sidewalks in Boulder. Some potential concerns surround the unexpected cost of the program to homeowners. If a neighborhood is targeted, the homeowner is required to pay for some of the cost to repair the sidewalk. This could be hugely detrimental for some homeowners. Additionally, each community in Boulder deserves access to high quality sidewalks. The City of Boulder should carefully consider which neighborhoods are chosen to be repaired. Neighborhoods which do not

have as much use, or are not as used by visitors (such as the Hill or Pearl) still deserve well maintained sidewalks.

The Miscellaneous Sidewalk Repair Program allows residents to choose to have their sidewalk repaired, the city will pay for half of the repair if the resident chooses a city contractor. This program is a valuable use of city funds in that it encourages sidewalk repair through the use of government subsidies. Some considerations for the city are offering a multi-tiered subsidy program which depends on income level or repair cost in order to help people who deserve a quality sidewalk but may not have as many funds to do so.

Recommendations:

- Create either a pricing model for each home based on income level, or a general fund which residents can apply for to be exempt from the sidewalk repair costs. Within the Annual Sidewalk Repair Program, residents whose sidewalks are deemed unfit should be offered an income-based exemption from the $450 cost.
- Ensure low-income neighborhoods are included in the Annual Sidewalk Repair Program to allow all Boulder residents the opportunity to use safe and well-maintained sidewalks.
- Translate the website on sidewalk repair, and the homeowner's obligation to the sidewalk repair, to languages other than English
- Through the Missing Sidewalk Links Program, ensure all neighborhoods are included and considered for repair. Low-income or disadvantaged communities should be prioritized in order to offer transportation alternatives to people who may need sidewalks to reach destinations or alternative transportation options such as the bus stop.

Educational Programs

The City of Boulder supports a number of educational programs surrounding transportation Some are focused on businesses and others focus on children. The following table will outline the effects of the transportation programs.

	Affordable	Inclusive	Access	Ecologically Sustainable	Healthy	Safe	Accessible Information
PACE & Mobility for All	**-Personal spending** **-Government spending**	**-Disabled** **-Low-income** **Less accessible location (some)** **-Non-driver** *-Under 18* *-Elderly* **-Language barrier**	*-Emergency services* *-Public service* *-Utilities* *-Health care* *-Food and clothing* *-Education* **-Employment** *-Postal services*	**-Minimizing SOV travel** **-Reducing emissions from SOV travel** *-Electric or hybrid vehicles* **-Shortening VMT**	*-Fitness* **-Improved health from pollution reduction**	**-Safer than SOV travel**	*-Language* *-Option to book in person* **-Option to book in person** **-Access to subsidizes/ offers**

Partners for a Clean Environment (PACE) and Mobility for All

PACE provides free expert advisor services, financial incentives and a certification program to help businesses measure and gain recognition for their energy, waste, water, and transportation achievements. Advisory assistance is provided at no cost to businesses in Boulder. Across Boulder County 20 percent of all businesses and operations are PACE certified, meaning they hold a certification of being an eco-friendly business who has achieved a high level of environmental performance across energy, waste, water, and/or transportation use.

In terms of transportation, PACE certification requires that more employees take sustainable forms of transportation to work than the community average, as defined by the PACE standards. PACE will advise property owners or managers to support workspace efficiency and support contractors to promote more efficient technologies through financial incentives and a certification program to help business measure and improve their energy, waste, water and

transportation use. For example, in terms of transportation, PACE can help advise carpooling, Vanpooling and bike-sharing programs to reduce SOV use. PACE has worked to streamline the processes needed to improve efficiency in energy, waste, water and transportation through one organization. PACE works with EnergySmart and Boulder Transportation Department's Mobility for All Program.

Mobility for All will work closely with the organization to develop a plan to reduce SOV use. This program is successful in its ability to craft specific resources for people that are usable and customized to the employee's specific needs.

Elaboration:

Affordable: PACE is offered through the City of Boulder and is free to businesses and contractors who request it. Mobility for All allows individuals to spend less on transportation through providing access to carpool and vanpool programs which reduce overall transportation spending. Both PACE and Mobility for All are funded through the city and use taxpayer money to encourage a reduction in SOV travel.

Inclusive: PACE and Mobility for All can include disabled, low-income, some people in less accessible locations, non-drivers, and non-English speakers. Since this program is aimed towards commuting to work, it does not include many people under 18 and elderly citizens who do not commute to work.

Accessible: PACE and Mobility for All focus on employment and do not offer access to other necessities.

Ecologically Sustainable: Both programs focus on shifting business and consulting practices to be more sustainable. Particularly, Mobility for All can reduce VMT in SOVs, reduce emissions

from SOVs, and shorten the number of VMT be encouraging carpooling and vanpooling. Mobility for All does not focus on electric vehicles.

Healthy: PACE and Mobility for All work to reduce emissions which can improve overall local, regional, and global health.

Accessible Information: Mobility for All works closely with businesses and contractors to ensure employees receive the subsidies and help they need.

Discussion: Achievements and Gaps in Boulder Overall

Achievements:

Boulder has worked to create a robust transportation system where a variety of people are included and there are viable modes of transportation to access many parts of the city. Programs stand out in each of the seven indicators as exemplary models for inclusive and accessibility based planning.

First, within affordability, PACE and Mobility for All offer free services to all Boulder companies and contractors who request it and provides cheaper transportation options for employees. This program stands out as a valuable use of taxpayer money which directly subsidizes commuters (Vanpool) and funds the program to benefit all users.

In terms of inclusivity, Via stands as an exemplary program. Via is offered to seniors, people with disabilities, those with other mobility limitations and individuals with temporary mobility limitations. The goal of Via is to improve accessibility for vulnerable populations. They strive to make their services as inclusive as possible by offering services in many languages, offering discounted rates for a variety of reasons, and running primarily through door to door services. Via is not focused on general youth (under 18) unless the individual needs transportation assistance due to a disability or mobility limitation.

Within the access indicator, eGo Carshare and BCycle stand out as model examples. Aside from emergency services, eGO and BCycle can help individuals access most of the services they need. The programs help people connect directly to their destinations without the use of SOV travel or concern for first and last mile travel to reach the destination. However, it is important to note not all people can access an eGO car or a BCycle station. This does place a limitation on the usability of the two programs. Many people may need to travel a significant distance to use a car or bike share service, making the improvements in access and reduction in SOV travel minimal. Further, carshare programs often involve SOV travel, but do tend to encourage decreased driving and increased use of non-private-SOVs.

In terms of ecological sustainability, three cycling programs stand out: BCycle, Community Cycles, and Living Labs. Each of these programs works to replace SOV use through promoting cycling. BCycle caters to residents and visitors. Community Cycles offers a variety of options to obtain a bike. Both programs support cycling as a viable, safe, and sustainable form of transportation. Community Cycles provides bikes and bike services to anyone in the Boulder area regardless of age, income level, or experience. Living Labs also promotes cycling through studying which bike lanes can reduce accidents and make users feel safer while commuting. If users feel safer, they are more likely to ride their bike to destinations than drive.

In terms of health, BCycle, Community Cycles, Living Labs, and Boulder Walks promote a healthier lifestyle through commuting while improving fitness and also reducing emissions from SOV travel.

The most dangerous form of transportation is SOV travel. In terms of safety on Boulder's transportation options, buses, biking, and walking are all safer than driving an SOV vehicle. Within vehicles though, vans and buses are safer than small sedans and trucks.

Via also stands out as an exemplary program in terms of accessible information. They offer different languages on their website, over the phone, and in person. Via's website also caters to many needs including offering larger font sizes and an easy to use interface. The website clearly outlines different ways to use the service and how to receive subsidies.

Gaps:

Some accessibility gaps stand out amongst the majority of Boulder's non-SOV programs.

Under-18- Minors, primarily non-drivers, cannot access many of the services Boulder offers for transportation. The RTD system does provide some minors with reduced-fare transportation if the user can obtain a discount card. For parents or guardians, it is often challenging to use alternate forms of transportation with children. SOV travel is often the easiest option for families. This barrier prevents many people with children from pursing non-SOV travel options based on convenience, time, and the challenge of bringing children along on multi-mode transportation trips.

Language- Many programs fail to offer services in languages other than English. This prevents people from using the services and excludes entire populations who could benefit from the program if it were based around more accessible language.

Electric or Hybrid Vehicles- Most programs which use cars, (RTD, Via, eGoCarshare, vanpool, and carpool) are working to incorporate more electric or hybrid vehicles. In order to reach Boulder's goal emissions reductions, this process will need to be expedited to ensure each vehicle can connect to a fossil-fuel free grid as the grid becomes renewable.

Emergency Services- One challenge of non SOV travel is reaching a hospital quickly without the use of an ambulance, which can be incredibly costly for individuals. No Boulder based services

offer a viable option to reach a hospital quickly without an ambulance. Each program requires either booking in advance, or only caters to accessing employment. As SOV use declines, many people may find reaching hospitals challenging or impossible given the extent of the injury and decrease in privately-owned cars. Currently, most non-SOV travel options are slower than SOV travel, if non-SOV travel becomes faster than SOV travel, users may be able to reach a hospital easily without using a personal vehicle.

Cyclic Transportation Planning

Boulder's GHG reduction goals are a great first step in emissions reductions. However, despite these goals, transportation systems are not easy to change. Patrick Arthur Driscoll (2014) outlines that current transportation systems are path dependent and often "serve to reinforce existing carbon-intensive transport modes despite aggressive greenhouse gas (GHG) reduction strategies in place and high levels of investment in collective transport, walking and cycling" (p. 318). This path dependence is often called lock-in or path dependency. Pierson (2000) defines path dependency as a "self-reinforcing process by which each step along a given path increases the likelihood of further steps in the same direction" (p. 251).

Lock-in, or path dependency is typically described in term of infrastructure. Often, planners find it challenging to rationalize changing technology or rebuilding infrastructure to meet current sustainability goals. In many situations, the infrastructure does not need to be replaced and building new infrastructure to meet emissions goals results in premature demolition and rebuilding of infrastructure. The balance between meeting emissions goals and using infrastructure to its full potential plagues many cities with steep emissions reduction goals. This topic is widely addressed in literature (p. 251).

However, in addition to infrastructure path dependence, there is also a path dependency in Boulder surrounding the locations of non-SOV transportation options. Many transportation organizations base their locations and routes on the existence of other routes. For example, BCycle bases their locations on perceived use, often in conjunction with bus routes, population density, and sidewalk access. For a BCycle station to be used, people must be able to access it. This makes intuitive sense for each separate transportation system. However, this planning creates what I call "cyclic transportation planning". The systems which exist, (bus routes, sidewalks, bike paths, etc.) reinforce where the next type of transportation system expansion will be successful. For example, a bus stop with no sidewalk access will not be widely used due to general challenges in reaching it; therefore, bus stops and dependent on sidewalks to be used. This example highlights one of many potential cyclic planning effects, it displays how many non-SOV systems are dependent on one another.

Cyclic transportation planning perpetuates access versus in-access many people in Boulder face. In general, residents Wests of 30th street have significantly more transportation options than those East of 30th. South Boulder and North Boulder are also excluded from some transportation systems. The central hub of Boulder, surrounding the university and Pearl St have more transportation options than those outside this central hub. I propose, that in part, this is due to the effects of cyclic transportation planning and the dependence each transportation program has on each other program.

If Boulder meets the climate commitment goals of an 80% reduction in GHG emissions by 2050, the areas outside of central Boulder will need to embrace alternative transportation options. This can begin by offering services to these regions. As long as each transportation system relies on other transportation systems for their routes, the entire city will not be able to

reach the locations they need without continuing to rely on SOV travel. Expanding non-SOV transportation options is a critical component of emissions reductions. This will not be feasible without offering people more accessible and destination oriented transport across the entire city. While it is challenging to encourage expansion of programs to less-dense and traditionally SOV dominated areas, the City of Boulder should to see the expansion of these programs as a necessity to reach emissions goals. Breaking the cycle of cyclic transportation planning can contribute to a more sustainable system, while it simultaneously supports the community and improves general livelihood.

Future of Boulder's Transportation Planning

As Boulder moves ahead in transportation planning, particularly the 2018 Report on Progress, it is important to keep in mind the framing of transportation goals. Accessibility based planning can propel Boulder towards more efficient and destination oriented goals. Boulder has already grappled with this idea in the recent years. One example is the bike lane expansion on Folsom. While this project did not disseminate, it did highlight Boulder's understanding of planning transportation based on accessibility. By expanding the bike lane and reducing the number of car lanes, Folsom street would cater to less SOV travel and encourage bike use. Secondly, many of Boulder's plans for East Arapahoe construction involve reducing the number of car lanes while increasing bike, bus and pedestrian lanes. This sort of planning is imperative to not only reduce SOV travel, but to simultaneously encourage alternate transportation forms. Particularly for those who commute into Boulder, the non-SOV travel must become more affordable, convenient, and usable than current SOV-travel. Despite pushback, people in and around Boulder will need to change their habits to accommodate the changing transportation priorities. Instead of focusing on VMT and speed, planning approaches should prioritize

destination based planning, which often means addressing where destinations are located spatially as well as which transportation method is the easiest form of travel to reach a particular destination.

Questions on Technology and Automation

Across the world, transportation systems are changing as technology challenges our current systems. One examples of this shift is automated vehicles. Many automated vehicles are currently functioning and working to aid in first and last mile connections and traditional travel. Electric vehicles which connect to a renewable grid and can connect individuals to other transportation options such as buses and trains can transform the usability of systems.

Other anticipated changes include increased electrification of all transportation. In order for this change to be more efficient and sustainable than current systems, the grid must be fueled by renewable electricity generation.

Another example of changing technologies is ridesharing, such as Uber and Lyft. Both of these companies have redefined traditional SOV or taxi travel. The changes in transportation will present new opportunities which can move our communities towards a more efficient and inclusive system. The City of Boulder has already taken a role in setting the example for other cities in technology like automation and ridesharing. This push can either offer more people greater access through increasing transportation options, or isolate people who are not included in the new forms of transportation. Based on my analysis of current systems, there are specific areas which Boulder should consider as the landscape of technology changes:

1. Employment- Transportation jobs will change, grow, or disappear as the technology shifts

2. First and Last Mile Considerations- automation and other connections such as BCycle will need to support the growing use of public transit systems
3. Rate of Change- People are slow to adapt to change and the City of Boulder will likely face resistance to new technologies which change fundamental systems like transportation. This change will require extensive educational campaigns and an understanding of how and why people adopt new technologies.

Conclusion

In conclusion, the City of Boulder faces a number of challenges and opportunities within transportation. Fortunately, the city has significant momentum around changing the transportation landscape based on the Climate Commitment. Additionally, Boulder attracts many businesses with innovate ideas. This landscape will likely encourage faster changes in transportation changes than other cities.

With these changes, it is important to address the social rights of transportation. Each new policy implementation should consider who the program benefits and if the change further isolates people with limited accessibility or offers new opportunities for individuals who have the most to lose in terms of transportation.

This report can be used by the City of Boulder to understand how current programs do or do not offer people more rights. The idea of cyclic transportation planning will help inform how and why certain areas of the city have more access than others. The City of Boulder should look closely at how transportation systems are implemented in order to increase access for people with the least access rather than adding to the central hub of transportation options.

Using various pieces of transportation literature, I have compiled a Boulder specific report to inform future policy recommendations and analyze the current state of Boulder's

transportation options. This report uses a capabilities approach, as outlined by Amartya Sen, to frame the needs individuals have in regard to transportation. By addressing transportation as a social right, Boulder can prioritize increasing accessibility for as many people in as many locations as possible to increase access.

References

City of Boulder. (2017, May). Boulder's Climate Commitment. Retrieved from https://www-static.bouldercolorado.gov/docs/City_of_Boulder_Climate_Commitment_5.9.2017-1-201705091634.pdf?_ga=2.11132980.1283369661.1511396191-964471137.1486838906

Driscoll, P. A. (2014). Breaking carbon lock-in: Path dependencies in large-scale transportation infrastructure projects. *Planning Practice and Research*, *29*(3), 317-330.

eGo Carshare (2017). eGo Carshare vs. Owning. http://carshare.org/ego-carshare-vs-owning/

Governors' Institute on Community Design. (2017, January). *The Why and How of Measuring Access to Opportunity.* Governors' Institute on Community Design, 1-67. https://smartgrowthamerica.org/resources/measuring-access-to-opportunity/

Insurance Institute for Highway Safety (2016). General Statistics. *Highway Loss Data Institute*

Litman, T. (2017, January 2). *Evaluating transportation equity*. Victoria Transport Policy Institute, 1-62. http://vtpi.org/equity.pdf

Nussbaum, M. (1988). Nature, Function, and Capability: Aristotle on Political Distribution. *Oxford Studies in Ancient Philosophy*.

Pierson, P. (2000) Increasing returns, path dependence and the study of politics, The American Political Science Review, 94(2), pp. 251–267.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences*, *4*(2), 155-169.

Sen, A. (1979) Equality of What? Stanford University: Tanner Lectures on Human Values

Shaheen, S., & Martin, E. (2011, Spring) The Impact of Carsharing on Household Vehicle Ownership. *Transportation Sustainability Research Center, University of California, Berkeley*

Vaidyanathan, S. (2016, July 29). America's Transportation Energy Burden for Low-Income Families. *American Council for an Energy-Efficient Economy.* Retrieved from https://aceee.org/blog/2016/07/america-s-transportation-energy