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

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12 **ABSTRACT**

13 Communities that offer Active Transportation Vehicles (ATV) programs, do so as a response to short trips not
14 covered in public transportation. The programs’ goal is to provide mobility options that respond to gaps in
15 transit, light rail, or for short commuting and convenience trips. The economic impacts of any transportation
16 program can be categorized as (Litman, Evaluating Transportation Equity Guidance For Incorporating
17 Distributional Impacts in Transportation Planning , 2018):

- 18 • Core: The most fundamental impacts of transportation relate to the investment required to build the physical
19 capacity to mobilize motorized and non-motorized vehicles, bicycles, pedestrians and goods and the associated
20 costs to support this.
- 21 • Operational: The economic consequences of changes in the performance of the system measured in terms such
22 as reliability and reduction in loss, damage or time define the operational economic impacts. This category is
23 closely related to the utilization level of the asset benefiting all those impacted.
- 24 • Geographical: This identifies the wide-market-base that the system serves and refers to the economic impacts
25 the transportation project or its network on the community and land resources.

26 Not included above is equity, which refers to the fairness with which impacts (benefits and costs) are distributed
27 among all stakeholders. Transportation planning decisions have significant equity impacts that may be difficult
28 to evaluate because there are several definitions of equity, many potential impacts to consider, various ways to
29 measure the impacts, and includes many options when categorizing people. We propose to define equity as
30 (must meet both statements) a). fosters the fair opportunities of mobility, safety, reliability and comfort to all
31 when comparing programs and projects where vehicle, transit, and share-ride pedestrian transport occur and b).
32 fosters the fair distribution of costs and benefits to all those incurring the effects of such programs or projects.
33 **Why must we include equity?** Simply, we need to balance the finite resources of any transportation system,
34 and the balancing act should be fair and equitable.

35 **INTRODUCTION**

36 Ridesharing relates to the sharing of rides or transportation assets, especially among commuters. This sharing
37 can be of vehicles (automobiles or cars) or active-transportation vehicles (bicycles and scooters). Ridesharing is
38 not new when it is associated with vehicles as taxi and limo services have been in place for several decades.
39 What is new is the ridesharing related to bikes and scooters and not beginning your trip in a rental office. Most
40 of the associated rides are short, generated by convenience and filling in the “last mile” gap of most public
41 transportation systems. This “last mile” gap ranges from ½ mile to 2 miles from the light rail or bus station to
42 the home, office or store that completes the trip. Equity refers to the “fairness with which impacts (benefits and
43 costs) are distributed. Transportation planning decisions often have significant equity impacts. (Litman,
44 Evaluating Transportation Equity Guidance For Incorporating Distributional Impacts in Transportation Planning
45 , 2018).” Many transportation planning and engineer professionals are trying to ensure that responding to
46 private pressures for this new mode of transportation sharing, that happened as an answer to a new technology
47 (battery run bicycles and scooters), a need previously not covered by traditional transportation units and a
48 business opportunity, is equitable. But what does it really mean and how do we make it happen? Transport
49 equity analysis can be difficult because there are several definitions of equity, many potential impacts to
50 consider, various ways to measure impacts, and includes many options when categorizing people.

51 This paper summarizes on-going research, some of it conducted in 2017 through 2020 identifying the tradeoffs
52 and measures important for those using or managing Active Transportation Vehicle (ATV) programs. For
53 purposes of this study, ATVs include bike-share, scooter-share, etc. The research team

- 1 used platforms of social media to distribute an 8-question survey and requested members of the Transportation
2 Research Board (TRB) and working groups to complete it. The goals were to:
- 3 1. Identify the perception of those surveyed on what the users see as important and identify the tradeoffs that
4 are part of their decision process.
 - 5 2. Determine (through survey) if an ATV program should be equitable and the definition of what this means
6 within ATV programs.
 - 7 3. Determined if the results represent what program managers, ATV vendors, and public transportation
8 officials measure when determining if their program is equitable and if these measures are used to define the
9 success of their program.
 - 10 4. Finally, determine if an equity measure is needed and recommend a methodology for measuring equity in
11 such public programs.

12 BACKGROUND

13 Transportation (Transport) as a sector is an
14 important component in the economy and a
15 common tool used for economic and social
16 development. It has even been stated (Rodrigue,
17 2017) that “a relation between the quantity and
18 quality of transport infrastructure and the level of
19 economic development is apparent”. High density
20 transport infrastructure and highly connected
21 networks are commonly associated with high levels
22 of development. When transport systems are
23 efficient, they provide economic and social
24 opportunities and benefits that result in positive
25 multipliers effects such as better accessibility to
26 markets, employment and additional investments.
27 When transport systems are deficient in terms of
28 capacity or reliability, they can have an economic
29 cost such as reduced or missed opportunities and
30 lower quality of life.

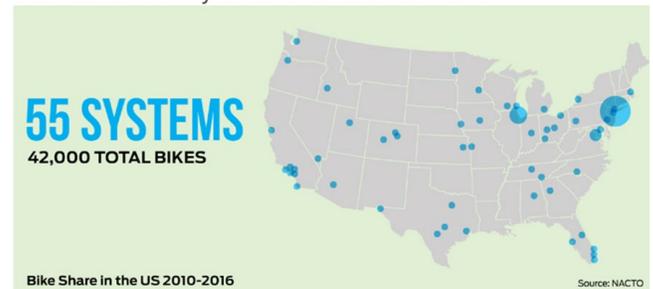
31 Focus on Active Transportation Vehicles

32 This paper focuses on multimodal accessibility
33 equity specifically for bike share and scooter share.
34 Active Transportation Vehicle (ATV) is an
35 innovative transportation program, ideal for short
36 distance point-to-point trips providing users the
37 ability to pick up a bicycle or scooter at any self-
38 serve station and return it either to any other station
39 located within the system's service area or any other
40 location where the vehicle can be picked up and do
41 not encroach the public right-of-way. ATV
42 programs launched in the U.S. and around the world
43 have experienced different degrees of success and
44 growth. In 2017, the number of ATV bikes in the
45 U.S. more than doubled – from 42,500 bikes at the
46 end of 2016 to about 100,000 bikes by the end of
47 2017. Most of the increase in ATV came from new
48 dockless systems. By the end 2019 the number of
49 systems grew to 55 with an aggregate number of
50 142,000 bikes, 12 minute average trip per member
51 and only 24% of the programs included income

52 based discounted programs (NACTO, (Update
53 (April 17, 2019): NACTO’s Newest Report, Shared
54 Micromobility in the U.S.: 2018, updates these
55 figures with 2018 ridership numbers, including on
56 e-scooter systems),, 2019)

57 Figure 1, below, shows the geographical
58 distribution of ATV programs in the US. In recent
59 years the overall transportation industry (primarily
60 public sector) has begun adopting performance
61 measurement, but no standards exist. This also is
62 true for ATV systems. The ATV programs goal is
63 to provide a mobility option that responds to gaps in
64 transit, light rail, or for short commuting and
65 convenience. As such, we recommend
66 complementing the traditional measurements of the
67 time and costs required to reach the ATV-basic
68 service and its mobility related activities with well-
69 defined equity indicators. However, based on
70 NACTO 2019 data only 24% of the communities
71 that offer ATV programs exhibit some equity
72 considerations in the form of a discount program.

The Number of Systems Continues to Grow



73
74 *Figure 1 -Geographical distribution of U.S. ATV*
75 *programs. The economic impacts of transportation*
76 *can be categorized as core, operational and*
77 *geographical.*

78 Specially in public agencies, it’s essential to get the
79 most out of every idea, option, and investment. To
80 accomplish this, we tend to use cost benefit
81 analyses to help make important decisions. Using a

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1 cost benefit analysis can in the identification of the highest and best return on an investment based on the cost,
2 resources, and risk involved. The truth is that not all stakeholders incur the same costs or benefits, therefore a
3 holistic analysis must be performed. When completed, a cost benefit analysis will yield concrete results that can
4 be used to develop reasonable conclusions around the feasibility and/or advisability of a decision or situation,
5 therefore critical thinking is so intertwined with this process.

6 Transportation ATV providers (public or private) rely on cost benefit analysis to support decision making
7 because it provides an agnostic, evidence-based view of the issue being evaluated—without the influences of
8 opinion, politics, or bias. By providing an unclouded view of the consequences of a decision, cost benefit
9 analysis is an invaluable tool in developing a project, program or strategy, or making resource allocation or
10 purchase decisions. Some of the costs and impacts to analyze are:

- 11 • Core: The most fundamental impacts of transportation relate to the physical capacity to mobilize
12 motorized and non-motorized vehicles, bicycles, pedestrian, passengers and goods and the associated
13 costs to support this mobility.
- 14 • Operational: Performance of the system such as reliability and reduction in loss, damage or time. This
15 category is closely related to the utilization level of the asset benefiting all those impacted within the
16 core category described above.
- 17 • Geographical: This identifies the wide market based that serves and impacts the transportation project or
18 network. It has a human and land component that should be evaluated.

19 The key component not included in the above is equity: In this paper, the researchers define equity, in the
20 context of public transportation, as actions that a). foster the fair *opportunity* of mobility, safety, reliability and
21 comfort to all when comparing programs and projects where vehicle, transit, and share-ride pedestrian transport
22 occur and simultaneously b). foster the fair *distribution* of costs and benefits to all those incurring the effects of
23 such programs or projects.

24 Why are ATV and bicycle programs important? Using the results of NACTO's analysis of bike infrastructure
25 and ridership trends in seven major cities across the U.S.—Chicago, Minneapolis, New York, Philadelphia,
26 Portland, San Francisco, and Washington DC— NACTO found a positive feedback loop between bike
27 ridership, the creation of protected bike networks, and overall cyclist safety. Based on NACTO research and
28 analysis of other reports, the paper (NACTO, Equitable Bike Share Means Building Better Places for People to
29 Ride, 2020) showed that as cities build more bike lanes, the number of cyclists on the street increases, and the
30 individual risk of a cyclist being killed or severely injured drops. Applying these findings to the practice of
31 increasing equity in bike share planning, this paper outlines seven lessons for cities as they plan to increase
32 access to and use of bike share in underserved communities: » Support bike share by building out bike networks:
33 Ensuring that people have places to ride where they feel comfortable and safe is essential to larger equity and
34 mobility efforts. The safety benefits of increased ridership are enhanced when growth in cycling is matched with
35 construction of new, better bike lanes.

36 This paper summarizes recent information about transportation equity and identifies how other transportation
37 professionals are measuring equity in public transportation programs. The research team focused on Active
38 Transportation Vehicles (ATV) programs and in 2017 surveyed more than thirty people representing numerous
39 agencies and organizations on whether they are measuring equity, and, if so, how it defines the success of their
40 program. The reason for choosing ATV programs is that the development of these is on-going and started
41 impacting mobility in the 2010s. In 2019 the research team created an eight-question survey to further the 2017
42 research.

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

- 45 • Who you currently are serving,
- 46 • Your challenging problems,
- 47 • How to decide if the solution is equitable (acceptable tradeoffs) and justifiable, and
- 48 • How to measure equity for the program.

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1 To help frame the answers for these questions, we must accept that when evaluating equity, we are evaluating
2 the **distribution of impacts (benefits and costs) and whether this distribution among the community many**
3 **groups is considered fair and appropriate. Therefore, it can be viewed as what we are willing to accept as**
4 **fair and appropriate tradeoffs.**

5 **Why conduct equity research and why is it important?**

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

13 In Arizona, bike- and scooter-share programs have been popular but the associated parking issues have been
14 problematic. As a result, one of the research team's challenging questions focuses on how one measures equity
15 when comparing the value of an ATV program to the rights of the public to sidewalks and other public rights of
16 way that are clear of obstacles, clutter, and that are compliant with the regulations of the Americans with
17 Disabilities Act (ADA). To help clarify the tradeoffs, a survey was developed in 2019 exclusively related to the
18 measure of equity performance. It is hoped that the research and recommendations of this paper help others
19 balance the tradeoffs of ATV and other transportation and transit public programs. For the purposes of this
20 paper the research team adopted as baseline methodology the evaluation principles and methods presented in
21 *Transport Planning: Principles, Techniques and Case Studies (2019)* by R. J. Nairn. Briefly, Transportation
22 Project Evaluation compares "the capital costs of undertaking the project with the net benefits it creates. These
23 net benefits are defined as the gross benefits created by the project less the economic resources consumed in
24 achieving them." (R J Nairn B.E., 2019)

25 It is our contention that equity should be measured when analyzing the individual group (aggregate) gross
26 benefits and the aggregate resources used and costs incurred for achieving them, so the individual group
27 components (aggregate by group) of a society enjoys similar net benefits when looking at these by trip or user.
28 In order to ensure no bias, it is appropriate to use the "net-benefit" metric, for example net-benefits per capita
29 for each group, or the benefit cost ratio per group. In theory, the importance of evaluating equity, especially
30 when evaluating the net benefits and the success of public transportation, **is the impact that transportation-**
31 **planning decisions have on quality of life:**

- 32 • The quality of transportation choices affects equity. Equity affects people's economic and social
33 opportunities.
- 34 • Equity is also affected by, and depends on, the policy decisions on what transport facilities, activities and
35 services are imposed indirectly and externally to the public. The imposition can be direct when identifying
36 the costs of taxes, user fees, congestion delay and accident risks. These costs are imposed on other road
37 users, such as when they are part of a system that funds infrastructure costs through payment of bonds and
38 regional, local financing.
- 39 • Transport expenditures represent a major share of most household, business and government expenditures.
40 As such transportation decisions and policies must follow a process where proper evaluation is done so that
41 only the appropriate impacts are transferred to the public. This can be done by including equity in the
42 identification of all the required public resources (tax funding and road rights of way), and the allocation of
43 which can favor some people over others.
- 44 • The introduction of equity considerations in transportation planning may impact local development, land
45 values and local economic activity. Incorporating equity considerations within transport planning decisions
46 can affect employment and economic development which have distributional impacts.

47 Throughout our research and looking at the responses obtained to the questionnaire, we know that "equity
48 analysis is important and unavoidable. Equity concerns often influence transportation policy and planning
49 decisions, and most practitioners and decision-makers sincerely want to address these concerns." (Litman,
50 *Evaluating Transportation Equity Guidance For Incorporating Distributional Impacts in Transportation Planning*

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1 , 2018). However, there is little guidance on what to measure and how to measure it. One of the problems is the
2 vast number of evaluation variables that are part of equity.

3 METHODS

4 Transportation impacts can be measured in various ways.

5 Mobility-Based versus Accessibility-Based Transportation Planning)

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

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

24 Some of the tradeoff's transportation planners face, as well as the difficulty in setting a metric are described in
25 the quote below [Litman, 2018].

26 *“Programmatic solutions often appear to be most cost effective since they focus resources on people who are*
27 *most disadvantaged, but structural reforms often provide significant co-benefits and so are often most beneficial*
28 *overall. For example, most communities can only afford to provide a small amount of special mobility services*
29 *but planning reforms that help create more multi-modal transportation systems and more accessible land use*
30 *development may improve access for physically, economically and socially disadvantaged people, including*
31 *those who not fit into standard “disadvantaged” categories such as people with moderate incomes or mild*
32 *disabilities.”*

33 METRICS AND SUCCESS

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

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

44 **Because there is no single correct methodology, it is generally best to consider a variety of issues and**
45 **perspectives. A planning process should reflect each community's equity concerns and priorities so public**
46 **involvement is important for transportation equity planning.** More comprehensive equity analysis allows
47 planners to better anticipate problems, incorporate equity objectives in planning (for example, it can help
48 identify congestion reduction strategies that also improve mobility for non-drivers and help lower-income

1 people), and it can help optimize planning decisions to maximize equity objectives. New analysis tools and
2 information resources are available to better evaluate equity and incorporate equity objectives into transport
3 planning. Improved equity analysis in transport planning can reduce conflicts and delays, and better reflect a
4 community's needs and values. Public transportation programs must provide benefits to residents no matter their
5 income, race or gender for it to be successful.

6 For the purposes of this study, in 2017 a ten-question questionnaire was developed using SurveyMonkey as the
7 distribution platform and distributed via the Association of Pedestrian and Bicycle Professionals (APBP) list
8 serve, and through the list serves of the Transportation Research Board (TRB) Major Cities (ABE30) and
9 Bicycle Transportation (ANF20) committees. The survey also was distributed to ATV program administrators in
10 Phoenix, Scottsdale, and Mesa, Arizona, which have active program. In addition, the survey was posted in the
11 American Society of Civil Engineering (ASCE) and the Institute of Transportation Engineers (ITE) community
12 blogs. The questionnaire was open from May 17 through June 16, 2018. In 2019 the ten-question questionnaire was
13 improved based on the collected 2017/2018 data. This survey remains open (<https://www.surveymonkey.com/r/BN283LF>)

14 As expressed by both the 2017 and 2019/2020 respondents, the average number of daily uses per public bike
15 (ANDPB) is the top success metric. Some of the respondents justified their use of daily uses because daily uses
16 and equity are intertwined in the analysis as success. Additionally, daily use is tied to the goals of providing
17 low-cost, convenient, and reliable transportation to all those that are targeted. We need to be careful as a large
18 number would indicate that the number of available bicycles is below demand needs. ANDPB could be a proper
19 metric if it is within predefined values. Note that it has no relation to the location of the demand for the service.
20 It says nothing regarding the demand in nearby areas not been served.

21 Performance measures should reflect the goals of those measuring it, and these should be quantifiable. For the
22 agencies we surveyed, most important is that the program is self-supporting, does not create negative
23 issues/barriers for pedestrians, and does not create nuisance when bike parking. For others that use the system,
24 the measure is more qualitative, focusing on the need to show that bikes are in obvious use and are visible by
25 other potential users. Like transit, success of the ATV system is less about the direct profitability, and more
26 about access to the system and the economic benefits of users as well as businesses located near kiosks or other
27 ATV stations or transit stops. Counting the number of ATV users can't be overemphasized as an essential
28 strategy for improving both the equity and overall use/efficiency of ATV systems. There is a maxim that states
29 "What gets measured gets done." An important corollary to this is, "What gets measured gets funded."

30 Counting ATV users also allows system planners and operators to better understand pedestrians' and bicyclists'
31 destinations, as well as the routes they're taking. With respect to docked systems, this is important when
32 evaluating the performance of existing stations and kiosks and planning new ones. Without accurate counts,
33 your system might not be performing efficiently and/or equitably serving current and potential users. A variety
34 of counting technologies can be used, including passive infrared (IR) counters, pneumatic tubes, pavement-
35 embedded radar counters, fisheye camera system with video recognition, and visual/manual counts. Based on
36 the baseline ("before") count data, when adjustments are made – to facilities, pricing, or policy – it is
37 recommended that "after" counts be conducted to look at the actual impacts on ridership and safety. Interview-
38 style or "man/woman on the street" interviews should be considered to gather opinion-based data.

39 RECOMMENDED EQUITY METRICS

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

45 In terms of what is most important to them when determining whether the benefits and costs are fair and
46 appropriate, 29.7 percent responded that the ATV program should balance user costs (fees, taxes, and fares) with
47 user benefits, mobility, and accessibility. The second most important metric, and with basically the same weight,
48 (28.9 percent) to assess fairness and appropriateness is the balance between the funding, design, and installation
49 of public facilities (physical space) and the allocation or provision of public services. It is, therefore, interpreted

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1 that the user cost of the ATV service and the space for them to mobilize, park, and start/end trips are the most
2 important impacts that need to be equitably managed within the ATV program. The response obtained above
3 were corroborated by the respondents stating that the following two metrics should be used when measuring
4 equity:

- 5 1. Units (bicycles, scooters) per capita (per adult, per commuter, per peak period of travel, per household)
6 and 2. Per unit of travel (per vehicle-mile/km, per commute trip, etc.).

7 Therefore, the combination of both into one metric – capital cost per vehicle mile per commute trip - allows for
8 determining the most significant measure of the tradeoffs impacting ATV users. We as researchers understand
9 that this indicator seems good from the public management point of view. From the user’s perspective we need
10 to consider the metric: total cost as perceived by the users per vehicle mile per commute trip.

11 From the “equity” stand, different social groups would have different “total costs perceived” per vehicle mile
12 per commute trip. A more incisive indicator would be if expressed as percentage of (daily) average income of
13 the user: In order to include a measure of demographic characteristics in the measure of equity, the measure of
14 per capital cost per vehicle mile, per commute trip should be a net value based on the income class of the user.
15 Additionally, any planning effort to define the appropriate cost of the ATV service and the space for them to
16 mobilize, park, start/end trip should involve the public thus outreach is the premise for any ATV program
17 planning, design, implementation, management and evaluation. To ensure equity in ATV programs (and we
18 contend this in all Transportation Public Mobility Programs) the following questions must be answered so that
19 the scope of the Program includes and is scoped around these:

- 20 • Who are you serving? All public that need shared options for their transportation and mobility.
- 21 • What is the problem? No convenient option to their mobility needs due to inadequate or costly transit, private
22 vehicle or other constraints.
- 23 • When is the solution equitable (acceptable tradeoffs) and justifiable? The cost per trip and per commuter is
24 appropriate for the demographic realities of the community being served by the ATV Program. It is a cost
25 comparable or less than that of public transit.
- 26 • How to measure equity for the program? Ensuring proper design of public facilities, adequate quantity and
27 quality of ATVs, proper parking, storing, and access to vehicles. ‘Capital cost per vehicle mile per commute
28 trip’ is recommended.

29 RESULTS

30 The goals of the conducted research were four. Here We summarize what we found, what do the results show
31 and the insight we gained.

- 32 1. The responses obtained identified that two units of measurement should be used when measuring equity:
33 a. Units (bicycles, scooters) per capita (per adult, per commuter, per peak period of travel, per
34 household), and b. Per unit of travel (per vehicle-mile/km, per commute trip, etc.)
- 35 2. Over ninety-two percent of those surveyed judge that an ATV program should be equitable and that is
36 best to include a variety of issues and perspectives. The planning and implementation processes must include the
37 community’s equity concerns and priorities therefore public involvements is important for equity planning.
- 38 3. Based on the survey results we conclude that the total cost expressed as percentage of (daily) average
39 income by user per vehicle mile per commute trip (for each group of the community being served) represents an
40 equity measure, as different social groups have different “total costs perceived” per vehicle mile per commute
41 trip. This metric works for both the users and for program managers, ATV vendors, and public transportation
42 officials.
- 43 4. An equity metric is needed, and future research will allow the recommendation of a methodology for
44 measuring equity in such public programs. Others (Brown, 2020) suggest that 12 strategies may ensure that
45 equity is included in transportation planning. If your program can look at all 12 and focus on half of these, you
46 are in the right way and side of equity. These 12 strategies are: Involve Low Income and Minority Groups,

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1 Invest in Minority, Black, Hispanic and Native American communities, Engage and Involve youth from low-
2 income and minority communities, Engage with senior citizens and older adults, Engage with Persons with
3 Disabilities and Special Health Care needs, Engage in foreign born and limited English proficiency LEP
4 populations, Engage in Sexual minorities, Engage with and promote women to positions of power, Revisit
5 marketing and communication material and strategies, Foster equitable treatment of diverse languages,
6 safeguard against discriminatory institutional and community policing, move from behind your computer and
7 engage with others in the streets.

8 5. The need to provide education and resources on equity received a 90 percent favorable response.

9 We conclude that “A planning process should reflect each community’s equity concerns and priorities, and
10 therefore public involvement is important for transportation equity planning.” Information on how to incorporate
11 and measure equity should be actively and widely distributed to everyone who is involved in planning,
12 operating, and evaluating active transportation programs and facilities. Using a robust, multi-pronged
13 distribution strategy via pedestrian/bicycle associations, councils of governments, regional planning
14 organizations, municipal planning organizations, and academic/research institutions we can continue the
15 positive momentum of raising the importance of equity in active transportation and in many other transportation
16 planning efforts.

17 FUTURE RESEARCH

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

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

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

36 CONCLUSIONS

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

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