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"Efficiency - Equity - Clarity"

# Evaluating Transportation Equity

Methods For Incorporating Distributional Impacts Into Transport Planning

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## Abstract

"Equity" refers to the fairness with which impacts (benefits and costs) are distributed. Transportation decisions often have significant equity impacts. Transportation equity analysis can be difficult because there are several types of equity, numerous impacts to consider, various ways to categorize people for analysis, and many ways of measuring impacts. Equity analysis should usually consider a variety of perspectives and impacts. A particular decision may seem equitable when evaluated in one way but inequitable when evaluated in another. This paper defines different types of transportation equity, discusses various equity issues, and describes ways of incorporating equity into transportation planning. It is intended to provide succinct information for practitioners on equity concepts, and practical ways of incorporating equity into decision-making.

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## Introduction

*Equity* refers to the distribution of impacts (benefits and costs), and the degree to which this distribution is considered fair and appropriate. Transportation planning decisions can have significant and diverse equity impacts:

- The quality of transportation available affects people's opportunities and quality of life. Different types of facilities and services favor different individuals and groups.
- Transport facilities, activities and services impose many indirect and external costs, such as congestion delay and accident risk imposed on other road users, infrastructure costs not funded through user fees, pollution, and undesirable land use impacts.
- Transport expenditures represent a major share of most household, business and government expenditures. Price structures can significantly affect financial burdens.
- Transport planning decisions affect the location and type of development that occurs in an area, and therefore accessibility, land values and developer profits.
- A significant portion of land is devoted to transport facilities, particularly in areas of intense activity, including cities and shorelands. This land is generally exempt from rent and taxes, representing an additional but hidden subsidy of transport activity.
- Transport investments are often used to stimulate economic development and support other strategic objectives. These can have distributional impacts.

Transportation equity analysis can be difficult because there are several types of equity to consider, various ways to categorize people for analysis, numerous impacts, and various ways of measuring impacts. A particular decision may seem equitable when evaluated in one way but inequitable when evaluated in another. Without standard evaluation methods equity impacts are often given little consideration, or dismissed as "intangibles," with the implication that they cannot be measured and can be ignored.

Some technical methods used to evaluate transport system performance are unintentionally biased to favor certain modes, users and transport activities. Transportation investment economic evaluation models tend to quantify some impacts but overlook others in ways that tend to favor motorized travel (Litman, 2003a). For example, performance indicators such as roadway level-of-service ratings identify the benefits of roadway capacity expansion, but the negative impacts that wider roads and increased vehicle traffic have on the mobility and safety of nonmotorized travel are usually not quantified and therefore given less consideration. Similarly, travel surveys tend to undercount non-motorized trips, and therefore undervalue non-motorized travel in planning and investment decisions. Many planning decisions would change if these impacts were better evaluated.

This paper provides an overview of transport equity issues, defines various types of transportation equity, discusses methods of evaluating equity impacts, and describes ways of incorporating equity goals into transportation decision-making.

**Example – Parking Requirement Equity Impacts**

Parking requirements are an example of how transportation decisions can have significant, unintended, often overlooked equity impacts. Most jurisdictions have regulations that specify the minimum number of parking spaces that must be supplied at each destination. These requirements tend to be generous, designed to insure that motorists can almost always find convenient at any destination (Litman, 2000). They are even justified on equity grounds, so that each development bears the costs of the parking demand it generates, to avoid spillover parking problems at nearby sites.

But these parking requirements represent a subsidy of vehicle ownership and use worth hundreds of dollars annually per motorist ("Parking Costs," Litman, 2005a). They encourage parking to be unpriced (abundant supply makes collecting fees unprofitable), causing parking costs to be borne indirectly through mortgages and rents, retail prices, and taxes. People bear these costs regardless of how many vehicles they own and how much they drive. As a result, households that own fewer than average vehicles or drive less than average tend to pay more than the parking costs they impose, while those who own more than average vehicles or drive more than average tend to underpay. Since vehicle ownership and use tend to increase with income, these regulations and subsidies tend to be regressive, that is, they place a relatively large burden on lower-income people.

By increasing automobile ownership and use these policies reduce demand for alternative modes such as walking and public transit, and therefore transportation system diversity. Because parking requires paving large amounts of land, they tend to encourage sprawl and create less walkable communities. These changes reduce mobility and accessibility for non-drivers, and increase total transportation costs, which tends to be particularly harmful to economically, socially and physically disadvantaged people.

These equity impacts are often overlooked when parking requirements are established. This is not because the people involved are immoral or uncaring, rather they generally have not considered all the equity impacts resulting from such decisions, particularly indirect and long-term impacts on other groups.[1] Decision-makers lack tools to quantify many of these equity impacts. They may be unfamiliar with alternative solutions to parking problems that better support equity objectives.[2] They may consider equity a specialized issue of concern to social agencies, outside of their responsibility.

Parking planning is not unique. Most transport planning decision have diverse and significant equity impacts that are often unrecognized in the planning process. Decision-makers therefore have a responsibility to improve their understanding of equity impacts.

[1] Since decision-makers tend to be busy, middle-class professionals who drive automobiles, they are likely to perceive the benefits of generous parking requirements and are less sensitive to the unfair costs such requirements impose on non-drivers.

[2] "Parking Management" and "Parking Solutions" chapters of the *Online TDM Encyclopedia* (VTPI, 2005).

## Types of Equity

Transportation equity impacts fall into three major categories.

### 1. Horizontal Equity

*Horizontal equity* (also called *fairness* and *egalitarianism*[3]) is concerned with the distribution of impacts between individuals and groups considered equal in ability and need. According to this definition, equal individuals and groups should receive equal shares of resources, bear equal costs, and in other ways be treated the same. It means that public policies should avoid favoring one individual or group over others, and that consumers should "get what they pay for and pay for what they get," unless subsidies are specifically justified.[4]

### 2. Vertical Equity With Regard to Income and Social Class

*Vertical equity* (also called *social justice*, *environmental justice*[5] and *social inclusion*[6]) is concerned with the distribution of impacts between individuals and groups that differ in abilities and needs, in this case, by income or social class. According to this definition, transport policies are equitable if they favor economically and socially disadvantaged groups, therefore compensating for overall inequities.[7] Policies favoring disadvantaged groups are called *progressive*, while those that make disadvantaged people relatively worse off are called *regressive*. This definition is often used to support affordable modes, discounts, and special services for lower-income people, minorities and other disadvantaged groups.

### 3. Vertical Equity With Regard to Mobility Need and Ability

This definition is concerned with the distribution of impacts between individuals and groups that differ in *transportation ability and need*, and therefore the degree to which the transportation system meets the needs of people with special transportation needs. This definition is used to support increased transportation diversity and land use accessibility, *accessible design* to accommodate people with disabilities, to support transportation services that provide basic mobility.

These different types of equity often conflict. For example, horizontal equity requires that users bear the full costs of their transport facilities and services, but vertical equity often requires subsidies for disadvantaged people. Therefore, transport planning often involves making tradeoffs between different types of equity.

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[3] *Egalitarianism* means treating everybody equally, regardless of factors such as race, gender or income.

[4] Neutral public policies and cost-based pricing are also *economic efficiency* principles, as discussed later.

[5] *Environmental justice* is defined as the "equitable distribution of both negative and positive impacts across racial, ethnic, and income groups, with the environment defined to incorporate ecological, economic, and social effects" (Alsnih and Stopher, 2003).

[6] *Social inclusion* means everybody can participate adequately in important activities and opportunities, including access to services, education, employment, and decision-making (Litman, 2003b; Lucas, 2004).

[7] Rawls (1971) provides a theoretical basis for vertical equity. He argued that primary social goods (liberty, opportunity and wealth) should be distributed equally or to favor less advantaged people.

## Transportation Equity Evaluation

There is no single way to evaluate transportation equity. Equity evaluation depends on the type of equity, how people are categorized, which impacts are considered and how they are measured, as summarized in Table 1.

***Table 1*** **Equity Evaluation Variables**

| Types of Equity | Categories | Impacts | Measurement Units |
|---|---|---|---|
| • Horizontal<br>• Vertical with-respect-to income and social class.<br>• Vertical with-respect-to need and ability. | • Demographics (age, gender, race, ethnic group, family status, etc.)<br>• Income class.<br>• Geographic location.<br>• Ability (e.g., people with disabilities, drivers license holders, etc.).<br>• Mode (walkers, cyclists, motorists, bus users, etc.).<br>• Vehicle type (cars, trucks, buses, etc.).<br>• Industry (truckers, transit operators, vehicle manufactures, etc.).<br>• Trip type and value. | • Price or fare structure.<br>• Tax burdens.<br>• Quality of transportation services.<br>• External costs (risk, congestion, pollution imposed on others).<br>• Economic opportunities and development.<br>• Transport industry employment and business opportunities. | • Per capita.<br>• Per vehicle-mile or kilometer.<br>• Per passenger-mile or kilometer.<br>• Per trip.<br>• Per dollar paid in fare or tax subsidy. |

*This table identifies factors that can affect equity analysis, including the type of equity considered, how people are categorized, which impacts are considered, and how they are measured.*

For example:

- Highway cost allocation studies are concerned with the horizontal equity of transport facility financial costs with respect to vehicle type, measured per vehicle-mile.
- Environmental justice is generally concerned with vertical equity of various market and non-market costs, with respect to income and class, measured per capita.
- Welfare-to-work programs are concerned with improving commuter services (and therefore economic opportunity) available to economically disadvantaged workers.
- Handicapped access is concerned with the quality of mobility services available to physically disadvantaged people, and therefore their opportunities in life.

Equity evaluation is significantly affected by the details of analysis. For example, analysis conclusions may change depending on how people are categorized, and which impacts are considered and whether they are measured per capita, per trip, per mile, or relative to user payments. There is no single correct way to evaluate transportation equity. It is generally best to consider various perspectives, impacts and analysis methods.

**Equity of Opportunity Versus Equity of Outcome**
There is an ongoing debate about how to measure vertical equity. There is general agreement that everybody deserves "equity of opportunity," meaning that disadvantaged people have adequate access to education and employment opportunities. There is less agreement concerning "equity of outcome," meaning that society insures that disadvantaged people actually succeed in these activities. Transportation affects equity of opportunity. Without adequate transport it is difficult to access education and employment. It therefore meets the most "conservative" test of equity.

### *Equity Compared With Other Planning Objectives*

There are often questions concerning how much weight equity objectives should receive compared with other planning objectives such as cost efficiency, improved mobility and reduced pollution. For example, people may support efforts to provide basic mobility for transportation disadvantaged people, but that does not mean that the budget for special mobility services should be unlimited. Similarly, efforts to insure that transportation is affordable to low-income people does not mean that all transport services should be free. Each equity objective must be balanced against other planning objectives.

There is no correct answer concerning how much weight to give to particular equity objectives. Such planning decisions should reflect community needs and values. Some communities may place a higher or lower value on a particular equity objective. For example, some communities may insist that school busing represents basic mobility and so should be fully subsidized, while others may require users to pay a fee. Similarly, one community may prefer to dedicate more public resources to facilities and services for people with disabilities than another.

Some transportation equity issues can be evaluated based on some performance standard. For example, a community may decide that special mobility services will be subsidized to the point that each registered user can have at least two trips per week, or monthly transit fares may be set so they represent no more than 7.5% of income for poor residents. Another approach is to establish a standard of the portion of public resources that will be devoted to disadvantaged groups. For example, a community may decide that public transit services should receive $50 annually per capita, or achieve at least 30% cost recovery, based on a comparison with peer communities.

The practical way of making such decisions is to create a public involvement process that allows community needs and values to be incorporated into planning and funding decisions (FHWA, 1996; "Planning and Implementation," VTPI, 2005). This requires that planners and citizens have information on various types of equity impacts and different ways of evaluating them.

### Accessibility Versus Mobility

Equity analysis is affected by whether transport quality is evaluated based on *accessibility* or *mobility* (Litman, 2003a; Caubel, 2004; "Accessibility," VTPI, 2005). *Accessibility* refers to people's ability to reach desired activities and destinations. *Mobility* refers to physical travel. Accessibility is affected by mobility, land use patterns (the distribution of destinations), and mobility substitutes (electronic communication and delivery services).

Mobility is easier to measure than accessibility, so conventional transport performance indicators, such as traffic speed and roadway level-of-service, tend to measure motor vehicle mobility, while other forms of access tend to be undercounted and undervalued.[8] This skews planning and investment decisions to favor motor vehicle travel at the expense of other modes, and so tends to favor people who drive more than average at the expense of those who drive less than average. For example, prioritizing transport projects based on their ability to improve roadway level-of-service, and therefore their ability to increase vehicle traffic volumes and speeds, tends to create roadway environments less suitable for walking, cycling and public transit access. Only by measuring transport based on accessibility can such tradeoffs, and their equity impacts, be evaluated.

Put more positively, evaluating transport quality based on accessibility rather than mobility can expand the range of potential solutions to transport problems. It places more value on alternative modes (walking, cycling, transit, telework and delivery services) and the connections between modes, and recognizes that transport service quality can be improved by increasing land use accessibility in addition to increasing mobility.

### Basic Access and Mobility

Equity analysis requires recognizing that some transport activities, called *basic access* or *basic mobility* (also called *essential* or *lifeline* transport) are particularly important to society. This includes access to essential services, education and employment opportunities, and service and fright transport. *Basic access* means that people are able to reach activities considered important to society. *Basic mobility* refers to physical travel that provides basic access. Basic access can be considered a "merit good" and even a right (Goodwin, 1990; Hamburg, Blair and Albright, 1995). This is why, for example, emergency vehicles, service and delivery vehicles, and high occupant vehicles are often given priority over other vehicles in traffic and parking, why public transit services are often subsidized, and why there are standards to insure that transport systems accommodate people with disabilities. The concept of basic access is useful for transport equity analysis. It means that transport activities and services can be evaluated and prioritized according to the degree to which they provide basic access. As a result, equity analysis often requires determining what types of trips are considered basic, and what level of transport service quality is adequate to satisfy basic access needs.

[8] Conventional transportation surveys tend to undercount nonmotorized trips because they ignore short trips, leisure trips, travel by children, and walking links of motorized trips. More comprehensive surveys, such as the most recent NPTS, indicate that walking is about twice as common as previous travel surveys indicate. For discussion see Litman, 2003a.

### *Categorizing People*

Equity evaluation often involves categorizing people by factors such as income, class, location, transport ability and needs, how they travel, or other attributes. Such categories can be arbitrary and variable. For example, although it is common to categorize people as "motorists," "transit users," and "pedestrian," most people use a variety of modes, particularly over the long-term. Similarly, a particular person may be physically able one day, but disabled the next. A household or lifecycle analysis is often best for equity analysis. For example, although only a small portion of households rely entirely on public transit at a particular time, a much larger potion of households have one or more members who use public transit, and many people who do not currently use public transit may depend on it at some point in their life, and so may value having it available.

Equity evaluation is often concerned with impacts on disadvantaged people. Disadvantaged status is multi-dimensional, including factors listed below.

**Factors Contributing to Transportation Disadvantaged Status**

- Low Income.
- Non-driver/car-less.
- Disabled (people with various types of physical or mental constraints).
- Language barriers (limited English proficiency).
- Degree of land use accessibility.
- Caregiving responsibilities (responsible for dependent child or person with disability).
- Attending school or employed.

The evaluation of disadvantaged status should take into account the degree and number of these factors that apply to an individual. The greater their degree and the more factors that apply, the more disadvantaged an individual or group can be considered. For example, a person who has a low income but is physically able, has no caregiving responsibilities, and lives in an accessible community is not necessarily transportation disadvantaged, but if that person develops a disability, must care for a young child, or moves to an automobile-dependent location, their degree of disadvantage increases.

### *Impact Categories*

Equity evaluation can consider a variety of impacts.

1. *Public expenditures* – Government funding for transportation facilities and services, etc.
2. *User financial costs*. – Vehicle ownership and operating costs, fares, etc.
3. *Service Quality* – Factors such as travel speed, delay, safety, comfort, etc.
4. *External Impacts* – Travel delay, risk and pollution impacts one traveler imposes on others.
5. *Economic development.* This refers to impacts on economic opportunities, including jobs, government contracts and economic development benefits.

### Reference Units

Transportation equity evaluation often uses *reference units* to compare impacts. Different units can give different conclusions about what is equitable. For example, expenditures can be compared per-capita, per-trip, per-passenger-mile, or per-dollar-of-user-payment. Transportation costs can include capital, operating or total expenditures; for a single year or several years; expenditures by a particular agency, a particular level of government, all levels of government, or by society overall (for example, including parking subsidies by businesses). There are various ways to calculate "user fees" when evaluating roadway cost recovery.[9] Geographic areas and demographic groups can be defined in various ways. These factors can be selected and manipulated to support a particular conclusion.

Reference units reflect various assumptions and perspectives. For example, *per capita* analysis assumes that every person should receive an equal share of resources. *Per-mile* or *per-trip* analysis assumes that people who travel more should receive more resources. *Cost recovery* analysis assumes that people should receive public resources in proportion to how much they pay in fees and taxes. Table 2 summarizes the equity implications of different reference units used for transport analysis.

***Table 2*** **Equity Implications of Different Reference Units**

| Unit | Description | Equity Implications |
|---|---|---|
| Cost Recovery | Transport expenditures are evaluated according to whether users pay their costs. | Favors wealthier travelers because they tend to pay more. |
| Congestion (V/C Ratio, roadway LOS) | Transport investments are evaluated according to most cost-effective roadway capacity expansion. | Favors people who most often drive on congested roads over people who seldom or never use such facilities. |
| Vehicle Miles Traveled (VMT) | Transport investments are evaluated according to which route or mode can increase vehicle travel at the least cost. | Favors people who drive their automobile more mileage than average. |
| Passenger Miles Traveled (PMT) | Transport investments are evaluated according to the most cost-effective way of increasing personal mobility. | Favors people who travel more than average. Tends to favor motor vehicle travel. |
| Passenger Trips | Transport investments are evaluated according to the costs of each trip. | Provides more support for transit and nonmotorized travel. |
| Access | Transport investments are evaluated according to where improved access can be accommodated at the lowest cost. | Depends on how access is measured. |
| Mobility Need | Transport investments are evaluated according to which provides the greatest benefits to disadvantaged people. | Favors disadvantaged people. |

*Equity analysis is affected by the units used for comparison. Some units only reflect motor vehicle travel and so undervalue alternative modes and the people who rely on such modes.*

[9] "Cost recovery" refers to the ratio between costs imposed by a user and what they pay in user charges. "User charges" should generally only include special taxes and fees. Since many jurisdictions exempt vehicle fuel from general taxes, it is fairest to only count special taxes above the general sales tax rate when calculating road user fees. Including general sales taxes when calculating road user charges, as some analysts do, assumes that vehicles and fuel should be general tax exempt, and therefore subsidized compared with other goods. See "Evaluating Criticism of Transportation Cost Analysis" in Litman, 2005a.

Cost recovery reflects economic efficiency and horizontal equity criteria, which require that people should "get what they pay for and pay for what they get." This justifies devoting more resources and providing better public services to wealthier individuals and groups because tend to pay more income, property and sales taxes. However, this contradicts vertical equity criteria, which require that public resources should be allocated to favor disadvantaged people. A reasonable compromise between these conflicting objectives is to strive for cost recovery with non-essential goods and services, such as luxury air travel and general road use, but apply vertical equity criteria to more essential, "basic access" transport services and activities, such as important errands, facilities to accommodate people with disabilities, services that accommodate lower-income commuters, and basic transit services.

Equity analysis often involves comparing per capita expenditures by geographic region or by mode. But it may be wrong to assume that expenditures in an area only benefit residents, or that expenditures on a particular mode only benefit its users. Residents may benefit little from a highway project through their neighborhood; it may primarily benefit through travelers and make them worse off due to traffic impacts. Public transit improvements may benefit motorists as well as transit riders by reducing roadway congestion and their need to chauffeur non-driving family members and friends.

In summary, reference units are useful for equity analysis, but it is important to understand their assumptions and perspectives. Horizontal equity analysis should be usually be based on *per capita* rather than *per-mile* comparison, with adjustments to reflect differences in user need and ability to for vertical equity objectives. For example, when comparing two geographic areas or demographic groups with comparable incomes and abilities, it would be most fair if they each receive equal annual per capita allocations of public resources, but if one area or group is economically, socially or physically disadvantaged, it should receive a greater allocation. Similarly, if one group or travel activity imposes greater costs, it should be charged higher user fees or taxes until per capita subsidies are about equal, unless one group deserves extra subsidy on vertical equity grounds.

### *Planning Biases and Market Distortions*

Current transport planning practices incorporate various biases and distortions that tend to be both horizontally inequitable (they arbitrarily favor one mode or user over others), and by reducing transport options for disadvantaged people, vertically inequitable. Examples are described below (Litman, 2005b; "Comprehensive Transport Planning," VTPI, 2005).

- Environmental injustice. There is evidence that lower income and minority neighborhoods bear more than their share of undesirable transport facilities, and receive less than a fair share of transport investments and services (Bullard and Johnson, 1997).
- Transport planning based on mobility rather than accessibility. This favors automobile-oriented transportation improvements, and undervalues improvements to alternative modes and land use policies to increase accessibility.
- Travel surveys that undercount nonmotorized travel. This skews planning and funding toward automobile improvements, reducing the quality of travel for nondrivers.
- Economic evaluation that overlooks many indirect costs of roadway capacity expansion, and therefore the full benefits of alternative modes and mobility management solutions. Frequently overlooked impacts include the effects of generated traffic and resulting downstream congestion, parking costs, increased traffic accidents, reduced physical activity, pollution emissions, negative impacts on nonmotorized travel, reduced community livability, and increased sprawl (Litman, 2005a).
- Fragmented and incremental planning, that allows individual decisions that contradict strategic planning objectives. For example, it is common for planning agencies to impose generous parking requirements on development, even in areas that want to encourage infill development, more compact development and use of alternative modes.
- Dedicated roadway and parking facility funding that cannot be used for other modes. This encourages planners to define transportation problems as highway problems, and leads to underinvestment in alternative modes, and discourages management solutions.
- Automobile underpricing, including free parking, fixed insurance and registration fees, general taxes funding roadways, and lack of congestion pricing. These market distortions increase vehicle ownership and use, and therefore reduce development of other modes.
- Land use policies that favor sprawl, such as generous parking and setback requirements, density restrictions, and single-use zoning. This leads to more automobile-dependent communities that provide poor access for non-drivers.

Although individually these biases and distortions may seem modest and justified, their impacts are cumulative, resulting in large total subsidies for automobile travel, and significant harm to non-drivers. For example, external costs of automobile use (including road and parking facility costs not borne by user fees, congestion and accident risk imposed on other road users, pollution and indirect energy costs) total hundreds of dollars annually per vehicle, far higher than public subsidies per transit rider ("Transportation Costs," VTPI, 2005; Litman, 2005a), but these costs are widely dispersed through the economy, incorporated into taxes, rents and retail prices, and so are generally ignored in planning decisions. By reducing transport system diversity and land use accessibility, these distortions harm disadvantaged people, and so are vertically inequitable.

## Incorporating Equity Analysis Into Transportation Planning

Transportation planners have various tools and methods for equity analysis. *Highway cost allocation*, which evaluate the horizontal equity of roadway costs and funding, are well established (Jones and Nix, 1995; FHWA, 1997). In recent years, new analysis methods have been developed for horizontal and vertical equity analysis using comprehensive data sources and Geographic Information Systems (GIS) to identify the distribution of impacts, and new data sources that can help identify disadvantaged and impacted groups, such as lower-income residents and people with disabilities (FHWA and FTA, 2002).

Horizontal equity requires that public resources be allocated equally to each individual or group, although exactly what constitutes an equal share depends on which resources are considered and how they are measured, for example, whether comparisons are made per household, per resident, or per adult) and whether adjustments are made to account for the extra costs of serving people with special needs, such as wheelchair users.

Vertical equity requires that disadvantaged people be identified and considered in planning. Ng (2005) describes the following steps for doing this.

1. Identify disadvantaged groups (minority, low income, car-less, disabled, single parents).
2. Identify disadvantaged geographic areas using census data ("Environmental Justice Areas").
3. Identify degrees of disadvantage in each geographic area, with five levels of severity.
4. Identify location of important public services and destinations (transit, highways, employment centers, hospitals, daycare centers, etc.).
5. Evaluate specific transportation plans according to how they affect accessibility between disadvantaged communities and important destinations.

Below are examples of data requirements for transport equity evaluation.

1. Census and survey data indicating the portion of the population with disadvantaged status (physical disability, elderly, low income, single parents, etc.).
2. Surveys to determine the degree to which people are unable to meet their basic access needs.
3. Surveys of disadvantaged people to determine their level of mobility (e.g. how many trips they make and miles they travel during an average day, week or year), the portion of their time and financial budgets devoted to travel, the problems they face using transportation facilities and services, and how this compares with people who are not disadvantaged.
4. Traffic accident injury and assault rates for disadvantaged people.
5. The degree to which specific transport facilities and services accommodate disadvantaged people.
6. The degree to which disadvantaged people are considered in transport planning through the involvement of individuals and advocates, and special data collection and analysis.
7. The frequency of failures, such as excessive waiting times, inaccurate user information and pass-ups of disadvantaged people by transport services.

It can be useful to identify the degree to which various strategies and options support or contradict various planning objectives, including transportation equity objectives, as illustrated in Table 3. In this case, a simple rating system from –3 (most harmful) to +3 (most beneficial) is used to rate each option with regard to various planning objectives, but other types of rating and weighting systems can be used (Litman, 2001).

***Table 3*** **Impact Evaluation – Example** (VTPI, 2005)

| Impact | Option 1 | Option 2 | Option 3 |
|---|---|---|---|
| Horizontal Equity (minimizes unjustified subsidies) | -2 | -2 | 3 |
| Vertical Equity (progressive with respect to income) | 0 | 2 | -2 |
| Vertical Equity (improve mobility for disadvantaged people) | -2 | 3 | 3 |
| Congestion Reduction | 3 | 2 | 3 |
| Road & Parking Savings | -3 | 2 | 3 |
| Consumer Savings | 0 | 3 | -3 |
| Road Safety | 1 | 2 | 2 |
| Environmental Protection | -2 | 3 | 3 |
| Efficient Land Use | -3 | 3 | 2 |
| Community Livability | -3 | 3 | 3 |

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.
*This table illustrates a matrix for comparing the impacts of three transportation improvement options. For example, Option 1 may involve a road widening project, Option 2 a transit improvement, and Option 3 congestion pricing.*

The relative degree to which non-drivers are disadvantaged relative to drivers can be measured using *mobility gap* analysis (LSC, 2001). A mobility gap is the different in motorized travel (automobile, public transit, taxi, etc.) between households with and without automobiles (called "zero-vehicle households"). This can be determined using travel survey data to compare the average daily trips generated by different types of households, taking into account factors such as the smaller average size and lower employment rates of zero-vehicle households. After taking these factors into account, zero-vehicle households are generally found to generate 30-50% fewer personal trips. This methodology may understate real transportation needs by assuming that automobile-owning households have no unmet mobility needs, which ignores the mobility problems facing non-drivers in vehicle-owing households. For example, a household that owns one vehicle shared by two or three adults, or households with adults who cannot drive due to disabilities or other problems, may face mobility gaps similar to zero-vehicle households.

Specific techniques can be used to quantify vertical inequity with respect to income (Marshall and Olkin, 1979). One approach is called the Dalton Principle: resource transfers from high- to lower-income people that maintain their overall income ranking is considered to improve equity. The *Gini-index*, the *Theil Coefficient* and the *Coefficient of Variation* are used to quantify inequity. Since these only consider income they may need adjustment to reflect other factors, such as people's mobility needs and physical ability.

### *Transportation Equity Indicators*

*Indicators* are measurable variables selected to reflect specific planning objectives. It is useful to identify a practical set of equity indicators for transport planning. Indicators should be selected to reflect various equity issues and perspectives, to have reasonable data and analysis requirements, and to be transferable between various situations.

Five equity issues and possible indicators for each are described below. These can be expanded, elaborated and disaggregated to meet the needs of a specific planning process.

#### Horizontal Equity

1. *Treats everybody equally, unless special treatment is justified for specific reasons.*

   - Public policies are applied equally to different groups.
   - Per capita public expenditures and cost burdens are equal for different groups.
   - Service quality is comparable for different groups and locations.
   - Different modes receive public support approximately in proportion to their level of use.
   - All groups have opportunities to participate in transportation decision-making.

2. *Individuals bear the costs they impose.*

   - Transport user fees and tax payments reflect the full costs imposed by each person or trip, unless a subsidy is justified on equity grounds.
   - Subsidies provided for equity or economic objectives are efficiently targeted.

#### Vertical Equity

3. *Progressive with respect to income.*

   - Lower-income households pay a smaller share of their income, or gain a larger share of benefits, than higher income households.
   - Affordable modes (walking, cycling, ridesharing, transit, carsharing, etc.) receive adequate support and are well planned to create an integrated system.
   - Special discounts are provided for transport services based on income and economic need.
   - Transport investments and service improvements favor lower-income areas and groups.

4. *Benefits transportation disadvantaged people (non-drivers, disabled, children, etc.).*

   - Investments and policies help create a more diverse, less automobile-dependent transport system that effectively serves non-drivers.
   - Land use policies improve non-motorized accessibility.
   - Transportation services and facilities (transit, carsharing, pedestrian facilities) reflect *universal design* (they accommodate people with disabilities and other special needs, such as using strollers and handcarts).
   - Special mobility services are provided for people with special mobility needs.

5. *Improves basic access: favors trips considered necessities rather than luxuries.*

   - Transportation services provide adequate access to medical services, schools, employment opportunities, and other “basic” activities.
   - Travel is prioritized to favor higher value travel, such as emergency and HOV trips.

## Transportation Equity Analysis Examples

*This section describers various examples of transportation equity analysis. For more examples see FHWA and FTA, 2002.*

### *Public Funding Allocation*

Horizontal equity requires that public policies and investments treat people equally unless a subsidy is specifically justified. If two jurisdictions are comparable in terms of residents' income and travel needs it is equitable that they should receive comparable per capita transport funding. But funding practices often violate this principle.

For example, Georgia state law requires that the state's highway funds be allocated equally among the state's 13 Congressional Districts, which favors rural areas and disadvantages urban regions. During a typical two-year period the British Columbia Ministry of Transportation and Highway spent $77 per capita in the Vancouver region, compared with $250 per capita in other regions.[10] Chen (1996) also found that cities receive far less per capita transportation funding due to transportation planning practices that favor automobile-oriented investments over investments in other modes.

There are three possible justifications for these cross-subsidies from urban to rural residents. First, if highways are considered to be funded by user fees (vehicle registration charges and fuel taxes), funding could be allocated based on where revenues are collected rather than per capita. However, urban regions contain about half of all registered vehicles and generates about half of all fuel tax revenues, so the funding discrepancy is not justified from this perspective.

Second, it could be argued that urban residents often drive on rural highways, and rely on interregional fright services, and so benefit from rural highway expenditures. However, rural residents also travel in urban areas and rely on urban services, and so benefit from transit investments (both directly, when they use transit, and indirectly, when they experience less traffic congestion because other travelers use transit). To the degree that rural highways are used for local personal travel (which is the dominant type of traffic on most rural highways), urban-to-rural cross subsidies are unjustified.

Third, it could be argued that rural residents are economically disadvantaged and have fewer travel options compared with urban residents, and so deserve a subsidy to meet their travel needs. Such subsidies are only justified for those rural motorists who really are disadvantaged, it does not justify subsidizing all rural highway travel.

This suggests that highway funding is inequitable. Only by providing significant urban transit funding can transportation budgets be considered fair.

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[10] The province would need to spend $172 annually per resident on transit services in the Vancouver region for provincial transport funding to be equal in urban and rural regions. At the time the province was considering eliminating transit funding on the grounds that it is a local service, as opposed to highways, which serve interregional travel. This analysis helped convince provincial officials to provide substantial additional funding for the Vancouver region's transit system.

### Transportation Cost Analysis

Both horizontal equity and economic efficiency require that users bear the costs they impose on society, unless a subsidy is specifically justified ("Market Principles," VTPI, 2005).[11] *Highway cost allocation* (also called *highway cost responsibility*) refers to analysis of the costs imposed by various types of vehicles and the degree to which they are recovered by user fees (Jones and Nix, 1995; FHWA, 1997). Most cost allocation studies only consider direct roadway expenditures, and categorize users according to vehicle size and type (automobiles, buses, light and heavy trucks). The table below summarizes the results of a major U.S. highway cost allocation study. It indicates that about a third of roadway costs are subsidies (costs not borne directly by user fees).

***Table 4*** **Roadway Cost Responsibility, 1997 US Dollars Per Mile** (FHWA, 1997)

| Vehicle Class | VMT (millions) | Federal Costs | State Costs | Local Costs | Total Costs | Total User Payments | External Costs |
|---|---|---|---|---|---|---|---|
| Automobiles | 1,818,461 | $0.007 | $0.020 | $0.009 | $0.035 | $0.026 | $0.009 |
| Pickups and Vans | 669,198 | $0.007 | $0.020 | $0.009 | $0.037 | $0.034 | $0.003 |
| Single Unit Trucks | 83,100 | $0.038 | $0.067 | $0.041 | $0.146 | $0.112 | $0.034 |
| Combination Trucks | 115,688 | $0.071 | $0.095 | $0.035 | $0.202 | $0.157 | $0.044 |
| Buses | 7,397 | $0.030 | $0.052 | $0.036 | $0.118 | $0.046 | $0.072 |
| *All Vehicles* | *2,693,844* | *$0.011* | *$0.025* | *$0.011* | *$0.047* | *$ 0.036* | *$0.010* |

*This table summarizes the results of a major cost allocation study which found that user fees fund only about two-thirds of roadway facilities.*

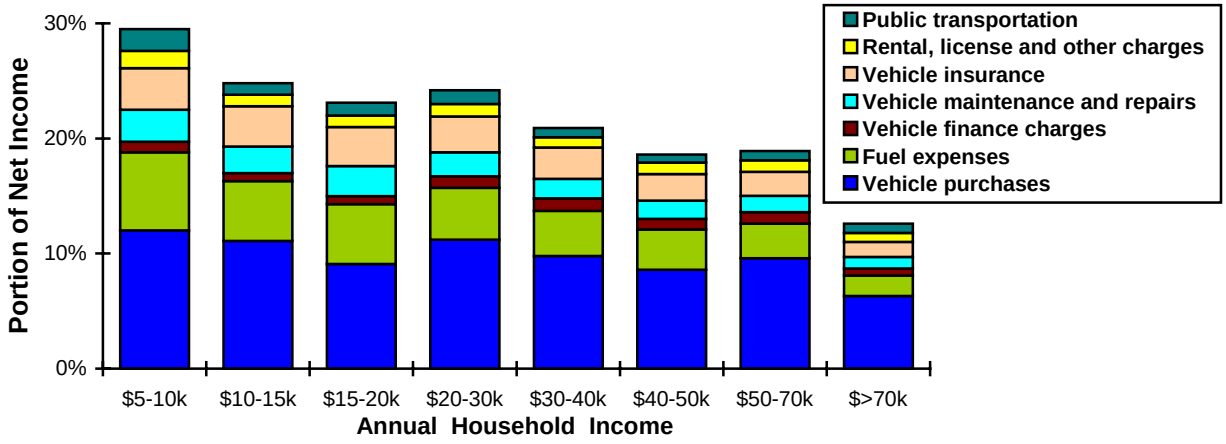
More comprehensive transportation cost studies include additional costs such as parking subsidies, traffic services, congestion delay, accident risk and pollution damages (INFRAS and IWW, 2004; Litman, 2005a). Considering more costs tends to indicate greater inequity. For example, considering just roadway costs not borne by user fees, automobile travel is subsidized about 1¢ per mile, but much greater subsidies are found if traffic services, parking subsidies, accident externalities and environmental impacts are also considered. These external costs mean that people who drive more than average receive greater public subsidies than people who drive less than average. Since driving tends to increase with income, this is both horizontally and vertically inequitable. Considering just financial costs, this inequity is partly offset by the additional taxes paid by higher-income people, but this offset is smaller when non-market costs such as accident risk and pollution damages are also considered.

[11] Equity and efficiency definitions of optimal pricing differ somewhat. Horizontal equity focuses on *average* costs, often measured at the group level, while economic efficiency focuses on *marginal* costs per trip, which ignores sunk costs such as past construction investments. However, average and marginal costs tend to converse over the long run since over time most costs become variable.

### *Transportation Cost Burdens*

Transportation is a major financial burden to many consumers, particularly for lower-income households. Figure 1 illustrates transport expenditures relative to total household income by income class. Lower-income households spend a far higher portion of income on transport than wealthier households, indicating that these costs are regressive.

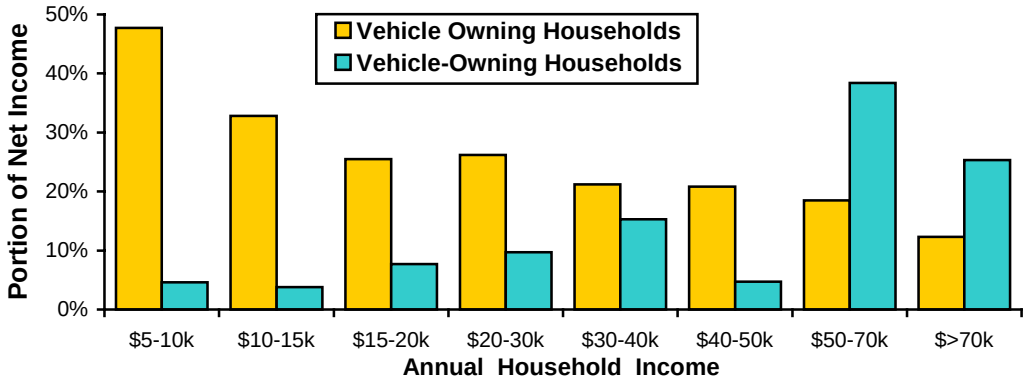
***Figure 1*** **Portion of Household Income Spent on Transport** (BLS, 2000)




*Transportation expenditures are highest as a portion of net (after tax) income for lower-income households, indicating that transportation costs are regressive.*

Households that own a motor vehicle tend to spend far more of their income on transportation then zero-vehicle households, as illustrated in Figure 2.

***Figure 2*** **Portion of Household Income Devoted to Transport** (BLS, 2003)[12]




*Transportation costs tend to be high and regressive for households that own a vehicle, but not for zero-vehicle households.*

[12] This figure assumes that all vehicle costs are borne by vehicle-owing households, and all public transport costs are borne by zero-vehicle households. This is not entirely true, since vehicle-owning households sometimes use public transport, and zero-vehicle households sometimes help pay vehicle expenses.

This financial burden is significantly affected by the type of transport system in an area. Residents of more automobile-dependent communities tend to spend significantly more of their income on transportation than residents of communities with more diverse, multi-modal transport systems.[13] This suggests that automobile dependency is regressive, and that policies and programs that improve travel options tend to be progressive.

The consumer costs and regressivity of automobile transport are even greater than these figures indicate when indirect costs are also considered, particularly residential parking, which represents about 10% of housing costs, and more for lower-priced, urban housing (Jia and Wach, 1998). High parking costs reduce housing affordability, imposing additional burdens on lower-income households, which are often forced to choose between suburban housing with lower rents but higher transportation costs, and more costly urban housing with lower transportation costs.

Although automobiles are expensive and their costs are regressive, studies indicate that vehicle ownership can be an important contribution to helping disadvantaged people obtain and maintain employment (Sawicki, and Moody, 2001). This has several equity implications. It suggests that strategies that help poor people obtain access to automobiles may can provide equity benefits, for example, as part of welfare-to-work programs. Carsharing and other vehicle rental services, special vehicle and insurance purchase loan programs, and Pay-As-You-Drive insurance can help some disadvantaged people increase their mobility and economic opportunities.

However, because vehicle ownership is costly, regressive and difficult (particularly for some disadvantaged people, such as people with disabilities and immigrants who do not speak English), so automobile-oriented solutions creates its own set of equity problems, in addition to imposing other costs on users and society (congestion, accident risk, pollution, etc.). The lower-cost automobiles affordable to poor people tend to be unreliable, and are sometimes unsafe. Lower-income drivers often share vehicles with other household members. As a result, even when poor people own an automobile they often rely somewhat on other modes. It therefore tends to be most equitable to maximize alternative transportation options, so lower-income and disadvantaged people have a high level of accessibility without depending primarily on automobile transport. In other words, access to automobiles may benefit disadvantaged people and so can be a worthwhile strategy, but improving alternative transportation options benefits them more overall, and so should be given equal or greater public support on equity grounds.

Similarly, land use strategies that improve community accessibility and locate affordable housing in more accessible, multi-modal locations can provide vertical equity benefits by reducing excessive transportation and housing cost burdens on poor and transportation disadvantaged households ("Location Efficient Development," VTPI, 2005).

[13] See, for example, the much lower portion of household expenditures devoted to transportation in communities with high quality transit systems, discussed in Litman, 2004.

### Traffic Impacts

The physical impacts of vehicle traffic can have significant equity impacts. For example, the congestion impacts that motor vehicles impose on other road users is horizontally inequitable to the degree that High-Occupant Vehicle (carpools, vanpools and buses) passengers are delayed by congestion, although they use less road space and so impose less delay on others per passenger-mile. Similarly, motor vehicle use imposed delay and accident risk on pedestrians and cyclists, and noise and air pollution on nearby residents.

Some traffic impacts, such as congestion delay and accident risk, are monetized (measured in monetary units) for economic evaluation (Litman, 2005a). However, adjustments may be needed for comprehensive equity evaluation. For example, most monetized congestion cost estimates only consider impacts on motor vehicles. Impacts on nonmotorized travel are usually ignored. Similarly, most crash cost estimates only consider direct damages, not the costs of nonmotorized trips foregone or shifted to motorized due to risk. These additional costs imposed on nonmotorized travel are often significant, particularly in urban areas (“Barrier Effects,” Litman, 2005a). They represent a horizontal inequity (motorists impose far more delay and risk on nonmotorized travelers than nonmotorized travelers impose on motorists), and to the degree that people who are transportation disadvantaged drive less and rely more on nonmotorized modes, this represents a vertical inequity.

Described in a more positive way, current evaluation practices tend to underestimate the full benefits and equity impacts of strategies that reduce vehicle traffic and improve nonmotorized travel conditions because they ignore many impacts on nonmotorized travel, and the resulting benefits to disadvantaged people.

Road space reallocation and traffic management programs have various distributional impacts, including benefits to motorists, although these are sometime overlooked. For example, traffic calming tends to reduce automobile traffic speeds while improving safety for motorist and nonmotorists, and neighborhood livability (“Traffic Calming,” VTPI, 2005). HOV priority strategies benefit rideshare and transit passengers, and may benefit motorists by reducing traffic congestion (“HOV Priority,” VTPI, 2005). Bicycle lanes benefit cyclists, and motorists to the degree that they reduce conflicts. Parking regulations, such as parking duration limits, benefit some users, trips and businesses at the expense of others.

Special analysis may be justified to determine whether transportation planning decisions violate environmental equity principles. For example, geographic analysis can help determine whether lower-income and minority communities contain an excessive portion of hazardous waste sites, or undesirable transportation facilities such as major highways and freight terminals (Bullard and Johnson, 1997). Special programs may be justified to clean up brownfields, insure that regional transportation facilities meet local community needs, mitigate traffic impacts, and compensate for external costs imposed on disadvantaged populations.

### Transportation Pricing Reforms

Horizontal equity requires that as much as possible, people pay the costs imposed by their travel activities. Pricing reforms such as fuel tax increases, road and parking pricing, and distance based fees can increase equity by charging according to use, taking into account factors such as vehicle type, time and location ("Pricing Evaluation," VTPI, 2005).

Transportation price increases are often criticized as being regressive, since a particular fee represents a greater portion of income for lower-income people than for higher-income people. Overall equity impacts depend on how prices are structured, the quality of transport alternatives available, how revenues are used, and whether driving is considered a necessity or a luxury (Litman, 1996; Banister, 1994). If there are good alternatives, and revenues are used to benefit the poor, or disadvantaged people are given discounts, price increases can be progressive overall. The poorest households tend to own fewer cars, drive less, rely more on alternatives and devote a smaller portion of annual expenditures to fuel than middle class families ("Fuel Taxes," VTPI, 2005).

There is often debate over the equity of road and parking pricing, particularly when fees are first introduced on previously unpriced facilities. Pricing is criticized on horizontal equity grounds, since most roads and parking facilities are currently unpriced. "Why should I pay while other motorists do no?" people ask. This may be a valid argument, but it is a transition impact; as pricing becomes more common it is no longer valid. In fact, this argument can be reversed, unpriced roads and parking can be considered unfair if motorists must pay elsewhere, or if users of other modes must pay fares.

Critics argue that road pricing represents "double taxation" since they already pay fuel taxes that fund roads. However, pricing is often applied in areas with particularly high facility costs, such new urban highways and downtown parking, where the cost of accommodating additional vehicles is far higher than average. Thus, the fuel taxes paid on that travel are much lower than the costs imposed.

Pricing proponents emphasize that motorists receive benefits, such as reduced traffic congestion, and that pricing is optional. For example, motorists may have a choice between free but congested highway lanes, and uncongested but priced lanes. Similarly, they may be able to choose between convenient but priced parking, and less convenient but free parking. This is called *value pricing*. Whether motorists have adequate alternatives is often an important issue in pricing equity analysis.

Pricing reforms can benefit disadvantaged people if they reduce negative impacts on disadvantaged neighborhoods or improve travel options for non-drivers. For example, Kain (1994) predicts that congestion pricing can benefit lower income commuters and non-drivers overall by improving transit and rideshare services. Cameron (1994) concludes that a 5¢ per mile road user fee in Southern California is not regressive because all residents benefit from reduced congestion and air pollution, particularly since the poorest residents are most exposed to pollution.

### *Comparing Modes*

It is sometimes appropriate to compare funding and traffic management of various modes. For example, critics sometimes argue that public transit users receive excessive subsidies compared with motorists, based on comparison of costs and subsidies per passenger-mile, but their arguments often overlook important factors (Hodge, 1995; Litman, 2004).

- Critics usually only consider a small portion of total costs, usually just direct roadway expenditures, but ignore other subsidies of automobile travel, such as parking, congestion externalities and environmental impacts.
- A significant portion of transit funding (about half) is justified to provide basic mobility for non-drivers, including costs for special equipment and services to accommodate people with disabilities. These special services often requires significant subsidy per trip.
- Most transit service is provided on dense urban corridors where automobile costs (road capacity, parking, pollution impacts, etc.) are also costly when measured per vehicle-mile. Transit service costs and subsidies should therefore be compared with the costs of accommodating additional automobile travel under the same circumstances.
- People who depend on transit tend to travel fewer miles per year, so, although their cost per passenger-mile may seem high, their per capita costs are relatively smaller.

Similarly, many people assume that pedestrians and cyclists pay less than their fair share of roadway costs since they are not generally charges road user fees, as are motorists. They therefore object to cyclists using public road, and to the use of roadway funding for walking and cycling facilities and programs. However, they also tend to overlook important factors (Litman, 2002).

- The local roads that pedestrians and cyclists used most are funded primarily by local general taxes (at least in the U.S.), which residents pay regardless of how much they drive.
- Walking and cycling imposed much smaller roadway costs per mile of travel, including road construction and maintenance requirements, and congestion, accident risk and pollution impacts imposed on others.
- People who rely primarily on non-motorized travel for transportation tend to travel fewer miles per year than motorists.

When these factors are considered, per-capita transportation funding often turns out to be lower for zero-vehicle households than for automobile-owning households. People who rely primarily on non-motorized transportation tend to subsidize the local road and parking facility costs of motorists.

## Strategies To Achieve Transportation Equity Objectives

*This section identifies various ways of achieving transportation equity objectives.*

### *Horizontal Equity – Planning and Investment Reforms*

Horizontal equity requires that public resources be allocated equally to each individual or group unless a subsidy is specifically justified, although exactly what constitutes an equal share depends on which resources are considered and how they are measured. In general, resource allocations should be measured per capita, with adjustments made to account for special needs, such as extra costs to accommodate people with disabilities and to provide fare discounts for people with low incomes.

Reforms are needed to correct current planning biases that favor certain groups and modes. For example, funding allocation rules that favor certain areas in terms of per capita funding, or certain modes in terms of funding per trip, should be corrected to allow resources to be allocated in the most equitable and cost effective way ("Least Cost Planning," VTPI, 2004). It is particularly appropriate to insure that alternative modes frequently used by economically, physically and socially disadvantaged people receive a fair share of public resources. Better survey techniques are needed to better count walking and cycling travel, so these modes receive a fair share of transportation funding.

### *Horizontal Equity – Pricing Reforms*

Horizontal equity requires that prices (what it costs to purchase a good or service) reflect the full costs of providing that good or service unless a subsidy is specifically justified. Automobile use is currently underpriced: a significant portion of costs are external (not charged to motorists) or fixed (not related to how much a vehicle is used), and fees seldom reflect factors that affect costs, such as time, location or vehicle type. Various pricing reforms can achieve horizontal equity objectives by making transport prices more accurately reflect costs (Litman, 2005b; VTPI, 2005). They can also achieve vertical equity objectives by supporting alternative modes, improving affordability, and by prioritizing travel to favor basic mobility and HOV modes. These include:

- *Fuller cost recovery* – User fees such as fuel taxes and tolls increase to reflect costs imposed. For example, fuel taxes could be increased to fund a greater portion of roadway costs, and more parking facilities should be priced.
- *Weight-distance fees* – Fees that reflect the roadway costs imposed by a vehicle class.
- *Road Pricing* – Charge directly for road use, with rates vary to reflect how roadway and congestion costs vary by location, time and vehicle type.
- *Parking cash out* – Allow commuters to choose cash instead of subsidized parking.
- *Parking pricing* – Vary rates to reflect how costs vary by location, time and vehicle type.
- *Pay-As-You-Drive vehicle insurance and registration fees*, which converts fixed costs into variable costs with respect to annual vehicle travel.
- *Environmental taxes and emission fees*. Some economists recommend special fees based on the environmental imposed by an activity, such as vehicle air pollution emissions.

### *Vertical Equity – Progressive With Respect To Income*

There are many ways to increase transport system affordability and insure that transport policies and program are progressive with respect to income ("Affordability," VTPI, 2005)

- As much as possible, prices should be structured to favor economically, socially and physically disadvantaged people. For example, transit services, road tolls and other services can have discounts for people who qualify for low-income benefits. Each household can receive a limited number of free road toll or parking vouchers.
- Implement mobility management programs, such as commute trip reduction and school transport management, which support and reward users of alternative modes.
- Support carsharing (vehicle rental services located in residential areas, designed to provide an affordable alternative to private vehicle ownership), pay-as-you-drive insurance (insurance and registration fees based directly on how much a vehicle is driven), and other programs and pricing options that make occasional automobile use more affordable.
- Offer parking cash out (employers who provide free parking also offer employees the cash equivalent when they commute by alternative modes) and unbundled parking (parking is rented separately from building space, rather than automatically included, so renters who reduce their parking needs save money).
- Favor more affordable modes in planning and investment decisions, including walking and cycling, ridesharing, public transit and intercity bus, carsharing, and Internet service.
- Implement smart growth policies that create more access and multi-modal land use. Locate public services (schools, hospitals, shops, etc.) where they are easily accessible without an automobile. Insure that affordable housing is in accessible locations.

### *Vertical Equity – Benefiting Transportation Disadvantaged People*

Because disadvantaged people tend to drive less than average and often rely on non-automobile modes, anything that increases transportation system diversity and land use accessibility tends to increase vertical equity ("Transportation Diversity," VTPI, 2005). Conversely, anything that increases automobile dependency tends to contradict vertical equity objectives by reducing travel options for non-drivers and increasing transportation costs ("Automobile Dependency," VTPI, 2005). As a result, planning and market distortions that favor automobile travel, described earlier in this paper, tend to reduce vertical equity, while mobility management and smart growth strategies tend to increase vertical equity by creating more diverse and accessible transport systems.

Certain modes and services are particularly important to transport disadvantaged people, including walking, cycling, ridesharing, public transit, intercity bus and rail services, taxi, lower-priced aviation services, special mobility services, carsharing, public Internet services, and delivery services. In addition to the individual modes, it is important to provide good connections between these modes and destinations, for example, insuring that there are good walking and cycling conditions around transit stops, that transportation terminals accommodate people with disabilities, and that public transit serves airports.

### Support Smart Growth Development

Sprawled land use reduces access and increases costs for disadvantaged people (Schneider and McClelland, 2005). Planning practices and policies that increase sprawl are inequitable because they reduce accessibility options and increase costs for non-drivers, and tend to harm certain disadvantaged populations, such as residents of lower-income urban neighborhoods. Smart Growth policies, which create more accessible, multi-modal communities, and redevelop existing urban neighborhoods, insure that people who rely on alternative modes have transport and housing options that meet their needs ("Smart Growth," VTPI, 2005). Reforming current planning and investment practices that favor sprawl tends to support equity objectives ("Smart Growth Reforms," VTPI, 2005). Locating affordable housing in accessible, multi-modal neighborhoods tends to increase equity by improving mobility options and reducing travel costs for people who are economically, physically and socially disadvantaged.

### Universal Design

*Universal design* (also called *accessible design* and *handicapped access*) refers to transport systems that accommodate the broadest possible range of users, including people with disabilities, people using handcarts, and other special needs ("Universal Design," VTPI, 2005). Walking facilities, public buildings, transportation terminals and public transportation vehicles should all reflect universal design principles. Every community should have taxis and special mobility services that accommodate people with significant physical disabilities. It is important that some residential neighborhoods and all commercial centers meet a high standard of universal design.

A useful exercise for transport decision-makers is to spend a couple weeks without driving an automobile, and a day or two traveling around public facilities in a wheelchair. This can help people who are normally motorists experience a non-drivers perspective.

### Give Diverse Stakeholders More Influence On Transport Planning

Vertical equity often requires better planning that involves people who are often excluded ("Transportation Planning," VTPI, 2004). This may require more outreach to disadvantaged groups (minorities, lower-income people, single mothers, etc.), consideration of an expanded range of impacts, and more integration between different jurisdictions and agencies. In some cases it may be appropriate to assign an advocate to represent disadvantaged groups that have difficulty participating in planning processes, such as children, people with severe disabilities and homeless people.

### Collect Information Needed For Transport Equity Evaluation

Vertical equity objectives require better transport data collection, to help quantify impacts on different groups. This may include information on the mobility needs and activities of various disadvantaged groups, information on impacts that have are often overlooked (such as the distribution of parking costs, the delay that wider roads and increased vehicle traffic have on nonmotorized modes, the quality of transportation services for non-drivers, and the impacts of land use decisions on accessibility and transportation costs.

## Conclusions

Equity refers to the distribution of impacts, and whether they are considered fair and appropriate. Transport planning decisions often have significant equity impacts. Transport equity analysis can be difficult because there are various types of equity, people can be categorized in various ways, transport planning decisions can have numerous impacts, and these can be measured in various ways. A particular decision may seem equitable when evaluated in one way, but inequitable when evaluated in another.

There is no single correct way to incorporating equity into transport planning. It is generally best to consider a variety of equity issues and perspectives. A planning process should reflect each community's concerns and priorities. Public involvement is therefore important for transport equity planning.

Some equity impacts are difficult to quantify, but new tools are available to better evaluate equity and incorporate equity objectives into transport planning. This paper identifies five transport equity indicators: people are treated equally, people bear the costs they impose, progressive with respect to income, benefits transportation disadvantaged people, and improves basic access. Various types of transport improvements can help achieve various equity objectives, as summarized in Table 5. These are just some examples of transport equity evaluation. Other equity issues may be of interest in other situations.

***Table 5*** **Strategies for Achieving Equity Objectives**

| Strategy | Treats Everybody Equally | People Bear the Costs They Impose | Progressive With Respect To Income | Benefits Transport Disadvantaged | Improves Basic Access |
|---|---|---|---|---|---|
| Pricing reforms (higher fuel taxes, road and parking pricing, distance-based fees) | X | X | | | X |
| Increased transport system diversity (improvements to modes used by disadvantaged people). | | | X | X | X |
| More accessible land use, and location-efficient development. | | | X | X | X |
| More affordable automobile options (PAYD insurance, carsharing, need-based discounts, etc.) | | | X | | X |
| Correct policies that favor automobile travel over other modes (planning and investment reforms). | X | X | X | X | |
| Improve public involvement in transport planning. | X | | | X | |
| Improve data collection (more information on disadvantaged people and alternative modes). | X | | X | X | |

*This table indicates the equity objectives achieved by various transport improvement strategies.*

## References and Information Resources

*Access Exchange International* (email: globalride-sf@worldnet.att.net) provides resources for improving mobility services for physically disabled people throughout the world.

*ADA Homepage* (www.usdoj.gov/crt/ada/adahom1.htm), by the U.S. Department of Transportation, provides information on implementing the Americans with Disabilities Act.

*ADAPT* (www.adapt.org) is an advocacy organization representing the interests of people with disabilities, which sponsors many projects related to mobility and access issues.

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