

Transportation Affordability

Evaluation and Improvement Strategies

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Walking, cycling and public transit are affordable transport modes. Compact, mixed use development increases affordability by reducing travel distances and improving mobility options.

Abstract

This paper investigates the concept of *transportation affordability*, its importance, how to evaluate it for transport planning, and practical ways to improve it. Affordable transport means that people can afford to purchase access to basic goods and activities, which typically means that households spend less than 20% of budgets on transport and less than 45% on transport and housing combined. Several factors can affect affordability, including individuals' mobility needs and abilities; the quantity, quality and pricing of transport options; land use factors that affect accessibility; and housing affordability. Conventional planning tends to consider a relatively limited range of transport affordability impacts and objectives. More comprehensive analysis can help decision makers better understand affordability impacts and identify better strategies for improving affordability. Strategies that increase automobile affordability tend to impose indirect costs, while those that improve other travel options tend to provide co-benefits, such as improved safety, community cohesion, and environmental protection, and so tend to have the greatest overall benefits.

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*“Annual income twenty pounds, annual expenditure nineteen six, result happiness.
Annual income twenty pounds, annual expenditure twenty pound ought and six, result misery.”*
- Charles Dickens (1849), “David Copperfield,”

Introduction

Affordability refers to people’s ability to purchase basic goods and services (housing, food, medical care and transport). It can be defined as the situation in which household budgets can purchase basic goods, or simply that lower-income people need not worry about obtaining life’s necessities.

Transportation affordability means that people can purchase access to basic goods and activities (medical care, basic shopping, education, work and socializing), which typically means that low- and medium-income households spend less than 20% of budgets on transport and less than 45% on transport and housing combined.

Transportation inaffordability causes significant problems. It imposes financial burdens and constrains people’s opportunities. Because these problems are greatest for physically and economically disadvantaged people, transport inaffordability is inequitable. Described more positively, increasing transport affordability can provide large economic and social benefits by reducing burdens and expanding opportunities to disadvantaged people. Increased transport affordability is equivalent to increased income.

Many planning decisions affect transportation and housing affordability. Decision-makers, who tend to be middle-income professionals who rely primarily on automobile transport and live in single-family homes, often lack personal experience with transportation inaffordability and with many affordability improvement strategies. Conventional, mobility-based planning tends to recognize the benefits of improving automobile, freight and air transport, and evaluates transportation affordability primarily in terms of motor vehicle operating costs and public transport fares. Walking and cycling conditions, public transit service quality, and land use factors that affect the distances between destinations, are generally given little consideration. This unfair and exacerbates economic problems since many workers find it difficult to access education and employment, and because motorized modes require costly infrastructure, impose external costs, and are resource-intensive, leading to increasing dependence on imported oil.

There are many factors to consider when evaluating transportation affordability, and many possible ways to achieve transport affordability objectives, some of which tend to be overlooked in conventional planning. Transport affordability can be increased by improving the quantity and quality of affordable transportation options, and by improving land use accessibility to reduce travel distances. Some of these strategies help achieve other planning objectives, such as congestion reduction, road and parking facility cost savings, improved safety and health, energy conservation and pollution reductions.

This report investigates the concept of transportation affordability, describes practical ways of evaluating it, and identifies various practical strategies for improving transportation affordability.

Problems of Transportation Inaffordability

Inaffordability creates stress, reduces economic opportunity, and can lead to medical and social problems. Because it particularly harms disadvantaged people, it is inequitable. Excessive housing costs can force workers to commute long distances, exacerbating transportation problems.

Inaffordability can also reduce economic development, particularly in economically successful communities. Low- and medium-wage jobs are an important economic input. Even high wage industries require numerous lower-wage support employees. For example, physicians, lawyers and business executives require receptionists, technicians and cleaners. Where living costs are high, businesses often have difficulty filling positions and workers to commute long distances, resulting in higher wages, increased stress, unreliability, higher turnover and reduced work quality. Some potential workers may stay on social assistance rather than move to areas with better job prospects but high living costs. High cost of living may reduce the number of college and university students, retirees, artists and innovators moving to a community, reducing growth in associated industries. High transportation costs can have other undesirable economic impacts, including reduced spending on other goods, reduced household savings, and reduced economic development (Ferdous, et al. 2008; Litman 2010)

The table below illustrates how high transportation and housing costs that increase the cost of living in a community drive up wages to attract a given quality of employee. If basic transportation and housing costs are \$300 per month higher than other communities, local employers must pay an extra \$1.88 per hour. If these costs are \$700 per month higher, employers must pay an extra \$4.38 per hour.

Table 1 Wage Impacts of High Transportation and Housing Costs

Monthly	Affordable	Unaffordable Transport	Unaffordable Housing	Unaffordable Transport & Housing
Monthly transport costs	\$200	\$500	\$200	\$500
Monthly housing costs	\$600	\$600	\$1,000	\$1,000
Total monthly costs	\$800	\$1,000	\$1,200	\$1,500
Monthly wage premium	\$0	\$300	\$400	\$700
Hourly wage premium	\$0	\$1.88	\$2.50	\$4.38

This table indicates how unaffordable transportation and housing costs tend to raise wages.

Transport inaffordability does not affect all workers equally. Some pay minimal rent because they live with family, own their homes or have subsidized housing. But once this pool of employees who can afford to accept lower wages is tapped, businesses must pay higher wages to attract additional employees. The result is less economic activity and lower profits than would occur with more affordable transportation and housing. This suggests that policies and programs that increase transportation and housing affordability support economic development, particularly in rapid growth communities that wish to expand industries that rely significantly on low- and medium-based employees, or to attract students, retirees, artists and other innovators.

Factors Affecting Transportation Affordability

Various factors that affect transportation affordability are discussed below.

Accessibility Versus Mobility

A paradigm shift (a fundamental change in the way problems are defined and solutions evaluated) is occurring in transport planning from *mobility-based analysis* which evaluates transport system quality based only on physical movement, to *accessibility-based analysis* which evaluates the transport system based on people's ability to reach desired goods, services and activities (Levinson and El-Geneidy 2006; Litman 2007). Accessibility is the ultimate objective of most transport activity, so accessibility-based analysis is generally more appropriate because it reflects ultimate planning goals.

Accessibility-based planning expands the possible solutions to transportation problems. Mobility-based planning generally assumes that *transportation* means automobile travel, so affordability requires subsidizing driving (for example, by financing roads and parking indirectly rather than user fees). Accessibility-based analysis allows alternative modes (walking, cycling, ridesharing and public transit), and location efficient development (locating affordable housing in accessible areas) to be considered transport affordability improvement strategies. Consumers often face tradeoffs between accessibility and mobility. For example, more accessible homes often cost more, while cheaper housing is often in urban fringe locations with relatively high transport costs. Choosing mobility over accessibility can have undesirable, unintended consequences:

- An automobile-dependent location makes households vulnerable to risks from vehicle failure, loss of driving ability and increased fuel prices.
- Automobile-dependency forces drivers to chauffeur non-driving family members.
- Since vehicles tend to depreciate, while real estate tends to appreciate, automobile expenditures provide less long-term value than housing purchases (McCann 2000).
- A more automobile-oriented home location tends to reduce physical activity, and increase obesity and related health risk (Frumkin, Frank and Jackson 2004).
- Automobile travel and sprawled land use impose external costs on society, including increased congestion, road and parking facility costs, crashes and pollution emissions.

Although consumers should be allowed to make their own accessibility-mobility tradeoffs, it makes sense for public policies to favor accessibility-oriented over mobility-oriented solutions, for example, by encouraging location-efficient development which reduces total social costs.

Implications:

- Transportation affordability should be evaluated based on accessibility rather than mobility, so that all accessibility impacts and options can be considered.
- Accessibility-oriented solutions are often more cost effective and beneficial overall than mobility-oriented solutions, particularly for disadvantaged populations.

Individual Needs And Abilities

Peoples' transportation needs and abilities vary. People who have more responsibilities, such as working or caregiving, tend to have more transportation needs. People with physical and mental disabilities may be unable to use some affordable travel options (such as walking and cycling, and conventional public transit). These factors should be taken into account in transport affordability evaluation. For example, transit agencies may offer family discounts or free fares for children traveling with parents, and people with disabilities may require taxi subsidies for the sake of affordability.

Below are specific needs and abilities that should be considered when evaluating transportation affordability:

- Income and wealth (or conversely, poverty).
- Daily and household responsibilities, such as commuting to school or a job, caregiving (such as being responsible for children or disabled adults), or special needs (such as requiring frequent medical treatments) tend to have more transportation needs.
- Physical and mental abilities, particularly ability to use affordable modes such as walk and bicycle (including their ability to carry loads), and public transit.
- Ability to understand and read the local language.
- Ability to drive, including access to a vehicle and legal certification to drive.

These factors have cumulative effects. A person who is unable to drive may have few transportation problems if they are unemployed, have no caregiving responsibilities, and are physically able, but the same person would face significant problems if they are looking for work, responsible for a child or disabled adult, or if they develop a physical disability. An index can be used to evaluate people's transportation needs and abilities, and therefore the degree of transportation deprivation and inaffordability they face, and the justification for providing targeted services and discounts to them.

Implications:

- Affordability analysis should consider people's specific needs and abilities
- Special services and targeted discounts may be justified for people with special needs.

Units of Measurement

Affordability analysis is affected by the reference units used for analysis. For example, evaluating transportation affordability based only on fuel costs (such as a portion of household wealth, or changes over time) assumes that everybody owns a vehicle and relies on driving for most transport. Measuring transport costs per capita recognizes that vehicle ownership costs are also significant, and reductions in vehicle ownership requirements can increase affordability.

Implications:

- Transportation affordability analysis should generally be measured per capita.

Household Incomes and Budgets

Transportation affordability can be evaluated based on the portion of income and expenditures devoted to transport, particularly by low- and moderate-income households.

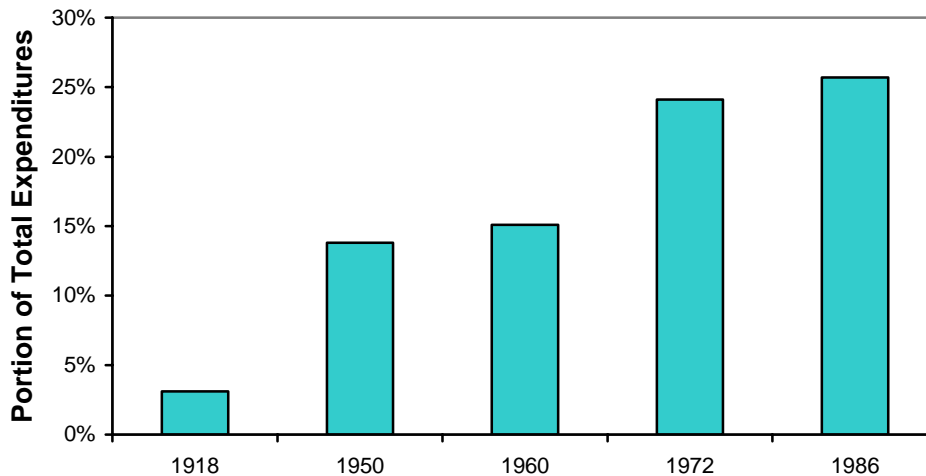
Table 2 Average Household Expenditures (Johnson, Rogers and Tan 2001)

Component	1917–19	1950	1960–61	1972–73	1986–87
Food	41.1%	32.5%	26.0%	22.6%	19.4%
Housing	26.8%	26.0%	29.2%	29.3%	33.7%
Transportation	3.1%	13.8%	15.1%	24.1%	25.7%
Clothing	17.6%	11.6%	10.3%	8.4%	5.2%
Health care	4.7%	5.1%	6.6%	4.7%	4.0%
Other	6.7%	11.0%	12.8%	10.9%	12.0%

This table indicates the portion of expenditures devoted to various categories of goods by single wage earner urban households for various periods during the Twentieth Century. Transportation expenditures increased significantly during this period, reflecting increased motorized travel.

Transportation costs increased as a portion of household expenditures during the last century, as indicated in Table 2 and Figure 1. This reflects the increased motor vehicle ownership and use over this period, and reductions in other expenses, particularly food and clothing. Note that the definitions used in this study differ from those of the Consumer Expenditure Survey, so data in figures 1 and 2 cannot be directly compared.

Figure 1 Household Transportation Expenditures (Johnson, Rogers and Tan 2001)



The portion of household expenditures devoted to transport increased significantly during the last century.

Affordability analysis is complicated because definitions and perspectives vary. For example, analysis results are affected by whether costs are measured relative to *income* or *expenditures*, whether non-income benefits (such as food and housing subsidies) are included, and whether residential parking costs are considered housing costs or transport costs. Many lower-income people receive non-income benefits or undeclared income, live in subsidized housing, grow food, receive charity, or use other strategies to stretch

dollars. Some households have planned periods of low incomes to attend college, travel or retire. These factors help explain why annual income is much lower than annual expenditures for the lowest income quintile, as indicated in Table 3. In addition, persons per household increases with income so vehicle ownership and transport expenditures increase faster with income when measured per household than per capita.

Table 3 2007 U.S. Household Budget Data by Income Quintile (BLS 2007)¹

	Total	Lowest	Second	Third	Fourth	Fifth
Income	\$3,091	\$10,531	\$27,674	\$46,213	\$72,460	\$158,388
Expenditures	\$49,638	\$20,471	\$31,150	\$42,447	\$57,285	\$96,752
Persons	2.5	1.7	2.2	2.5	2.9	3.2
Vehicles	1.9	0.9	1.5	2	2.4	2.8
Owns at least one vehicle	0.88	0.65	0.89	0.94	0.96	0.98
Food	\$6,133	\$3,035	\$4,260	\$5,682	\$7,242	\$10,444
Food – Percent Expenditures	12.4%	14.8%	13.7%	13.4%	12.6%	10.8%
Housing	\$16,920	\$8,285	\$11,390	\$14,388	\$19,017	\$31,492
Housing – Percent Expenditures	34.1%	40.5%	36.6%	33.9%	33.2%	32.5%
Total Transport	\$8,758	\$3,242	\$5,717	\$7,926	\$11,058	\$15,831
Transport – Percent Income	13.9%	30.8%	20.7%	17.2%	15.3%	10.0%
Transport – Percent Expenditures	17.6%	15.8%	18.4%	18.7%	19.3%	16.4%
Transport subcategories						
<i>Per Household</i>						
Vehicle Purchases	\$3,244	\$1,075	\$1,945	\$2,601	\$4,460	\$6,133
Fuel and Oil	\$2,384	\$1,046	\$1,768	\$2,418	\$2,988	\$3,696
Other Vehicle Expenses	\$2,592	\$950	\$1,762	\$2,544	\$3,105	\$4,596
Public Transport	\$538	\$171	\$242	\$362	\$506	\$1,406
<i>Per Vehicle</i>						
Vehicle Purchases	\$1,707	\$1,194	\$1,297	\$1,301	\$1,858	\$2,190
Fuel and Oil	\$1,255	\$1,162	\$1,179	\$1,209	\$1,245	\$1,320
Other Vehicle Expenses	\$1,364	\$1,056	\$1,175	\$1,272	\$1,294	\$1,641

This table summarizes selected household budget statistics by income quintile.

The *Self-Sufficiency Standard* (<http://selfsufficiencystandard.org/standard.html>) established by the Center for Women’s Welfare defines the net income required to meet basic needs without public subsidies (e.g., public housing, food stamps, Medicaid, etc.) or private/informal assistance (e.g., free babysitting by a relative or friend, food banks or food stamps, shared housing, etc.). These costs vary by geographic and demographic factors. It assumes that all adults (whether married or single) work full-time, and so includes commuting and child care expenses, and the net effect of federal, state and local taxes and tax credits. This Standard is calculated for seventy different family types, with one or two adults, and zero to three children of various ages. To the extent feasible the data used in the Self-Sufficiency Standard are:

- Collected or calculated using standardized or equivalent methodology nationwide.
- Obtained from scholarly or credible sources such as the U.S. Census Bureau.
- Set at minimum but adequate levels; (e.g., nutrition levels).
- Updated annually and varied geographically and/or by age as appropriate.

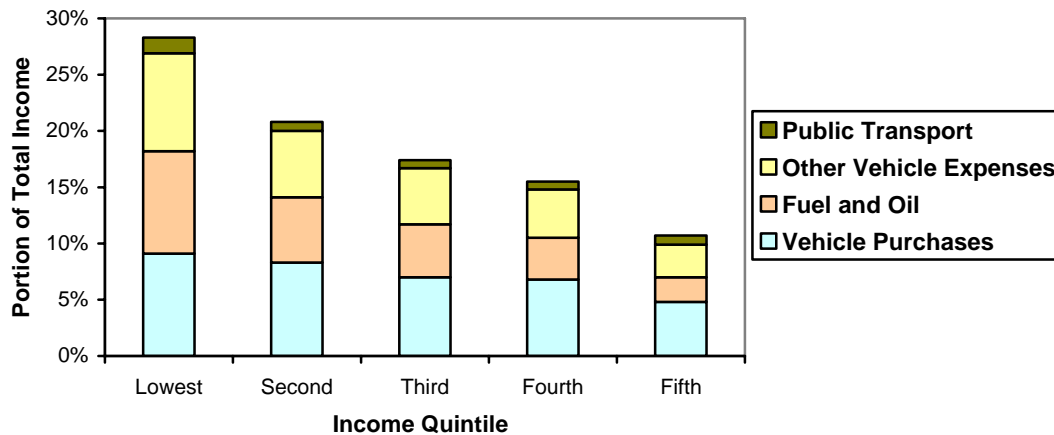
¹ For European household expenditure statistics see EuroStat (2008).

Housing costs are based on the most recent Fair Market Rents (FMRs) calculated annually by the U.S. Department of Housing and Urban Development (HUD) for each state's metropolitan and non-metropolitan areas. FMRs reflect the cost of housing that meets basic standards of decency, including utility costs (except telephone and cable). In most cases, FMRs are set at the 40th percentile, meaning that 40% of the housing in a given area is less expensive than the FMR.

Transportation costs vary by location. If public transportation service is considered adequate in the area, indicated by 7% or greater transit commute mode share, transportation costs are calculated based on the price of a monthly adult pass. If the area lacks adequate public transportation, transportation costs are calculated based on the average cost of owning and operating a car for each employed adult. Vehicle ownership costs are based on Consumer Expenditure Survey amounts for households between the 20th and 40th percentile incomes.

Transportation affordability analysis can be complicated because people's mobility needs and abilities vary. For example, some people can easily satisfy their access needs on a limited budget by walking, cycling and public transit. However, people with limited physical ability, caregiving responsibilities, or who live or work in automobile-dependent locations may need to spend much more to meet their access needs, so their transport costs are unaffordable. Some moderate-income households experience significant affordability problems, for example, because a member has a medical condition that requires costly treatment or to finance an education. It would therefore be inappropriate to assume that transportation affordability is a concern only for poor households. Since automobile dependency reduces the quality of lower-cost travel options (such as degraded walking and cycling conditions, and reduced public transit service quality), it tends to cause transportation unaffordability, and tends to be inequitable since physically, economically and socially disadvantaged people are particularly harmed.

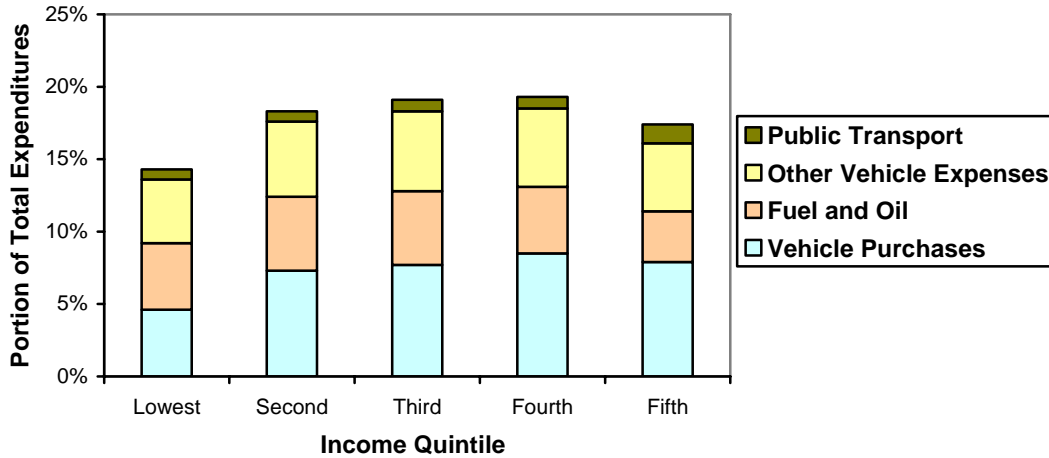
Figure 2 Transport Expenditures (BLS 2007)



This figure shows the portion of total household income devoted to transportation.

Transportation expenditures are regressive when measured relative to household *incomes*, as illustrated in Figure 2, but not relative to household *expenditures*, as illustrated in Figure 3. This is because many lower-income households spend more than their current incomes (for example, because they are retired and living on savings), and many lower-income households have minimal travel costs because they are retired or disabled.

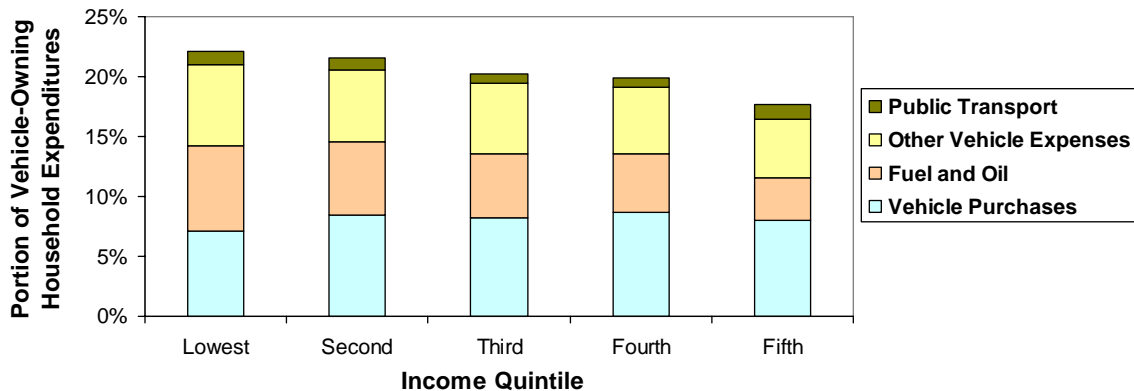
Figure 3 Transport Expenditures (BLS 2007)



This figure shows the portion of total household expenditures devoted to transportation.

Transport costs are clearly regressive if all motor vehicle costs are assigned to vehicle-owning households, as illustrated in Figure 4. This implies that lower-income households are forced to choose between two different types of problems: forego vehicle ownership and the benefits it provides, or own a vehicle and bear an excessive financial burden.

Figure 4 Transport Expenditures By Vehicle-Owning Household (BLS 2007)



This figure assigns all vehicle costs to vehicle-owning households, indicating they are regressive.

Improved accessibility can increase economic opportunities for education, employment and access to cheaper goods (such as discount stores). Automobile ownership is an important form of accessibility, but costly. For example, O’Toole (2006) cites research by Sullivan (2003) and Raphael and Stoll (2000) which indicate that automobile ownership increases lower-wage worker average incomes \$1,100 per month, although both studies emphasize that these results reflect confounding effects (more skilled and aggressive workers with higher incomes and longer working hours are more likely to afford a car). Other accessibility improvements may be more appropriate and cost effective ways to improve job access.

Low-income households use various strategies to make driving affordable: they minimize driving, purchase low-value vehicles, share vehicles, drive unregistered and uninsured vehicles and service their own vehicles. However, vehicle ownership is still costly. Even cheap vehicles typically cost \$4,000 annually to own and operate, so workers would need to earn an extra \$350 per month just to break even for automobile commuting. Low-income households often pay high insurance premiums and own unreliable vehicles and so struggle to insure and repair their vehicles. Described more positively, improving transport affordability provides large benefits. For example, saving \$150 per month in travel expenses (that is, if improved transport options reduce the need to own a vehicle) is equivalent to a 10% wage increase for a household that earns \$1,500 per month. Similarly, a household that reduces travel expenses \$5,000 annually, for example by shifting from owning two to one vehicles, and invests the savings each year over a 40 year working life will retire approximately \$1 million wealthier.

Transport affordability can be evaluated relative to lower-income household budgets, as summarized in Table 4. Current U.S. minimum wages range from \$5.15 to \$8.00 per hour, resulting in after tax monthly incomes from about \$900 to \$1,700. The lowest-income quintile households have total expenditures averaging about \$1,600 per month, of which \$627 (39%) is devoted to housing and \$254 (16%) to food, leaving \$296 to \$777 for all other expenses, including transport, clothing, healthcare and entertainment.

Table 4 Low-Income Household Monthly Budget Analysis

Wage	Gross	Taxes	Net	Housing	Food	Remainder	Car Costs	Car-Free
	<i>160 hours</i>			<i>39%</i>	<i>\$254</i>		<i>\$200</i>	<i>\$50</i>
\$6.00/hr	\$960	6%	\$902	\$352	\$254	\$296	67%	17%
\$8.00/hr	\$1,280	8%	\$1,178	\$459	\$254	\$464	43%	11%
\$10.00/hr	\$1,600	10%	\$1,440	\$562	\$254	\$624	32%	8%
\$12.00/hr	\$1,920	12%	\$1,690	\$659	\$254	\$777	26%	6%

This table summarizes typical low-income household budgets.

The lowest income quintile spends \$241 monthly per vehicle on average, it is difficult to spend much less (“Vehicle Costs,” Litman 2006). Low-income people who do not own a vehicle typically spend \$40-60 per month on transport (shoes, bicycles, transit fares and occasional taxi rides). As a result, lower-income vehicle-owning households must typically spend between a quarter and two thirds of their remaining (besides housing and food) budget on transport, compared with only 6-17% for a “car free” household.

Affordability can also be evaluated by setting a maximum portion of household income devoted to transport considered affordable, such as 18%, 20% or 22% (18% is the overall average for all households). Table 5 indicates what this would mean for various income levels. For very low-income households, vehicle ownership is generally unaffordable.

Table 5 Low-Income Household Monthly Budget Analysis

Wage	Gross	Taxes	Net	Transport Budget		
				18%	20%	22%
\$6.00	\$960	6%	\$902	\$162	\$180	\$199
\$8.00	\$1,280	8%	\$1,178	\$212	\$236	\$259
\$10.00	\$1,600	10%	\$1,440	\$259	\$288	\$317
\$12.00	\$1,920	12%	\$1,690	\$304	\$338	\$372

This table indicates maximum affordable transportation expenditures for low-income households.

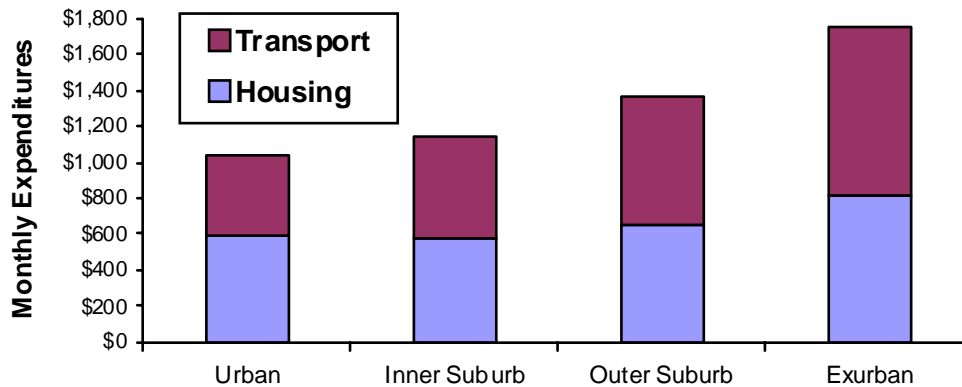
Implications:

- Transportation affordability analysis can use various indicators based on household incomes and budgets.
- Affordability analysis requires a realistic understanding of household costs and transportation cost burdens.
- Transportation cost savings can be considered equivalent to increased household income.

Land Use Patterns

Various land use factors (density, mix, roadway and pathway connectivity) affect the amount of travel needed for a given level of accessibility. A more accessible land use pattern (called *smart growth*) means that less mobility is needed to reach activities and destinations, and more travel options serve common destinations. A typical household's accessibility can be envisioned as a triangle connecting home, work and services. Travel distances and options among these destinations affect overall accessibility. For example, improving the variety of services (shops, schools, restaurants, parks, etc.) within a neighborhood or worksite, and improving travel options from home to worksite, tends to increase accessibility and reduce transport expenditures.

Figure 5 Housing and Transport Costs (CTOD 2006)



Although housing costs vary little, transportation costs increase significantly in less urban areas.

In general, suburban and rural communities tend to have less accessible land use patterns and more automobile-dependent transportation systems, increasing transport unaffordability. Residents of more accessible land use patterns tend to spend less on transportation (Figure 5), and lower-income residents of such communities have better travel options than in more automobile dependent areas. The degree to which affordable housing and lower-wage jobs have accessible locations affects transportation affordability. *Location efficient development* is a term for special efforts to insure that affordable housing options are located in accessible, multi-modal areas, where residents can achieve a high level of accessibility with reduced car ownership and use, and therefore improved transportation options (VTPI 2006).

Implications:

- Land use accessibility is an important factor in transportation affordability.
- Residents of more accessible and multi-modal communities tend to spend on transportation than residents of more automobile-dependent communities, and non-drivers tend to have better accessibility options.
- Locating affordable housing and lower-wage jobs in more accessible locations is a practical way to increase transportation affordability.

Transportation Options

Transportation options (also called *mobility options*, *transport diversity* and *transport choice*) refer to the quantity and quality of transport modes and services available in a particular situation. In general, the greater the quantity and quality of affordable modes (walking, cycling and public transit), the more affordable the transport system. Better transport options allow travelers to choose the combination that best meet their needs. *Level-of-service* (LOS) ratings (which grade service quality from A [best] to F [worst]) can be used to evaluate the quality of transport options, as indicated in Table 6.

Sometimes, a particular factor has a major impact on accessibility. For example, if inadequate information constrains transit use (potential riders don't know how to use it or have exaggerated fears of discomfort and unreliability), better information can improve accessibility. If poor cycling conditions constrain bicycle use, improved cycling facilities can improve accessibility. An often-overlooked factor that affects transport affordability is the relative status of different transport options. Modes such as walking, cycling and public transit sometimes fall into a cycle of stigmatization, reduced use by wealthier travelers and declining service quality. Improving the social status of these modes may be an effective way of increasing transport system affordability.

Table 6 Multi-Modal Level Of Service (“Transport Options,” VTPI 2006; FDOT 2002)

Mode	Level of Service Factors
Universal design (disability access)	Degree to which transport facilities and services accommodate people with disabilities and other special needs.
Walking	Sidewalk/path quality, street crossing conditions, land use conditions, security, prestige.
Cycling	Path quality, street riding conditions, parking conditions, security, safety education.
Ridesharing	Ridematching services, chances of finding rideshare matches, HOV priority.
Public transit	Service coverage, frequency, speed (particularly compared with driving), vehicle and waiting area comfort, user information, price, security, prestige.
Automobile	Speed, congestion delay, roadway conditions, parking convenience, safety.
Carsharing	Availability, convenience, price, variety of vehicles available, vehicle quality, prestige.
Telework	Employer acceptance/support of telecommuting, Internet access.
Delivery services	Coverage, speed, convenience, affordability.

This table indicates specific factors for evaluating the service quality of transport modes.

Implications:

- Improving lower-cost transport options and increasing the number of destinations served by such modes tends to improve transport affordability.
- Increased convenience, comfort, affordability, security, user information and prestige of affordable modes can increase affordability.

Transportation Costs

Various specific costs affect affordability, including:

- Vehicle purchase costs and fees.
- Vehicle insurance and registration fees.
- Fuel prices.
- Road tolls and parking fees.
- Transit and taxi fares.
- Telecommunications and delivery services.

For example, an increase in vehicle insurance and registration fees, parking and road tolls, fuel prices, or transit fares tends to reduce transportation affordability for the affected groups.

Affordability analysis should generally be as comprehensive as possible, taking into account all related costs, and based on *total* rather than *unit* costs. For example, transportation affordability is ultimately based on total vehicle costs, not just fuel costs, and reductions in per-gallon fuel prices may provide little overall increase in affordability if it encourages vehicle purchasers to select less fuel-efficient vehicles or stimulates more dispersed, automobile-dependent land use development. Transportation affordability should also account for indirect costs, such as residential parking costs.

Implications:

- Transportation affordability analysis should consider a variety of specific transportation costs.
- Analysis should be based on total costs rather than individual cost components.
- Analysis should account for indirect costs and their affordability impacts.

Housing + Transportation Affordability Index (<http://htaindex.cnt.org>)

The *Housing + Transportation Affordability Index*, developed by the Center for Neighborhood Technology (CNT) and the Center for Transit Oriented Development (CTOD), is an innovative tool that measures true housing affordability. Planners, lenders, and most consumers traditionally measure housing affordability as 30% or less of income. The Housing + Transportation Affordability Index takes into account not just the cost of housing, but also the intrinsic value of place, as quantified through transportation costs.

This work is a project of the Brookings Institution's Urban Markets Initiative and is the most comprehensive study-to-date of the Housing + Transportation Affordability Index. That study found that the three primary dependent variables in the household transportation model are auto ownership, auto use and transit ridership and that the two primary independent variables are residential density and household income. The second phase of the project models neighborhood-level data for 52 different metropolitan areas with results available through an interactive mapping website.

Transportation Affordability Indicators

Various indicators that can be used to evaluate transportation affordability are described below.

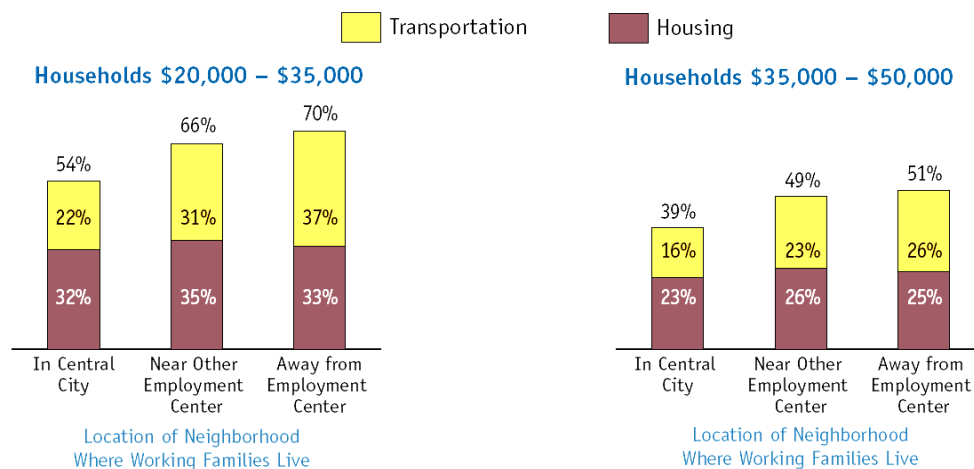
Affordability Index – Combined Transportation and Housing Costs

Some transportation and land use management strategies, particularly pricing reforms and smart growth land use development, have been criticized for reducing affordability. However, these strategies have mixed affordability impacts. For example, raising road, parking or fuel prices reduces the affordability of driving, but may increase transportation affordability if revenues are used to improve transportation options (walking, cycling and public transit services). Similarly, smart growth land use policies may increase the cost of land per acre, but by increasing density can reduce costs per housing unit. The evidence concerning the effects of growth management regulations indicates that when other factors are considered, Smart Growth does not reduce housing affordability (Nelson, et al., 2002; Wassmer and Baass, 2005; Tomalty and Haider 2008).

Households often face tradeoffs between income, housing costs and travel costs. Several studies have investigated these tradeoffs. In many situations, lower-cost housing is located in areas with high transportation costs, resulting in no overall affordability gain.

For example, Lipman (2006) found that transportation expenses are often higher than housing costs for middle-income households. This study found that transport costs range from about 10% in multi-modal communities up to about 25% in automobile dependent communities, as illustrated in Figure 6. Makarewicz, et al. (2008) found similar patterns in the Minneapolis-St. Paul region. Location efficient development, which locates affordable housing in areas with good travel options and reduces residential parking costs, can therefore increase overall affordability (Arigoni 2001; CTOD and CNT 2006; CNU 2008; ULI 2009; CHP 2009).

Figure 6 Share of Income Spent on Housing and Transport (Lipman 2006)



Source: Center for Neighborhood Technology calculations.

NOTE: Employment centers are job locations with a minimum of 5,000 employees.

The portion of income devoted to combined housing and transportation by lower and moderate income households increases with distance from major employment centers. Housing cost reductions are more than offset by increased transport costs, reducing overall affordability.

Miller, et al. (2004) used census consumer expenditure data and transportation survey information to compare housing and transportation costs for residents of various locations in the Toronto region. They found that suburban location tends to cost more overall than city locations. In 1996, (the latest year for which complete comparable data is available) the study estimates that a family with one car living 50 kilometres outside downtown Toronto, spent \$1,600 more a year on travel. For households with two vehicles — the norm for most suburban families — the annual cost rises to about \$5,800 more. The same house in the suburbs would cost about \$1,100 a year more in mortgage, property taxes, utilities and maintenance to run than a similarly valued home downtown.

“It is generally believed that many households choose to live in suburban locations either because housing costs are lower there or because households can obtain ‘more house’ for a given expenditure,” says study author Eric Miller. “But housing costs and travel costs tend to increase as one moves away from the central areas of the region’s cities, particularly from (downtown) Toronto. The idea that city living is too expensive just does not seem to hold up,” the study concludes.

A number of specific Smart Growth and TDM strategies can help increase housing affordability (Arigoni 2001; CNU 2008; Tomalty and Haider 2008). These include:

- *Intensification*: increase housing supply in areas with reduced housing and transportation costs, such as transit-oriented development, brownfields, and commercial corridors.
- *Housing Form*: increase the supply of more affordable housing types, such as smaller lots and homes, rental accommodation, secondary suites, mobile homes and modular houses.
- *Development Process*: measures to reduce the cost of housing generally – e.g., transportation planning standards, alternative engineering standards, parking standards, improving the approvals process, and addressing NIMBY.
- *Parking Management*: that reduces parking requirements.
- *Location Efficient Development*: allow reduced parking requirements and more attractive mortgages for housing in accessible, multi-modal communities.
- *Smart Growth Fiscal Reforms*: reduce development and utility costs for infill development.

Implications:

- Affordability analysis should consider housing and transportation costs together.
- Transportation costs should be considered by consumers when evaluating housing affordability and by lenders when evaluating a household’s borrowing capability.
- Location-efficient development can be considered a transportation affordability strategy.

Community Affordability

Transportation affordability can also be evaluated from society's perspective, that is, the overall costs and cost efficiency to the entire community, including indirect, external and non-market costs (Litman 2005b). For example, some transportation cost reduction strategies, such as reducing fuel taxes, and funding roads and parking facilities through general taxes or development costs, may increase vehicle travel affordability but increase other costs. If any of these indirect costs are borne by lower-income people (for example, through increased housing costs or taxes) they may experience an overall reduction in affordability. Similarly, overall affordability may decline if underpricing motor vehicle travel causes increased congestion delays, accidents or pollution damages, particularly if these costs burden lower-income people.

Described differently, it is important to account for economic transfers, such as subsidies and external costs, and distinguish them from true resource costs and resource cost savings.

Implications:

- Comprehensive affordability analysis should consider all economic impacts, including indirect, external and non-market benefits and costs.
- It is important to account for economic transfers, such as the economic impacts of subsidies and external costs.

Transportation Makes Atlanta Very Unaffordable

Metro Atlanta sells itself as an affordable city. Well, that's just not true — especially for working families.
Maria Saporta, *Atlanta Journal-Constitution*, 06/11/07

Metro Atlanta actually is the second-most expensive major city in the nation for families earning between \$20,000 and \$50,000 a year, according to recent analysis. Those families spend an average of 29% of their income on housing and 32% of their income on transportation for a total of 61%. The analysis was done by the Center for Housing Policy, which compared housing and transportation costs in 28 of the major cities in the United States. The only city more expensive than metro Atlanta is San Francisco, where 35% of a working family's income goes toward housing and 27% goes toward transport, 63% total.

"That startled me," said John O'Callaghan, president and CEO of the Atlanta Neighborhood Development Partnership, which helps finance affordable housing. "Atlanta has been built on the car. People drive until they can find a home they can afford. But they don't add up the car payments, car insurance and transportation costs. And it's getting worse as gas prices are going up."

As one of the least dense major cities in the country, long commutes are a way of life. Susan Adams, director of ANDP's Mixed-Income Communities Initiative, said Atlanta's average commute is 12 miles one-way compared to an average of nine miles among the 27 other cities. Once again, the inability for metro Atlanta to deal with its transportation is having a direct impact on the affordability of our region.

Up to now, affordability has focused on housing costs, which means that metro Atlanta has been able to hide its dirty secret of its increasing transportation costs. But no more. Nationally, housing experts now are measuring affordability by including a region's transportation costs in a new index. Eventually, urban leaders hope that Realtors, developers, homeowners and apartment dwellers will be just as sensitive to their transportation costs as their housing costs. "Transportation costs are very influential in the Atlanta region, and it has a big impact on our per-capita income," said Mike Alexander, chief of research for the Atlanta Regional Commission. "Generally, compared to other places, we are an affordable place to live, but you have to include transportation costs, or it's not a fair comparison."

The combination of rising transportation costs and the decline in per-capita income growth should sound the alarm to people in Georgia. If metro Atlanta loses its cachet of being one of the nation's more affordable cities, we will be less attractive to people and companies interesting in relocating here. But it doesn't have to be this way. At ARC's Atlanta Regional Housing Forum last week, several ideas were discussed on how to turn these trends around. "Density is the single best way of getting affordable housing," said Bruce Gunter, CEO of Progressive Redevelopment. "We are not dense at all. We are going to have to completely rethink about how we grow."

A key element of affordability is to have people live close to where they work. If people can walk to work or only drive a few miles, it will decrease their transportation costs. Jim Durrett, executive director of the Livable Communities Coalition, said that developing affordable housing around job centers is something that employers are beginning to understand. Cutting down on commuting will help improve the quality of life of employees.

There also is the transit piece. Town centers that include residences, offices, retail, restaurants and services also are better served by transit. And transit often is much less expensive than owning and operating a car. "You have to get the right transportation links to get people to their jobs," O'Callaghan said. "Transportation is a big piece of that. And there are other life costs to spending time in the car. It impacts our health. And it impacts the time we spend with our families."

Examples of Affordability Analysis

Various indicators can be used to evaluate transportation affordability, including the portion of household expenditures devoted to transportation, the quantity and quality of affordable transportation options available to a particular group or for a particular type of trip, and the quality of accessibility for non-drivers compared with drivers.

Mobility Gap Analysis

Leigh, Scott & Cleary (1999) developed a method for quantifying a community's *mobility gap*, defined as the amount of additional transit service required for households without a motor vehicle to have a comparable level of mobility as vehicle owning households. This is a conservative estimate because it does not account for unmet mobility needs of non-drivers in vehicle-owning households. Only about a third of transit needs are currently being met in typical areas they evaluated, indicating a level of service (LOS) rating D, based on ratings shown in Table 7. This approach can be used to predict the LOS rating that will occur under various transit planning and investment scenarios.

Table 7 Transit Level Of Service Ratings (Leigh, Scott & Cleary 1999, p. VIII-3)

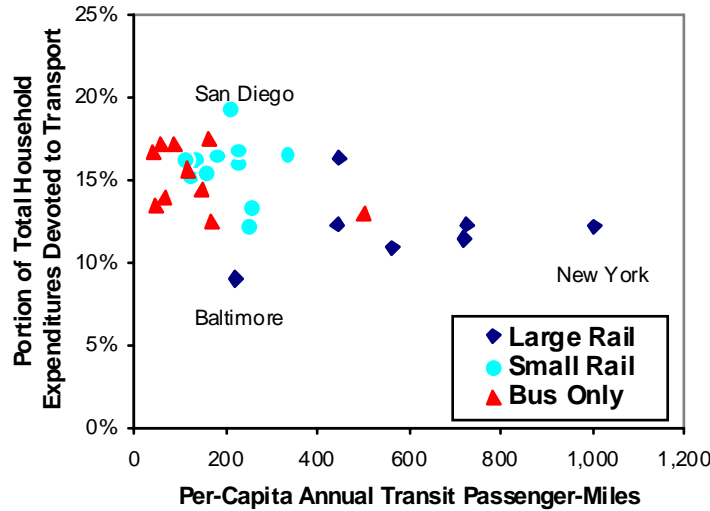
Portion of Demand Met	Transit Level-Of-Service
90% or more	A
85-89%	B
50-74%	C
25-49%	D
10-24%	E
Less than 10%	F

A variety of factors can be considered when evaluating a community's transit needs and the mobility gap between residents who drive and those who do not. These include vehicle ownership (residents of households that do not own a motor vehicle tend to rely significantly on transit), age (residents in the 10-21 and 65+ year age ranges tend to rely on transit more than those 21-65), income (lower-income people tend to use transit more than higher-income people), race and residency status (non-white and immigrant residents tend to rely more on transit than white and U.S. born residents).

Transit-Oriented Development

Living in a transit-oriented community tends to reduce total household transportation costs, according to research comparing U.S. cities based on the quality of their transit system (Litman 2004; Polzin, Chu and Raman 2008; FTA 2008; Pollack, Bluestone and Billingham 2010).

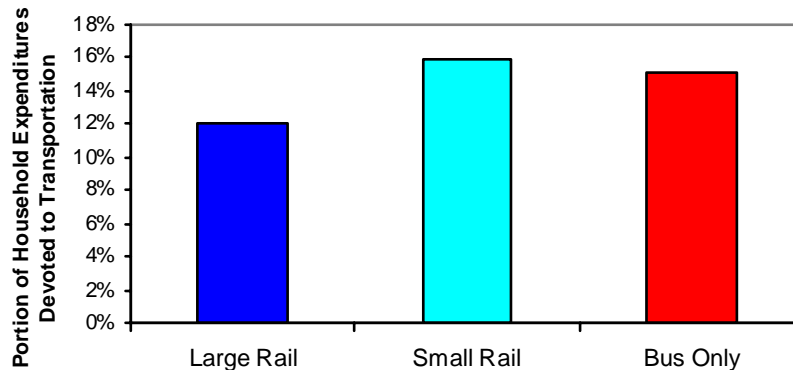
Figure 7 Percent Transport Expenditures (Litman 2004)



The portion of total household expenditures devoted to transportation (automobiles and transit) tends to decline with increased transit ridership, and is lower, on average, in Large Rail cities.

Residents of cities with high quality transit systems (called *Large Rail* in this analysis) devote just 12.0% of their income to transport, compared with 15.8% in *Small Rail* cities (cities with modest rail transit systems), and 14.9% in *Bus Only* cities (cities that lack rail transit), as illustrated in Figures 7 and 8. This represents about \$500 in annual per capita transport cost savings in the transit-oriented cities. International comparisons show similar patterns (Kenworthy and Laube 2000). However, transit-oriented development can stimulate gentrification which reduces housing affordability unless special efforts are made to increase the supply of lower-priced housing in such areas.

Figure 8 Percent Transport Expenditures



Transportation Affordability Improvement Strategies

*These strategies increase transportation affordability by improving the quality of lower-cost modes. For more information see the **Online TDM Encyclopedia** (www.vtppi.org/tdm).*

Nonmotorized Transportation Improvements

Nonmotorized transportation (walking, cycling, handcarts, etc.) are affordable forms of transportation by themselves, and as access modes to transit. There are many ways to improve pedestrian and cycling transportation.

Ridesharing

Informal ridesharing is a particularly important option for non-drivers and lower-income residents.

School Trip Management

Improving mobility options (walking routes, bicycle safety education, ridesharing, transit services) for students and parents can benefit lower-income households.

Telework

Telecommunications can often substitute for physical travel. Telework programs can help people obtain Internet connections and skills, particularly those who are lower-income.

Taxi Service Improvements

Taxi service is an important transportation option in many situations. Establishing formal taxi service can improve transportation options in many rural communities.

Transit Improvements

Transit services provide affordable mobility. Lower-income people tend to rely heavily on transit. Shifting travel from automobile to transit can provide vehicle operating cost savings, and may allow households to reduce vehicle ownership and associated costs.

Bike/Transit Integration

Bicycling integrates well with public transit (bus, train, ferry, and air transport). Transit is most effective for moderate- and long-distance trips on busy corridors, while cycling is effective for shorter-distance trips with multiple stops. Combining transit and cycling can provide a high level of affordable mobility.

Mobility Management Marketing

Many lower income people would like to use alternative transportation modes, but they feel stigmatized doing so. Mobility management marketing programs that raise the status of walking, cycling, public transit travel and car sharing can help increase transportation affordability.

Address Security Concerns

Many lower income people would like to use alternative transportation modes, but they feel unsafe doing so. Programs that address security concerns of walkers, cyclists and transit users, can help increase transportation affordability.

Increase the Affordability of Transport Services

These strategies reduce the financial costs of transport services.

Commuter Financial Incentives

Commuter Financial Incentives such as Parking Cash Out and Transit Benefits reward people who use alternative commute modes. This provides financial benefits to lower-income workers, who tend to use alternative modes more than average.

Commute Trip Reduction Programs

Commute Trip Reduction (CTR) (also called *Employee Trip Reduction* or *Vehicle Trip Reduction*) programs give commuters resources and incentives to reduce their automobile trips. Such programs can provide services that improve commuter affordability, including Rideshare Matching, Guaranteed Ride Home, Alternative Scheduling, Telework and Walking and Cycling Improvements.

Transit and Rideshare Subsidies

Subsidies that reduce transit and vanpool fares increase transportation affordability.

Location Efficient Development

Location Efficient Development consists of residential and commercial development located and designed to maximize accessibility. This improves affordable transportation options, such as walking, cycling and transit, and tends to significantly reduce household transportation costs. If implemented with parking management, it can increase housing affordability by reducing parking costs.

Improve Accessibility

These strategies improve transportation affordability by improving land use accessibility, which reduces the amount of physical travel needed to reach goods and activities.

Smart Growth

Smart Growth includes various land use management strategies that reduce automobile dependency by increasing transportation options and accessibility. It can increase overall household affordability by reducing transport costs and increasing housing options in more accessible neighborhoods. Specific Smart Growth strategies include:

- Access management
- Clustering
- Location efficient development
- New urbanism
- Transit oriented development

Address Security Concerns

Many lower income people would like to live in more accessible neighborhoods or use alternative transportation modes, but they feel unsafe doing so. Programs that address the security concerns of urban neighborhoods, can help increase transportation affordability.

Make Automobile Use More Affordable

These strategies improve transportation affordability by reducing the cost of using an automobile.

Carsharing

Carsharing refers to automobile rental services intended to substitute for private vehicle ownership. It makes occasional use of a vehicle affordable, even for low-income households.

Pay-As-You-Drive Pricing

Pay-As-You-Drive vehicle insurance and registration fees convert these into variable costs: the less you drive the less you pay. This makes vehicle ownership more affordable if motorists limit their driving.

Vehicle Fees

A common strategy proposed for increasing transportation affordability is to minimize motor vehicle user fees such as fuel taxes, road tolls and parking fees. However, these strategies can have undesirable overall economic and transportation impacts, and their ability to increase affordability is limited. Low vehicle user fees require increases in other fees and taxes increase, such as rents and property taxes. The affordability impacts depend on exactly how these costs are distributed.

Only about two-thirds of low-income households own a motor vehicle and lower-income households drive relatively few annual miles, particularly on congested urban highways (the roads that are most often tolled) so general fuel tax and toll reductions are an inefficient way to increase low income household affordability. Higher income consumers capture most of the benefits. Targeted discounts and exemptions are far more efficient.

Also, low vehicle fees tends to increase total vehicle travel, which increases traffic congestion, accident risk and pollution emissions. Economically and physically disadvantaged people often bear these costs, including increased congestion delays when they travel by automobile or bus; increased accident risk when they walk, bicycle or drive; and increased exposure to air and noise pollution.

Described differently, vehicle fees may increase without reducing overall affordability if implemented with strategies that increase housing affordability and transport options, and with targeted discounts and subsidies. Overall affordability impacts depend on several factors, including how groups are defined (for example, whether analysis evaluates impacts on low-income motorists or on all low-income people, including those who do not drive), the quality of transport options available, and how revenues are used. If revenues are used to reduce other taxes or improve affordable transportation options (such as improving walking and cycling conditions, and transit services), lower-income households may benefit overall.

Housing Affordability

Policies that stimulate more dispersed, automobile-dependent home location by lower-income households puts them at financial risk (Dodson and Sipe 2006). To the degree that lower current fuel prices encourage sprawl development patterns and sprawled housing choices by lower-income households it reduces their future affordability.

More affordable transportation tends to improve households' economic resilience, that is, they are better able to respond to unexpected financial burdens such as fuel price increases, vehicle failures or income losses, and so it reduces housing foreclosures. According to the *Location Efficiency and Mortgage Default* study, the probability of mortgage foreclosure increases as neighborhood vehicle ownership levels rise, after controlling for income (NRDC 2010). These results suggest that public policies that support location efficiency can help to reduce mortgage foreclosures, and that loans are safer for housing in more multi-modal locations.

Several strategies can increase affordable-accessible housing (Tompkins County 2009; Obrinsky and Debra Stein 2007; Pollack, Bluestone and Billingham 2010):

- Reduced parking requirements.
- Unbundling parking (i.e., renting parking separately from housing).
- Reduced restrictions on density, land use mix and secondary suites.
- *Location Efficient Mortgages*, which means that lenders recognize the potential savings of a more accessible housing location when assessing a household's borrowing ability.
- Smart growth reforms that reduce development and utility costs for infill development.
- Urban service improvements (such as better local schools, traffic calming, and street maintenance) can make urban neighborhoods more attractive and suitable for lower-income residents.

True Housing Affordability – by Jim Lazar

An “affordable” home is one that:

- Is located close to transit, shopping, schools and employment, so households can reduce the number of vehicles they must own (for example, owning one rather than two cars), and the miles they must drive. This can save \$2,000 - \$5,000 per year in vehicle ownership and operating costs.
- Is energy efficient. This can save \$500 - \$1,000 per year.
- Is built with quality materials. This can reduce annual maintenance and replacement costs.
- Is built with non-toxic materials. This helps prevent respiratory illnesses, saving 2-10 sick days annually. The economic value of good health is extremely high, if difficult to measure.
- Supports community cohesion (more friendly neighborly interactions). This tends to increase security, reduce expenses such as childcare, and improve residents' quality of life.

It is the sum of the mortgage payments, the maintenance costs, the transportation costs, health care costs and child care costs that determines affordability, not just the seller's asking price for a home.

Examples and Case Studies

Examples of affordable transport policies and projects are described below.

Redeveloping Parking Lots (CNT 2006)

The study, *Paved Over: Surface Parking Lots or Opportunities for Tax-Generating, Sustainable Development?* (www.cnt.org/repository/PavedOver-Final.pdf) by the Center for Neighborhood Technology, evaluates the potential economic and social benefits if surface parking lots around rail transit stations were developed into mixed-use, pedestrian friendly, transit-oriented developments, with case studies of nine suburban communities with rail transit service in Cook County, Illinois. The analysis concludes that such development could help to meet the region's growing demand for affordable, workforce, senior, and market rate housing near transit, and provides various benefits including increased tax revenues and reduced per capita vehicle travel. The parking lots in these nine case studies are estimated to be able to generate 1,188 new residential units and at least 167,000 square feet of new commercial space, providing additional property tax revenues in the hundreds of thousands of dollars per year at each site, plus significant reductions in trip generation and transportation costs compared with more conventional development.

Oil Vulnerability Index

Fishman and Brennan (2009) developed an *Oil Vulnerability Index* which assesses the household financial risks of oil price increases in Victoria, Australia. The analysis indicates that fast-growing outer suburbs are particularly vulnerable to oil price rises due to their high levels of automobile travel and relatively low incomes. Future petrol price increases are likely to place significant financial stress on such households.

Transportation Cost Impacts on Household Affordability (Weinstein Agrawal, et al. 2011)

This study used in-depth interviews to examine how transportation financial stresses such as reduced income and higher fuel prices affect low-income families. It investigated four general areas of interest: travel behavior and transportation spending patterns; the costs and benefits of alternative modes of travel; cost management strategies; and opinions about the effects of changing transportation prices on travel behavior. Key findings include:

1. Most low-income households are concerned about their transportation costs.
2. Low-income individuals manage their household resources to survive on limited means and to respond to changes in income or transportation costs.
3. In making mode-choice decisions, low-income travelers, like higher-income travelers, carefully evaluate the costs of travel (time and out-of-pocket expenses) against the benefits of alternative modes available to them.
4. Some low-income individuals were willing to accept higher transport expenditures—such as the costs of auto ownership or congestion tolls—if they believed that they currently benefit or would potentially benefit from the increased expenses.
5. Although low-income households find ways to cover their transportation expenditures, many of these strategies have negative effects on their lifestyles.

The report concludes with recommendations for increasing transportation affordability, minimizing the impact of new transportation taxes or fees on low-income people, and developing new research and data collection strategies.

Mixed-Income Housing TOD Action Guide (www.mitod.org/tools.php)

The *Mixed-Income Housing TOD Action Guide* describes many of the same strategies recommended in this report to help create more affordable-accessible housing:

- [Adjust Zoning to Promote Diversity](#)
- [Brownfield Remediation](#).
- [Community Land Trusts](#)
- [Condominium Conversion Controls](#)
- [Development Agreements](#)
- [Fast Track Permitting](#)
- [Fee Waivers, Reductions, Deferrals](#)
- [First-Right-of-Refusal Laws for Tenants and Nonprofits](#)
- [Implement physical transit-access improvements](#)
- [Improve transit knowledge](#)
- [Incentive-Based Zoning](#)
- [Inclusionary Zoning](#)
- [Joint Public/Private Development](#)
- [Land Banking](#)
- [Limited Equity Housing Co-ops](#)
- [Linkage fees](#)
- [Parking Maximums for Transit Areas](#)
- [“Project Based” Section 8 Preservation](#)
- [Provide greater access to transit discounts and resources](#)
- [Public Land Dedication or Write-Downs](#)
- [Public Land Disposition Plan](#)
- [Reduced Parking Requirements](#)
- [Regulatory Accommodation for Small Sites](#)
- [Rent Control](#)
- [Self-help programs](#)
- [Site parks & schools](#)
- [Site social service facilities](#)
- [Subsidized housing redevelopment/renovation](#)
- [Support start-up nonprofit developers](#)
- [Target-property Acquisition & Rehabilitation funds](#)
- [Tax Forgiveness for Back Taxes on Affordable Housing Opportunity Sites](#)
- [TOD-Targeted Homeownership Assistance](#)
- [TOD-Targeted Housing Financing](#)
- [Transfer taxes](#)

Accessible Suburban Multi-Family (Larco 2010)

Nearly a quarter of all suburban housing is multifamily, but such development tends to have poor accessibility due to inadequate connections (sidewalks, paths and roads) to nearby commercial areas. Such housing fails to reach its potential for reducing automobile travel and increasing active travel. The enclave nature of most suburban multifamily housing results, in part, from regulatory and planning practices that promote

enclave design. This includes a general lack of specificity in multifamily codes; code-dictated buffers between dissimilar uses; a general lack of street network regulation for multifamily developments; a perception by planners that multifamily housing should primarily act as a buffer between commercial and single-family uses; a general unwelcoming attitude towards this development type; and a general lack of attention given to this housing typology. Various policy and planning reforms can improve suburban accessibility, including street connectivity standards; programs to create more sidewalks, crosswalks and pedestrian shortcuts; shifts to smaller parking lots, and walkability improvements within developments to facilitate pedestrian travel.

GreenTRIP (www.transformca.org/GreenTRIP)

GreenTRIP is a Traffic Reduction + Innovative Parking certification program for new residential and mixed use developments. It rewards projects that reduce traffic and greenhouse gas emissions. *GreenTRIP* expands the definition of green building to include transport to and from the buildings. Each certified project receives a *Project Evaluation Report* which describes the project location, details and inventories how the project meets *GreenTRIP* standards. This typically includes features such as an accessible and multi-modal location (near shops and other services, good neighborhood walkability, near public transit), parking management, carshare services, discounted public transit passes, and affordable housing. The program provides the following support:

- *Tailored Traffic Reduction Strategies* – Experts work with developers, designers and operators to identify the most appropriate transport and parking management strategies.
- *Public Hearing Testimony* - *GreenTRIP* staff will explain the traffic and greenhouse gas reducing benefits achieved by *GreenTRIP* Certified projects to decision-makers and the public.
- *Market Differentiation* - Use of the *GreenTRIP* name and logo in promotional materials, and a plaque to mount on the project when built.

As of March 2010 the following projects were certified:

The Crossings (www.transformca.org/files/SLCrossingsProjEvalRpt.pdf)

Parker Place (www.transformca.org/files/ParkerPlace_ProjEvalRpt.pdf)

Station Park Green (www.transformca.org/files/StationParkGreenProjEvalRpt.pdf)

The Ohlone (www.transformca.org/files/OhloneProjEvalRpt.pdf)

Conclusions

Our modern economy provides a wonderful array of goods and services to affluent consumers but tends to be less responsive to people with lower incomes. This is particularly true of transportation. North American transport systems are not very affordable. They are designed to serve motorists. Affordable options, such as walking, cycling, ridesharing and public transit are generally inferior and poorly integrated.

As a general rule, transport is unaffordable if it requires more than 20% of low-income household's total budget. For most low-income households, affordable transportation requires a multi-modal transport system with high quality walking, cycling, public transit, carsharing and taxi services, plus accessible land use patterns, particularly affordable housing located in accessible, multi-modal locations.

Transportation inaffordability is a significant economic and social problem. It constrains people's economic opportunities (for example, ability to access education and employment opportunities), and forces households to spend an excessive portion of their budgets on transport, limiting their ability to purchase other essential goods.

Conventional planning considers a relatively limited range of transport affordability impacts and objectives. More comprehensive analysis can help decision makers better understand the affordability impacts of planning decisions, and to identify more effective strategies for improving transport affordability. The following factors should be considered when evaluating transport affordability:

- Impacts on accessibility rather than just mobility.
- Individual needs and abilities (such as physical ability).
- Household incomes and budgets.
- Land use patterns (the degree of accessibility).
- Transportation options (the quantity and quality of affordable transport modes).
- Transportation costs (including all costs, not just fuel or transit fares).
- Affordability index (combined transport and housing costs).
- Total economic impacts (including indirect, external and non-market costs and benefits).

There are many possible ways to improve transport affordability. Strategies that increase affordability by underpricing motor vehicle use tend to impose indirect costs, including higher housing and tax costs, and increased traffic problems and sprawl. Those that improve affordable transport options, such as walking, cycling and public transit, help achieve other planning objectives and so can provide the greatest overall benefits.

Locating affordable housing in multi-modal, accessible communities tends to significantly improve transportation affordability. Automobile transport affordability can be increased with distance-based vehicle insurance and registration pricing, parking cash out and unbundling, and carsharing, which makes occasional automobile use affordable.

Improving transport affordability can significantly increase disadvantaged people's opportunity and happiness, and so it helps support economic development and increase social equity. It is therefore an important transport planning objectives.

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