

# Equity in Active Vehicle Transportation Programs and Projects – the need to measure and do it well.

## 1 ABSTRACT

2 Background: Communities that offer Active Transportation Vehicles (ATV) programs, do so as a response to  
3 short trips not covered in public transportation. Programs like this respond to gaps or are used for short  
4 commuting and convenience trips. Most of the research to date, categorize the economic impacts associated  
5 with this type of transportation program as: Core, Operational and Geographical.

6 Not included above is equity, which refers to the fairness with which impacts (benefits and costs) are  
7 distributed.

### 8 Objectives:

- 9 1. Identify the perception on what the users see as important and identify the tradeoffs that are part  
10 of their decision process.
- 11 2. Determine (through survey) if an ATV program should be equitable and the definition of what  
12 this means.
- 13 3. Determined if the results represent what program managers, ATV vendors, and public  
14 transportation officials measure when determining if their program is equitable and if these measures are  
15 used to define the success of their program.
- 16 4. Finally, determine if an equity measure is needed and recommend a methodology for measuring  
17 equity.

18 Methods: This paper summarizes on-going research, conducted between 2017 through 2020 identifying the  
19 tradeoffs and measures important for those using or managing ATV programs. The research team used platforms  
20 of social media to distribute an 8-question survey.

21 Results: The responses obtained identified that two units of measurement should be used when measuring  
22 equity:

- 23 1. Unit per capita (per adult, per commuter, per peak period of travel, per household) and
- 24 2. Per unit of travel (per vehicle-mile/km, per commute trip, etc.

25 Over ninety-two percent of those surveyed judge that an ATV program should be equitable and that is best to  
26 include a variety of issues and perspectives. The planning and implementation processes must include the  
27 community's equity concerns and priorities therefore public involvements is important for equity planning.

28 Conclusion: Results show that when selecting the total cost expresses as percentage of (daily) average income  
29 by user per vehicle mile per commute trip, we are able to include an equity measure as different social groups  
30 have different "total costs perceived" per vehicle mile per commute trip. This measure works for both the users  
31 as well as for program managers, ATV vendors, and public transportation officials.

### 32 Highlights:

- 33 • Equity,
- 34 • Policy fairness implementation,
- 35 • Active transportation,
- 36 • Rideshare,
- 37 • Transportation and mobility gaps,
- 38 • Performance measures

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1 INTRODUCTION

2 Ridesharing relates to the sharing of rides or transportation assets, especially among commuters. This sharing  
3 can be of vehicles (automobiles or cars) or active-transportation vehicles (bicycles and scooters). Ridesharing is  
4 not new when it is associated with vehicles as taxi and limo services have been in place for several decades.  
5 What is new is the ridesharing related to bikes and scooters and not beginning your trip in a rental office. Most  
6 of the associated rides are short, generated by convenience and filling in the “last mile” gap of most public  
7 transportation systems. This “last mile” gap ranges from ½ mile to 2 miles from the light rail or bus station to  
8 the home, office or store that completes the trip.

9 Equity refers to the “fairness with which impacts (benefits and costs) are distributed. Transportation planning  
10 decisions often have significant equity impacts. (Litman, Evaluating Transportation Equity Guidance For  
11 Incorporating Distributional Impacts in Transportation Planning , 2018).” Many transportation planning and  
12 engineer professionals are trying to ensure that responding to private pressures for this new mode of  
13 transportation sharing, that happened as an answer to a new technology (battery run bicycles and scooters), a  
14 need previously not covered by traditional transportation units and a business opportunity, is equitable. But what  
15 does it really mean and how do we make it happen? Transport equity analysis can be difficult because there are  
16 several types of equity, many potential impacts to consider, various ways to measure impacts, and includes  
17 many options when categorizing people.

18 This paper summarizes on-going research, some of it conducted in 2017 through 2020 identifying the tradeoffs  
19 and measures important for those using or managing Active Transportation Vehicle (ATV) programs. For  
20 purposes of this study, ATVs include bike-share, scooter-share, etc. The research team used platforms of social  
21 media to distribute an 8-question survey and requested members of the Transportation Research Board (TRB)  
22 and working groups to complete it. The goals were to:

- 23 1. Identify the perception of those surveyed on what the users see as important and identify the tradeoffs that  
24 are part of their decision process.
- 25 2. Determine (through survey) if an ATV program should be equitable and the definition of what this means  
26 within ATV programs.
- 27 3. Determined if the results represent what program managers, ATV vendors, and public transportation  
28 officials measure when determining if their program is equitable and if these measures are used to define the  
29 success of their program.
- 30 4. Finally, determine if an equity measure is needed and recommend a methodology for measuring equity in  
31 such public programs.

32 BACKGROUND

33 Transportation (Transport) as a sector is an important component in the economy and a common tool used for  
34 development. It has even been stated that “a relation between the quantity and quality of transport infrastructure  
35 and the level of economic development is apparent”. High density transport infrastructure and highly connected  
36 networks are commonly associated with high levels of development. When transport systems are efficient, they  
37 provide economic and social opportunities and benefits that result in positive multipliers effects such as better  
38 accessibility to markets, employment, and additional investments. When transport systems are deficient in terms  
39 of capacity or reliability, they can have an economic cost such as reduced or missed opportunities and lower  
40 quality of life. (Rodrigue, 2017)

41 Focus on Active Transportation Vehicles

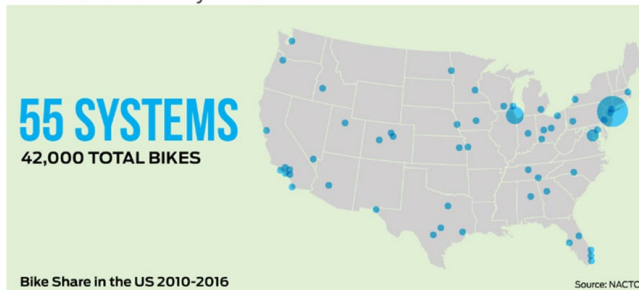
42 This paper focuses on multimodal accessibility equity specifically for bike share and scooter share. Active  
43 Transportation Vehicle (ATV) is an innovative transportation program, ideal for short distance point-to-point  
44 trips providing users the ability to pick up a bicycle or scooter at any self-serve station and return it either to any  
45 other station located within the system's service area or any other location where the vehicle can be picked up and  
46 do not encroach the public right-of-way. ATV programs launched in the U.S. and around the world have  
47 experienced different degrees of success and growth. In 2017, the number of ATV bikes in the U.S. more than

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1 doubled – from 42,500 bikes at the end of 2016 to about 100,000 bikes by the end of 2017. Most of the increase  
2 in ATV came from new dockless systems. By the end 2019 the number of systems grew to 55 with an aggregate  
3 number of 142,000 bikes, 12 minute average trip per member and only 24% of the programs included income  
4 based discounted programs (NACTO, (Update (April 17, 2019): NACTO’s Newest Report, Shared  
5 Micromobility in the U.S.: 2018, updates these figures with 2018 ridership numbers, including on e-scooter  
6 systems),, 2019)

7 The image on the next page shows the geographical distribution of U.S. ATV programs. In recent years, the  
8 overall transportation industry (primarily public sector) has begun adopting performance measurement, but no  
9 standards exist. This also is true for ATV systems. Although the two types of ATV systems differ somewhat in  
10 logistical considerations, the planning process and performance metrics are quite similar. The programs goal is  
11 to provide a mobility option that responds to gaps in transit, light rail, or for short commuting and convenience.  
12 As the ATV programs are responding to a specific need and gap, we recommend that we measure equity if an  
13 accessible public mobility service is provided, as well as the time and costs required to reach the ATV-basic  
14 service and its mobility related activities. However, based on NACTO 2019 data only 24% of the communities  
15 that offer ATV programs have a discount program.

The Number of Systems Continues to Grow



16  
17 *Figure 1 -Geographical distribution of U.S. ATV*  
18 *programs. The economic impacts of transportation*  
19 *can be categorized as core, operational and*  
20 *geographical.*

- 21 • Core: The most fundamental impacts of  
22 transportation relate to the physical

38 The key component not included in the above categories is equity:

39 The researchers define equity, in the context of public transportation, as (must meet both statements) a). fosters  
40 the fair opportunities of mobility, safety, reliability, and comfort to all when comparing programs and projects  
41 where vehicle, transit, and share-ride pedestrian transport occur and b). fosters the fair distribution of costs and  
42 benefits to all those incurring the effects of such programs or projects. as that which foster the same  
43 **opportunities** of mobility, safety, reliability, and comfort to all thus comparing programs where vehicle, transit,  
44 and share-ride pedestrian transport occur. Why must we include equity? Using the results of NACTO’s analysis  
45 of bike infrastructure and ridership trends in seven major cities across the U.S.—Chicago, Minneapolis, New  
46 York, Philadelphia, Portland, San Francisco, and Washington DC— NACTO found a positive feedback loop  
47 between bike ridership, the creation of protected bike networks, and overall cyclist safety. Based on NACTO  
48 research and analysis of other reports, the paper (NACTO, Equitable Bike Share Means Building Better Places  
49 for People to Ride, 2020) showed that as cities build more bike lanes, the number of cyclists on the street  
50 increases, and the individual risk of a cyclist being killed or severely injured drops. Applying these findings to  
51 the practice of increasing equity in bike share planning, this paper outlines seven lessons for cities as they plan  
52 to increase access to and use of bike share in underserved communities: » Support bike share by building out  
53 bike networks: Ensuring that people have places to ride where they feel comfortable and safe is essential to  
54 larger equity and mobility efforts. The safety benefits of increased ridership are enhanced when growth in  
55 cycling is matched with construction of new, better bike lanes.

capacity to mobilize motorized and non-  
motorized vehicles, bicycles, pedestrian,  
passengers and goods and the associated  
costs to support this mobility.

- Operational: Performance of the system  
such as reliability and reduction in loss,  
damage, or time. This category is closely  
related to the utilization level of the asset  
benefiting all those impacted within the  
core category described above.
- Geographical: This identifies the wide  
market based that serves and impacts the  
transportation project or network. It has a  
human and land component that should be  
evaluated.

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1 This paper summarizes the wealth of information about transportation equity and identifies how other  
2 transportation professionals are measuring equity in public transportation programs. The research team focused  
3 on Active Transportation Vehicles (ATV) programs and in 2017 surveyed more than thirty people representing  
4 numerous agencies and organizations on whether they are measuring equity, and, if so, how it defines the  
5 success of their program. The reason for choosing ATV programs is that the development of these is on-going  
6 and started impacting mobility in the 2000s. In 2019 the research team created an eight-question survey to  
7 further the 2017 research.

8 The team felt this would assist in framing the methodology for defining and measuring equity in such public  
9 programs and help others who may be struggling with how to properly measure equity in terms of:

- 10 • Who you currently are serving,
- 11 • Your challenging problems,
- 12 • How to decide if the solution is equitable (acceptable tradeoffs) and justifiable, and
- 13 • How to measure equity for the program.

14 To help frame the answers for these questions, we must accept that when evaluating equity, we are evaluating  
15 the **distribution of impacts (benefits and costs) and whether this distribution is considered fair and**  
16 **appropriate. Therefore, it can be viewed as what we are willing to accept as fair and appropriate**  
17 **tradeoffs.**

### 18 [Why conduct equity research and why is it important?](#)

19 In 2017 the research team created and distributed a Survey Monkey questionnaire and received thirty-four  
20 responses. The respondents included ATV vendors, managers, users, academics, and public agency officials  
21 who had a relationship with an Active Transportation Vehicle (ATV) program. Most of the respondents  
22 acknowledged the importance of equity as a measure of success for a public transportation program such as  
23 bikeshare and scooter-share, but do not specifically evaluate it. The research team desired to determine some of  
24 the reasons for this, as well as determine if an equity performance measure were needed, if such a measure could  
25 be defined, and whether it was of value in the practical world.

26 In Arizona, bike- and scooter-share programs have been popular but the associated parking issues have been  
27 problematic. As a result, one of the research team's challenging questions focuses on how one measures equity  
28 when comparing the value of an ATV program to the rights of the public to sidewalks and other public rights of  
29 way that are clear of obstacles, clutter, and that are Americans with Disabilities Act (ADA) regulations  
30 compliant. To help clarify the tradeoffs, a survey was developed in 2019 exclusively related to the measure of  
31 equity performance. It is hoped that the research and recommendations of this paper help others balance the  
32 tradeoffs of ATV and other transportation and transit public programs. For the purposes of this paper the  
33 research team studied *Transport Planning: Principles, Techniques and Case Studies (2019)* by R. J. Nairn. The  
34 authors of this study reference Transportation Project Evaluation as generally comprised of comparing "the  
35 capital costs of undertaking the project with the net benefits it creates. These net benefits are defined as the  
36 gross benefits created by the project less the economic resources consumed in achieving them. (R J Nairn B.E.,  
37 2019)

38 It is our contention that equity should be measured when analyzing the individual group (aggregate) gross  
39 benefits and the aggregate resources used and costs incurred for achieving them, so the individual group  
40 components (aggregate by group) of a society enjoys similar net benefits when looking at these by trip or user.  
41 In theory, the importance of evaluating equity, especially when evaluating the net benefits and the success of  
42 public transportation, **is the impact that transportation planning decisions have on quality of life:**

- 43 • The quality of transportation choices affects equity. Equity affects people's economic and social  
44 opportunities.
- 45 • Equity is also affected by, and depends on, the policy decisions on what transport facilities, activities and  
46 services are imposed indirectly and externally to the public. The imposition can be direct when identifying  
47 the costs of taxes, user fees, congestion delay and collision risks. These costs are imposed on other road

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1 users, such as when they are part of a system that funds infrastructure costs through payment of bonds and  
2 regional, local financing.

- 3 • Transport expenditures represent a major share of most household, business, and government expenditures.  
4 As such transportation decisions and policies must follow a process where proper evaluation is done so that  
5 only the appropriate impacts are transferred to the public. This can be done by including equity in the  
6 identification of all the required public resources (tax funding and road rights of way), and the allocation of  
7 which can favor some people over others.
- 8 • The introduction of equity considerations in transportation planning may impact local development, land  
9 values and local economic activity. Equity along might not be a factor. Incorporating equity considerations  
10 within transport planning decisions can affect employment and economic development which have  
11 distributional impacts.

12 Throughout our research and looking at the responses obtained to the questionnaire, we know that “equity  
13 analysis is important and unavoidable. Equity concerns often influence transportation policy and planning  
14 decisions, and most practitioners and decision-makers sincerely want to address these concerns. (Litman,  
15 Evaluating Transportation Equity Guidance For Incorporating Distributional Impacts in Transportation Planning  
16 , 2018)” However, there is little guidance on what to measure and how to measure it. One of the problems is the  
17 vast number of evaluation variables that are part of equity, and that there are at least three types of equity that  
18 may be measured (Rafael H. M. Pereira, 2016).

### 19 METHODS

20 Transportation impacts can be measured in various ways. The measurement data affects the equity analysis and  
21 results. The following paragraphs summarize these effects.

#### 22 Definition of Transportation (Mobility-Based Versus Accessibility-Based Planning)

23 Transportation analysis is affected by how transportation is defined and evaluated (Studies, 2006).  
24 Transportation planning used to evaluate transportation based on mobility or physical travel, using data  
25 quantifying traffic speed and roadway level-of-service. However, mobility is not the primary goal of public  
26 transportation programs. Most public Transportation activities’ goals are best defined by accessibility (Hana  
27 Creger, 2018). Accessibility, in the case of public transportation activities identifies the people’s ability to reach  
28 desired services and activities. Various factors affect accessibility including the maturity, connectivity,  
29 expansion and affordability of the transportation network, the geographic distribution of activities that are  
30 included in the network, and mobility options that take place in such network such as telecommunications and  
31 technology (Litman, Measuring Transportation: Traffic, Mobility and Accessibility, 2003).

32 This has important equity implications (Litman, Evaluating Transportation Equity Guidance For Incorporating  
33 Distributional Impacts in Transportation Planning , 2018). Mobility-based planning works best for faster modes  
34 and longer trips over slower modes and shorter trips, and therefore motorists over non-drivers. Consequently,  
35 evaluating transportation system performance based on roadway level-of-service tends to justify roadway  
36 expansion projects even though wider roads and increased traffic speeds tend to degrade walking and bicycling  
37 conditions and activities. This happens since most public transit trips include walking links, and the walking  
38 links are important to consider as they increase, if short, transit access. Accessibility-based evaluation can  
39 consider the situation identified before, and the tradeoff of links and accessibility, and so, public transit and  
40 transportation equity impacts.

41 Some of the tradeoff’s transportation planners face, as well as the difficulty in setting a measure are described in  
42 the quote below [reference].

43 *“Programmatic solutions often appear to be most cost effective since they focus resources on people who are*  
44 *most disadvantaged, but structural reforms often provide significant co-benefits and so are often most beneficial*  
45 *overall. For example, most communities can only afford to provide a small amount of special mobility services*  
46 *but planning reforms that help create more multi-modal transportation systems and more accessible land use*  
47 *development may improve access for physically, economically and socially disadvantaged people, including*

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1 *those who not fit into standard “disadvantaged” categories such as people with moderate incomes or mild*  
2 *disabilities. For example, improving pedestrian safety may reduce traffic speeds and therefore economic*  
3 *productivity, and providing public transit services may require tax subsidies, and in some cases may increase*  
4 *local air and noise pollution. Some communities may place a higher or lower value on a particular equity*  
5 *objective. For example, some communities may place a higher value on providing basic mobility for non-*  
6 *drivers. Some communities may consider road tolls and parking fees unfair because they are regressive, while*  
7 *others consider them fair because they charge motorists directly for the facilities they use and so increase*  
8 *horizontal equity.”*

### 9 *METRICS AND SUCCESS*

10 To determine if an ATV program is performing and if it is successful, it is necessary to define success and the  
11 associated performance criteria. There are a variety of definitions of success and possible metrics that can be  
12 considered, depending on the type of entity -- public agency, vendor, or end user. For example, city/public  
13 agencies might define success as the number of bikes being used, the areas being served, and/or a cost-recovery  
14 component. A vendor, however, might base their criteria for success strictly on profits. The end user might view  
15 success based on the accessibility and affordability of the bikes/ATVs.

16 *The Bike-share Planning Guide* (ITDP 2017) identifies two conventional performance metrics that can help this  
17 assessment for ATV systems: 1) average number of daily uses per public bike, and 2) average daily trips per  
18 residents. By determining the number of daily uses and the number of trips, fees can be determined, and profit  
19 maximized. However, equity is emerging and important in the performance and operation of ATV programs.

20 **Because there is no single correct methodology, it is generally best to consider a variety of issues and**  
21 **perspectives. A planning process should reflect each community’s equity concerns and priorities so public**  
22 **involvement is important for transportation equity planning.** More comprehensive equity analysis allows  
23 planners to better anticipate problems, incorporate equity objectives in planning (for example, it can help  
24 identify congestion reduction strategies that also improve mobility for non-drivers and help lower-income  
25 people), and it can help optimize planning decisions to maximize equity objectives. New analysis tools and  
26 information resources are available to better evaluate equity and incorporate equity objectives into transport  
27 planning. Improved equity analysis in transport planning can reduce conflicts and delays, and better reflect a  
28 community’s needs and values. Public transportation programs must provide benefits to residents no matter their  
29 income, race, or gender for it to be successful.

30 For the purposes of this study, in 2017 a ten-question questionnaire was developed using SurveyMonkey as the  
31 distribution platform and distributed via the Association of Pedestrian and Bicycle Professionals (APBP) list  
32 serve, and through the list serves of the Transportation Research Board (TRB) Major Cities (ABE30) and  
33 Bicycle Transportation (ANF20) committees. The survey also was distributed to ATV program administrators in  
34 Phoenix, Scottsdale, and Mesa, Arizona, which have active program. In addition, the survey was posted in the  
35 American Society of Civil Engineering (ASCE) and the Institute of Transportation Engineers (ITE) community  
36 blogs. The questionnaire was open from May 17 through June 16, 2018. In 2019 the ten-question questioner was  
37 improved based on the collected 2017/2018 data. This survey remains open.

38 As expressed by both the 2017 and 2019/2020 respondents, the average number of daily uses per public bike is  
39 the top success metric. Some of the respondents justified their use of daily uses because daily uses and equity  
40 are intertwined in the analysis as success. Additionally, daily use is tied to the goals of providing low-cost,  
41 convenient, and reliable transportation to all those that are targeted.

42 Performance measures should reflect the goals of those measuring it, and these should be quantifiable. For the  
43 agencies we surveyed, most important is that the program is self-supporting, does not create negative  
44 issues/barriers for pedestrians, and does not create nuisance when bike parking. For others that use the system,  
45 the measure is more qualitative, focusing on the need to show that bikes are in obvious use and are visible by  
46 other potential users. Like transit, success of the ATV system is less about the direct profitability, and more  
47 about access to the system and the economic benefits of users as well as businesses located near kiosks or other  
48 ATV stations or transit stops. Counting the number of ATV users cannot be overemphasized as an essential

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1 strategy for improving both the equity and overall use/efficiency of ATV systems. There is a maxim that states  
2 “What gets measured gets done.” An important corollary to this is, “What gets measured gets funded.”

3 Counting ATV users also allows system planners and operators to better understand pedestrians’ and bicyclists’  
4 destinations, as well as the routes they are taking. With respect to docked systems, this is important when  
5 evaluating the performance of existing stations and kiosks and planning new ones. Without accurate counts,  
6 your system might not be performing efficiently and/or equitably serving current and potential users. A variety  
7 of counting technologies can be used, including passive infrared (IR) counters, pneumatic tubes, pavement-  
8 embedded radar counters, fisheye camera system with video recognition, and visual/manual counts.

9 Based on the baseline (“before”) count data, when adjustments are made – to facilities, pricing, or policy – it is  
10 recommended that “after” counts be conducted to look at the actual impacts on ridership and safety. Interview-  
11 style or “man/woman on the street” interviews should be considered to gather opinion-based data.

### 12 RECCOMENDED EQUITY METRICS

13 The 2019 survey was answered by 84 respondents of which 41.7 percent were end users, while 23.8 percent  
14 were funding agencies, 29.7 percent were advocates or other social or non-profit related group, 13.1 percent  
15 were research/university faculty, 11.9 percent local public agencies where ATV mobilized, and less than 15  
16 percent where either vendors/operator, others and preferred not to answer. The research team was satisfied of  
17 this distribution between groups of respondents as all groups provided input.

18 In terms of what is most important to them when determining whether the benefits and costs are fair and  
19 appropriate, 29.7 percent responded that the ATV program should balance user costs (fees, taxes, and fares) with  
20 user benefits, mobility, and accessibility. The second most important impact (28.9 percent) to determine fairness  
21 and appropriateness is the balance between the funding, design, and installation of public facilities (physical  
22 space) and the allocation or provision of public services. It is, therefore, interpreted that the user cost of the ATV  
23 service and the space for them to mobilize, park, and start/end trips are the most important impacts that need to  
24 be equitably managed within the ATV program. The responses obtained above are corroborated by the  
25 respondents stating that two of the proposed units of measurement should be used when measuring equity:

- 26 1. Unit per capita (per adult, per commuter, per peak period of travel, per household) and
- 27 2. Per unit of travel (per vehicle-mile/km, per commute trip, etc.).

28 Therefore, the combination of both – capital cost per vehicle mile per commute trip - allows for determining the  
29 most significant measure of the tradeoffs impacting ATV users. We as researchers understand that this indicator  
30 seems good from the public management point of view. From the user’s perspective we need also need to  
31 consider selecting the total cost as perceived by the users per vehicle mile per commute trip.

32 From the “equity” stand, different social groups would have different “total costs perceived” per vehicle mile  
33 per commute trip. A more incisive indicator would be if it is expressed as percentage of (daily) average income  
34 of the user:

35 To include a measure of demographic characteristics in the measure of equity, the measure of per capital cost  
36 per vehicle mile, per commute trip should be a net value based on the income class of the user. Additionally,  
37 any planning effort to define the appropriate cost of the ATV service and the space for them to mobilize, park,  
38 start/end trip should involve the public thus outreach is the premise for any ATV program planning, design,  
39 implementation, management and evaluation. To ensure equity in ATV programs (and we contend this in all  
40 Transportation Public Mobility Programs) the following questions must be answered so that the scope of the  
41 Program includes and is scoped around these:

- 42 • Who are you serving? All public that need shared options for their transportation and mobility.
- 43 • What is the problem? No convenient option to their mobility needs due to inadequate or costly transit, private  
44 vehicle, or other constraints.

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1 • When is the solution equitable (acceptable tradeoffs) and justifiable? The cost per trip and per commuter is  
2 appropriate for the demographic realities of the community being served by the ATV Program. It is a cost  
3 comparable or less than that of public transit.

4 • How to measure equity for the program? Ensuring proper design of public facilities, adequate quantity and  
5 quality of ATVs, proper parking, storing, and access to vehicles. ‘Capital cost per vehicle mile per commute  
6 trip’ is recommended.

### 7 RESULTS

8 The goals of the conducted research were four. We will summarize what we found, what do the results show and  
9 what insight we gained?

10 1. The responses obtained identified that two units of measurement should be used when measuring  
11 equity: 1. Unit per capita (per adult, per commuter, per peak period of travel, per household) and 2. Per unit of  
12 travel (per vehicle-mile/km, per commute trip, etc.

13 2. Over ninety-two percent of those surveyed judge that an ATV program should be equitable and that is  
14 best to include a variety of issues and perspectives. The planning and implementation processes must include the  
15 community’s equity concerns and priorities therefore public involvements is important for equity planning.

16 3. Based on the survey results we conclude that when selecting the total cost expresses as percentage of  
17 (daily) average income by user per vehicle mile per commute trip we are able to include an equity measure as  
18 different social groups have different “total costs perceived” per vehicle mile per commute trip. This measure  
19 works for both the users as well as for program managers, ATV vendors, and public transportation officials.  
20 More is needed in terms of data as in not measured for success identification of ATV programs.

21 4. An equity measure is needed, and future research will allow the recommendation of a methodology for  
22 measuring equity in such public programs. Others (Brown, 2020) suggest that 12 strategies may ensure that  
23 equity is focused within transportation. If your program can look at all 12 and focus on half of these, you are in  
24 the right way and side of equity. These 12 strategies are: Involve Low Income and Minority Groups, Invest in  
25 Minority, Black, Hispanic and Native American communities, Engage and Involve youth from low-income and  
26 minority communities, Engage with senior citizens and older adults, Engage with Persons with Disabilities and  
27 Special Health Care needs, Engage in foreign born and limited English proficiency LEP populations, Engage in  
28 Sexual minorities, Engage with and promote women to positions of power, Revisit marketing and  
29 communication material and strategies, Foster equitable treatment of Diverse Languages, Safeguard Against  
30 discriminatory Institutional and Community Policing, Move for behind your computer and Engage with others  
31 in the Streets. The 90 percent favorable response to one question points to the need to provide education and  
32 resources on equity -- “A planning process should reflect each community’s equity concerns and priorities, and  
33 therefore public involvement is important for transportation equity planning.” Information on how to incorporate  
34 and measure equity should be actively and widely distributed to everyone who is involved in planning,  
35 operating, and evaluating active transportation programs and facilities. Using a robust, multi-pronged  
36 distribution strategy via pedestrian/bicycle associations, councils of governments, regional planning  
37 organizations, municipal planning organizations, and academic/research institutions we can continue the  
38 positive momentum of raising the importance of equity in active transportation and in many other transportation  
39 planning efforts.

### 40 FUTURE RESEARCH

41 It is hard to define equity when looking at a project, but equity should be the focus and one of the priorities  
42 when looking at transportation public programs. Equity cannot be achieved without “1. *Trying to understand*  
43 *and give people what they need to enjoy full healthy lives; 2) ensuring the presence of justice and fairness within*  
44 *the procedures, processes, and distribution of resources by institutions or systems; 3) understanding the*  
45 *underlying or root causes of inequality and oppression within our society; and 4) deepening our collective*  
46 *knowledge about the connection between social identities, access, mobility, power and privilege* (Brown, 2020)”



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1 Future research is needed, when looking at ATV, to identify a methodology that allows and ensures (even if this  
2 is managed by others) that in the community you serve:

- 3 • Low income and minority groups have access to ATVs. This may mean finding alternatives to request, pay  
4 or use ATVs units with mechanisms other than with a smart phone app or a credit card. This may require that  
5 the alternatives be available in foreign languages.
- 6 • Talk often and frequently with all groups (elder, youth, parents, etc.) and ask what the program is doing  
7 well, and how is failing. This means do, evaluate, revisit, and change as often as needed.
- 8 • Work with the marketing and communication specialists of the area. The goal is to find creative ways to  
9 educate (etiquette, safe usage), enforce (social responsibility, codes), and provide means for them to express  
10 their place within the community.
- 11 • Attend the city council, planning commission, etc. as true equity requires intentionality. It requires knowing  
12 the community, its people, and places to provide comfort.

### 13 CONCLUSIONS

14 It is clear from this study that equity is a concern to many who deal with active transportation vehicles and  
15 programs. In terms of evaluating the equity of these programs this study's survey respondents are rather equally  
16 split about the trade-offs and impacts that are most important to them: Public Facilities, User Costs and Benefits,  
17 External Impacts, Economic Impacts, and Regulation and Enforcement. The bottom line is that all of them are of  
18 importance. Respondents show equal support for the most important variable/characteristic for determining the  
19 target audience(s) and reach of an ATV program. The results of the survey also show the most important  
20 planning measure is the relation of the number of users and the population served, followed by cost, and  
21 traveling time. It should be highly emphasized the continuous improvement of balancing equity and fairness in  
22 public transportation programs. Because shared active transportation programs are in constant flux and are  
23 docking public rights-of-way, there is need for public agencies to set clear regulations and their enforcement.  
24 Other actions that a public agency must address, to make the shared and active transportation programs  
25 beneficial to the public and community at large, is keeping streets, sidewalks, and vehicles of public  
26 transportation clean and periodically supervised, educate users and improve security.

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