Evaluating Transportation Equity:

Guidance for Incorporating Distributional Impacts in Transport Planning

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Social equity refers to the distribution of benefits and costs, and the degree that distribution is considered appropriate. Transportation planning decisions can have significant equity impacts: they affect the allocation of public resources, economic opportunities, and quality of life. Most people care about these impacts and want their transportation system to be equitable. As a result, practitioners have a responsibility to consider equity impacts in transportation planning.

This is a timely issue.[1-3] In the past, transportation system performance was evaluated based primarily on travel speeds, which favored faster but more costly modes, such as driving, over slower but more affordable modes with lower external costs, such as walking, bicycling and public transit.[4] Equity received little consideration.

For example, during the last century, highway projects displaced many high-access urban neighborhoods.[5] The planning process recognized the benefits that those highways provided to motorists but gave little consideration to the reduced accessibility and environmental degradation they imposed on urban communities. Those projects are now widely criticized and some are likely to be removed, but the damage they caused is irreversible.[6]

These practices persist. Many transportation agencies continue to allocate funds using performance indicators and funding formulas that give little consideration to equity-related goals such as affordability, non-drivers' accessibility, public health, or local environmental quality. This favors roadway expansions over other transportation improvements, and so favors motorists over people who rely on other modes.

Consider another example. Most jurisdictions have off-street parking minimums. Where they are imposed on residential buildings they add hundreds of dollars to annual housing costs, and where imposed on commercial buildings they add a few dollars to a typical household's weekly grocery bills.[7] This is unfair—it forces car-free households to subsidize the parking costs of their car-owning neighbors—but the equity impacts are usually overlooked; when evaluating parking minimums, practitioners seldom analyze who ultimately bears the costs and how they affect affordability.

These examples illustrate the need for more comprehensive equity analysis in transportation planning. However, equity analysis can be challenging. A particular policy or planning decision may seem equitable if evaluated using one set of definitions and metrics, but not if evaluated using others. This article provides an overview of key transportation equity concepts and describes practical ways to incorporate equity analysis into planning.

Perspectives and Impacts

There are various types of equity. *Horizontal equity* assumes that people with similar needs and abilities should be treated similarly. *Vertical equity* assumes that disadvantaged people should receive favorable treatment. Table 1 describes five types of transportation equity.

Table 1. Types of Transportation Equity

Horizontal	***A fair share of resources*** (also called ***fairness*** or ***equality***). It implies that people should "get what they pay for and pay for what they get," unless subsidies are specifically justified.
Horizontal	***External costs.*** Costs that travel activities impose on other people, such as the delay, risk and pollution, are unfair. Fairness requires minimizing or compensating for such impacts.
Vertical	***Inclusivity - vertical equity with regard to need and ability.*** This considers how transportation systems serve people with disabilities, youths and seniors, and other special mobility needs. This justifies multimodal planning and universal design requirements.
Vertical	***Affordability - vertical equity with regard to income.*** This considers how transportation systems affect lower-income people. Policies that favor lower-income people are called *progressive* and those that favor higher-income people are called *regressive*. This justifies policies that improve affordable modes and subsidize low-income travellers.
Vertical	***Social justice.*** This considers how transportation systems serve disadvantaged and underserved groups, and address structural injustices such as racism and sexism.

It is generally infeasible to consider all possible factors in a planning process. A more practical approach is to define measurable equity objectives, such as those in Table 2. Planning decisions can be evaluated based on their effects on these objectives, and the planning process can identify policies to help achieve them.

Table 2. Typical Transportation Equity Objectives

Horizontal Equity		Vertical Equity		
Fair Share	***External Costs***	***Inclusivity***	***Affordability***	***Social Justice***
• Everybody contributes to and receives comparable shares of public resources. • Planning serves non-drivers as well as drivers. • Affected people are involved in planning.	• Minimize external costs. • Favor resource-efficient modes that impose less congestion, risk, and pollution on other people. • Compensate for external costs.	• Accommodate people with disabilities and other special needs. • Basic access (ensure that everybody can reach essential services and activities).	• Favor affordable modes. • Provide discounts and exemptions for lower-income users. • Provide affordable housing in high-accessibility neighborhoods.	• Protect and support disadvantaged groups (women, youths, minorities, low-income, etc.). • Affirmative action policies and programs. • Correct for past injustices.

This table identifies typical measurable equity objectives.[8] A planning process can evaluate specific policies and decisions based on whether they support or contradict these objectives. (WRT = With Respect To.)

Analysis Methods

This section describes ways to evaluate various types of transportation equity.

Horizontal Equity: A Fair Share of Public Resources

Many long-running transportation equity debates concern public resource allocation. Such analysis tends to reflect a particular perspective and often overlooks other impacts and goals. For example:

- State officials complain if they receive less federal highway funding than their motorists pay in fuel taxes.[9] However, most experts recommend that public funds be allocated based on cost efficiency or user needs; allocation based on tax payments can result in inefficient and regressive funding allocation.
- Highway advocates complain when fuel taxes are spent on non-highway projects, which they call *diversions*.[10] However, those critics ignore the fact that fuel taxes only fund about half of total roadway costs; their argument that motorists should "get what they pay for" ignores the corollary that motorists should also "pay for what they get."
- Highway cost allocation studies examined whether the road user fees paid by various vehicle types reflect their share of roadway costs.[11] But the U.S. federal government has not commissioned such a study since 1997 because their conclusions—that fairness requires higher taxes on heavy vehicles plus new fees to reflect congestion, crash risk, and pollution costs—face political opposition.

More comprehensive equity analysis considers a wider range of factors. For example, equity implies that the public resources spent on a mode or group should reflect its share of travel demands; if a mode generates 10 percent of trips, it is fair for it to receive 10 percent of investments or road space. Let's evaluate current infrastructure spending based on this principle.

North American communities typically spend about $25 USD annually per capita on walking facilities, $40 per capita on bicycling facilities, $200 per capita on public transit services, $1,000 per capita on roads and traffic services, plus more than $2,000 per capita on government-mandated off-street parking facilities, as illustrated in Figure 1.

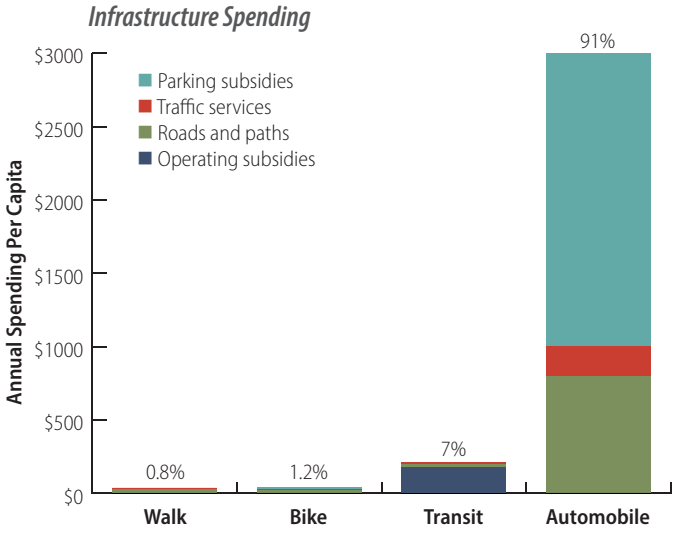

Figure 1. This graph compares infrastructure investments for various modes.[12-15]

Figure 2 compares expenditures on non-auto mode infrastructure with various indicators of their demands, including mode shares, traffic fatalities, the portion of travelers who use those modes at least occasionally, and typical mode share targets intended to help achieve congestion reduction, public health, and emission reduction

goals. As a result, horizontal equity could justify investing 10 percent to 30 percent of infrastructure spending on non-auto modes to ensure that current and potential users receive their fair share. This analysis suggests that people who rely on non-auto modes, or would like to, receive less than their share of investments.

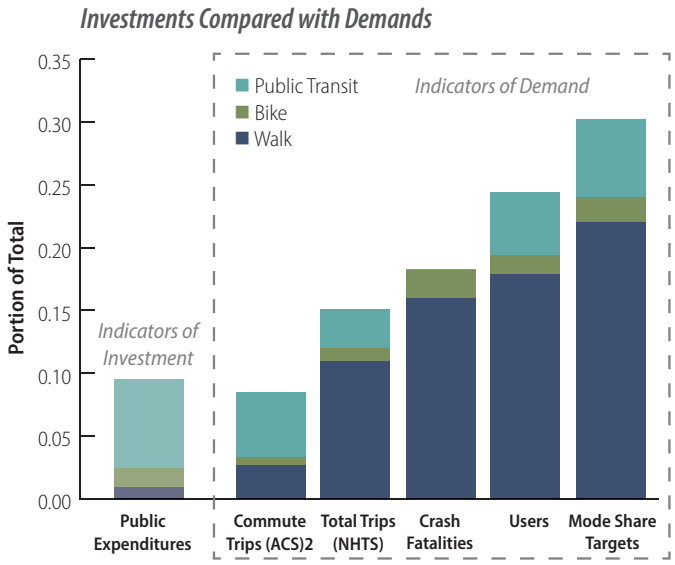

Figure 2. This figure compares spending on walking, bicycling, and public transit with indicators of their demands.[14, 16] This indicates that people who rely on non-auto modes receive less than their fair share of public investments. (ACS = American Community Survey. NHTS = National Household Travel Survey.)

Of course, this analysis can be structured in other ways that provide different results. Some evaluations only consider expenditures by a particular level of government, or measure impacts per passenger-mile, which ignores the greater annual travel-miles, and therefore greater infrastructure costs, by motorists compared with non-drivers. Since horizontal equity is concerned with fairness between people, analysis should generally measure impacts per capita.

Horizontal Equity: External Costs

Equity analysis can be applied to external costs, including the delay, risk, and pollution damages that travelers impose on other people. Horizontal equity requires that those costs be minimized and compensated so one group does not impose excessive costs on others.

Various studies have quantified and monetized (measured in monetary units) external costs.[17-20] Figure 3 illustrates these estimates. Because automobiles are faster, and require more space and energy than other modes, they tend to impose more delay, risk, noise, and air pollution than other forms of transport, particularly under urban-peak conditions.

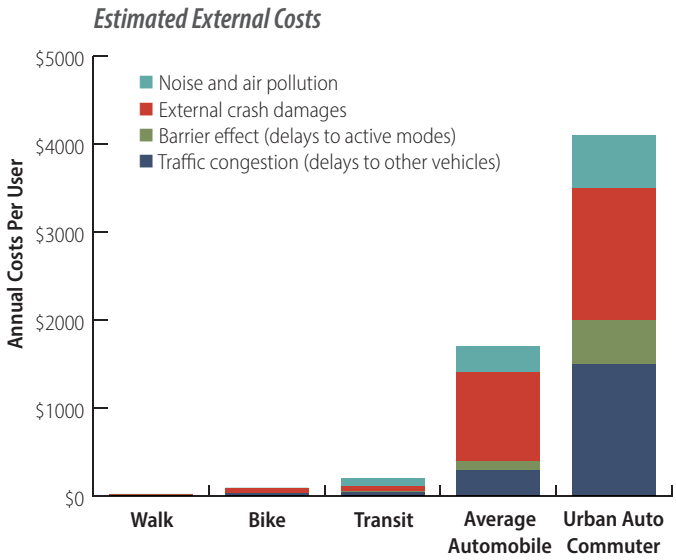

Figure 3. Transportation imposes various external costs on other people.[21] ("Barrier effect" refers to the delay and risk that wide roads and vehicle traffic impose on walking and bicycling.)

These external costs are inequitable:

- It is unfair that travellers using space-efficient modes, such as buses and rideshare vehicles, bear congestion delay caused by space-intensive modes such as automobiles. Fairness can justify bus and HOV lanes, and road pricing to internalize this cost.
- It is unfair that pedestrians and bicyclists bear excessive crash risk imposed by automobile traffic. Fairness can justify safety improvements, such as protected sidewalks, paths, bikeways, and traffic calming, financed with user fees.
- It is unfair that communities bear traffic noise and air pollution. Fairness can justify pollution reduction policies, such as electric vehicle mandates, fossil-fuel traffic restrictions and speed reductions, plus emission fees to internalize these costs.

Inequities also occur within a mode. For example, because automobile travel imposes significant external costs, people who drive more than average impose net external costs on motorists who drive less than average.

Road user fees are sometimes criticized as unfair to lower-income motorists, but that generally reflects incomplete analysis. Lower income residents tend to own fewer vehicles, drive less, and rely more on non-auto modes than higher-income residents.[22] As a result, disadvantaged groups tend to benefit overall if road user revenues are used to improve affordable modes.[23]

Inclusivity: Accommodating People with Disabilities and Other Special Needs

To be equitable, a transportation system must serve diverse users including travellers with impairments, young children, pets, baggage, and other special needs. Serving their demands requires multimodal planning to provide diverse travel options, plus universal design to accommodate travellers with disabilities and other mobility impairments.

Inclusivity can be evaluated by defining multimodal service quality standards and targets. For example, a community could establish targets that all streets will have accessible sidewalks, that 90 percent of households have an elementary school within a safe 20-minute walk, and all transit vehicles accommodate people with disabilities. Inclusivity can also be evaluated by comparing disparities between advantaged and disadvantaged groups, such as differences between non-drivers and drivers in the number of services and jobs that can be reached within 20 minutes. These factors can be analyzed using Walk Score, multimodal level-of-service ratings, universal design standards, and comprehensive accessibility models that measure the services and activities that can be reached within a given time period by various modes.[24-26]

Affordability: Serving Travellers with Low Incomes

Affordability refers to costs relative to incomes, and therefore people's ability to purchase basic goods within their limited budget. Affordability is a *potential*: even car-owning households may benefit from having more affordable options available if needed in the future. Experts define affordability as households spending no more than 45 percent of their budgets on transportation and housing combined; since households typically spend about 30 percent of budgets on housing, affordability requires that households spend no more than 15 percent on transportation—less if they have high housing costs, and more if their housing costs are lower than average.[18, 27]

Conventional transportation planning gives little consideration to affordability. If considered at all, affordability is evaluated based on individual costs such as fuel prices, road tolls, or public transit fares; total transportation costs are seldom considered.

Figure 4 compares typical user costs of various modes. Active modes have the lowest costs, public transit has moderate costs, and automobile travel is most expensive. Although lower-income motorists use various strategies to minimize their vehicle expenses, for example, by purchasing older vehicles and minimum insurance coverage, and sometimes performing their own repairs, it is difficult to legally operate a vehicle for less than $4,000 annually, or more for high annual miles.[21] Because automobiles sometimes incur large unexpected costs due to mechanical failures, crashes or traffic violations, lower-income motorists benefit from having affordable options available as an emergency backup.[28]

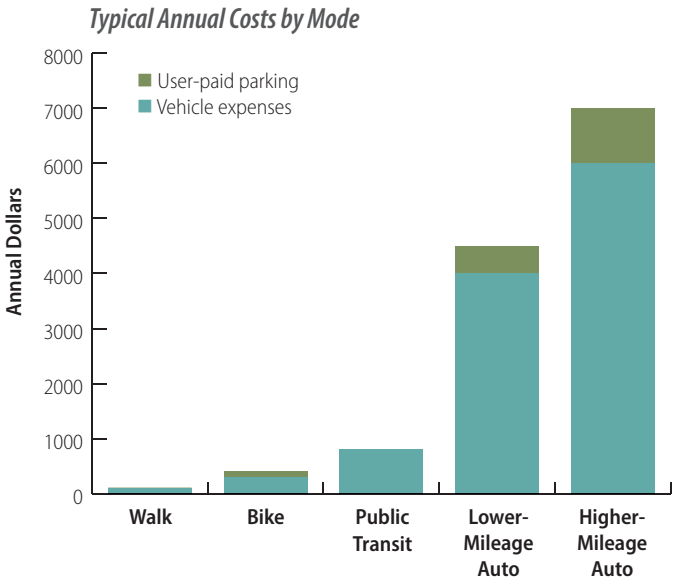

Figure 4. Walking, bicycling, and public transit are the most affordable modes. Automobiles are more expensive and sometimes impose large, unpredictable costs.[21]

To increase affordability, communities can improve lower-cost travel modes and create more affordable housing in compact, multimodal neighborhoods where it is easy to get around without a car. New tools can evaluate affordability.[29] The *Location Affordability Index* and the *Housing and Transportation Affordability Index*, estimate total housing and transportation costs, and therefore the potential savings provided by more affordable modes and more accessible locations.[18, 30]

Social Justice

Social justice considers structural inequities such as racism, sexism, and classism.[1, 31-32] It can be evaluated by identifying and measuring disparities between advantaged and disadvantaged groups in transportation *inputs* such as public investments; *outputs* such as the quality of walking, bicycling, and public transit services in disadvantaged neighborhoods; *outcomes* such as job access and employment rates; and *engagement* such as rates of participation in planning activities. This type of analysis can compare these factors for minority and non-minority, women and men, low- and high income communities, children and adults, and non-drivers and drivers. Social justice objectives can be addressed by establishing affirmative action policies, programs, and targets to eliminate unfair disparities.

Evaluating Equity Strategies

There are two general approaches to achieving equity objectives. *Structural* (or *functional*) strategies reform planning practices to support equity goals. These include multimodal planning

that improves affordable and inclusive transport options, pricing reforms to internalize external costs, and Smart Growth development policies that increase affordable housing options in multimodal neighborhoods. C*ategorical* (or *programmatic*) strategies are special policies or programs for designated groups. These include, for example, universal design standards to ensure that facilities and services accommodate users with impairments, transit fare discounts for seniors and people with disabilities, and special commuter bus services in high poverty areas. Because transportation planning can have many equity impacts, its analysis should be multifaceted. A plan would not become equitable by addressing one inequity while others are ignored.

Conclusions

Transportation planning decisions can have significant equity impacts, and most communities want to become more equitable, so practitioners have a responsibility to consider equity in their analysis. That can be challenging because there is no single way to evaluate transportation equity; there are multiple equity types, impacts, metrics, and groupings to consider. Planning decisions should reflect a community's equity needs and values, so it is important to incorporate public engagement that involves all stakeholders, particularly disadvantaged groups.

Because of this complexity, the most practical way to incorporate equity into planning is to define measurable objectives that reflect various perspectives and impacts, and identify policies to achieve them. These policies should usually include a combination of structural reforms to make the transportation system fairer and more inclusive, plus targeted programs to address specific injustices. New analysis tools can improve transportation equity analysis. They require detailed information on transportation costs and expenditures, plus multimodal levels of service, with particular attention to the travel demands and impacts on disadvantaged groups. **itej**

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Answer to "Where in the World" on page 11: City of Avalon, Santa Catalina Island, CA, USA. Photo submitted by Stephen Byrd.