



## 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 to society, how to evaluate it for transport planning, and practical ways to improve it. A variety of factors affect transportation affordability, including individuals' mobility needs and abilities; the quantity, quality and pricing of mobility 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 more effective strategies for improving transport affordability. Transportation affordability strategies that underprice motor vehicle use tend to impose indirect costs, while those that improve other travel options tend to support other planning objectives, such as improved safety, community cohesion, and environmental protection, and so tend to provide 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 important goods and services.  
*Transportation affordability* refers to people’s financial ability to access important goods and activities such as medical care, basic shopping, education, work and socializing.

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 affordability. Modern transport planning responds well to demands of wealthy travelers but not to the needs of the poor. Current planning supports automobile, air and freight transport but does much less to improve affordable modes such as walking, cycling and public transit travel, or to insure that affordable housing is available in accessible locations. 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.

Some transport affordability strategies are economic transfers, cost shifts rather than true cost reductions, which tend to be economically inefficient because they violate the principle that prices reflect marginal costs, and so encourage inefficient consumption. For example, driving is made more affordable by financing parking facilities within building budgets which reduces housing affordability, a portion of roadway costs are borne through general taxes rather than user fees, and automobile insurance is made affordable to higher-risk drivers by overcharging lower-risk drivers.

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

## The Value of Affordability

Transportation and housing inaffordability creates various problems. It is a major burden on lower income households, and so is inequitable. It increases stress, reduces economic opportunity, and can lead to medical and social problems.

Inaffordability can reduce economic development. Low- and medium-wage jobs are an important economic input, representing 20-50% of total jobs. Even high wage industries require numerous lower-wage support employees. For example, physicians, lawyers and business executives require receptionists, technicians and cleaners. If a community has a high cost of living, businesses may have difficulty filling positions, be forced to pay higher wages, have higher turnover, and more employees working multiple jobs, reducing their availability and work quality. Workers may be forced to commute long distances in old cars, leading to stress and unreliability. Some potential workers may stay on social assistance rather than move to areas with more jobs 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.

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 tends to raise wages.*

Not all employees are equally affected by inaffordability. Some pay no rent because they live with family, own their homes or have subsidized housing. Some may accept inferior housing in exchange for a better quality of life or long-term economic opportunities. But once this pool 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.

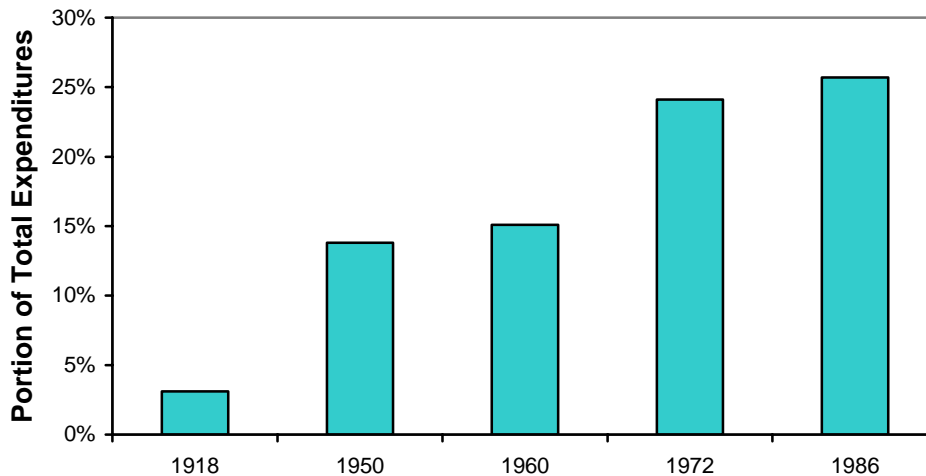
**Table 2** Average Household Expenditures (Johnson, Rogers and Tan 2001)

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)<sup>1</sup>**

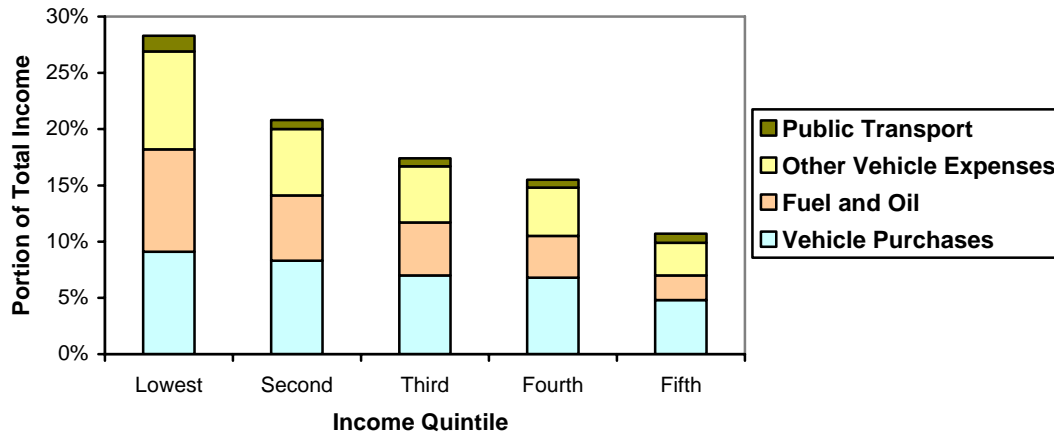
	Total	Lowest	Second	Third	Fourth	Fifth
Income	\$3,091	\$10,531	\$27,674	\$46,213	\$72,460	\$158,388
Expenditures	\$49,638	\$20,471	\$31,150	\$42,447	\$57,285	\$96,752
Persons	2.5	1.7	2.2	2.5	2.9	3.2
Vehicles	1.9	0.9	1.5	2	2.4	2.8
Owns at least one vehicle	0.88	0.65	0.89	0.94	0.96	0.98
Food	\$6,133	\$3,035	\$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%
<b>Transport subcategories</b>						
<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.*

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.

<sup>1</sup> For European household expenditure statistics see EuroStat (2008).

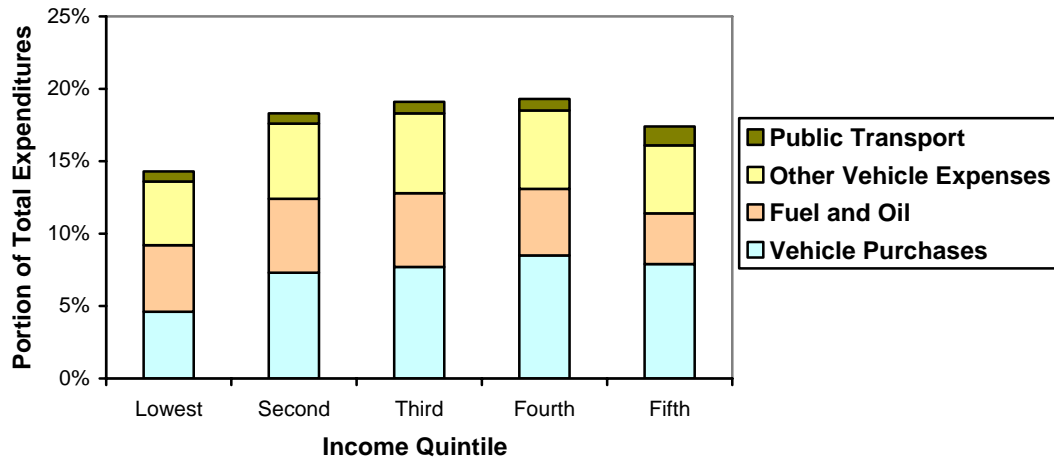
**Figure 2** Transport Expenditures (BLS 2007)



*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.

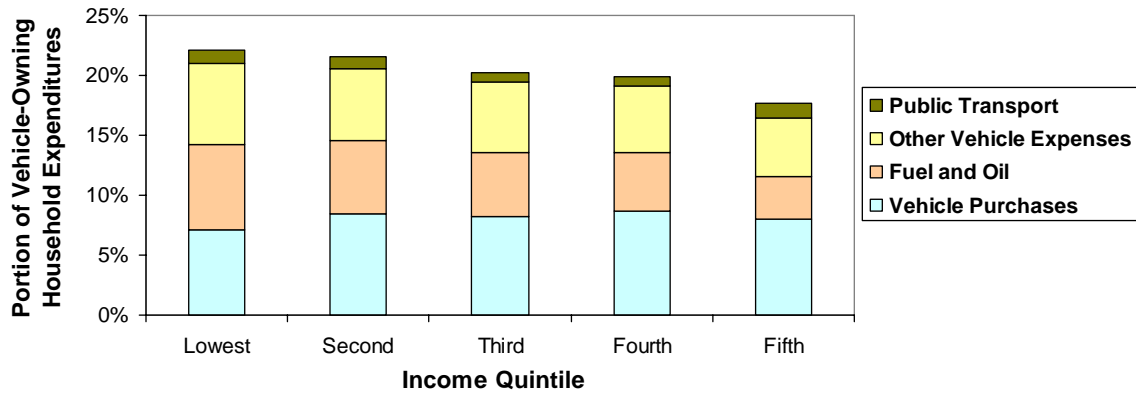
**Figure 3** Transport Expenditures (BLS 2007)



*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 160 hours	Taxes	Net	Housing 39%	Food \$254	Remainder	Car Costs \$200	Car-Free \$50
\$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.*

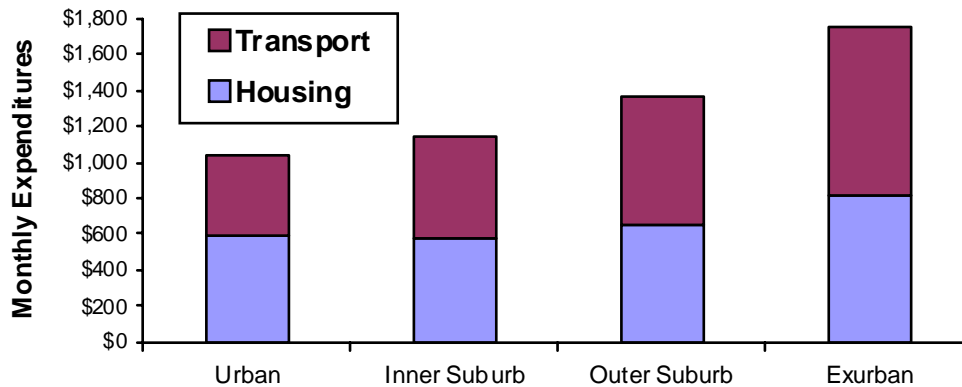
*Implications:*

- 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

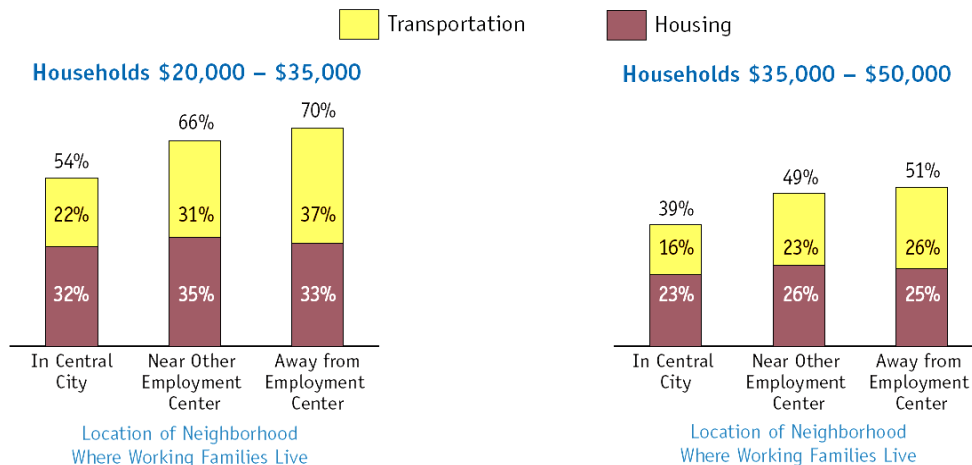
Various indicators that can be used to evaluate transportation affordability are described below.

### Affordability Index – Combined Transportation and Housing Costs

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. Miller, et al. (2004) found similar results in the Toronto region, finding that a typical household would spend about \$5,800 annually in additional motor vehicle costs if located in a suburban area. 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).

**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.*

#### 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)

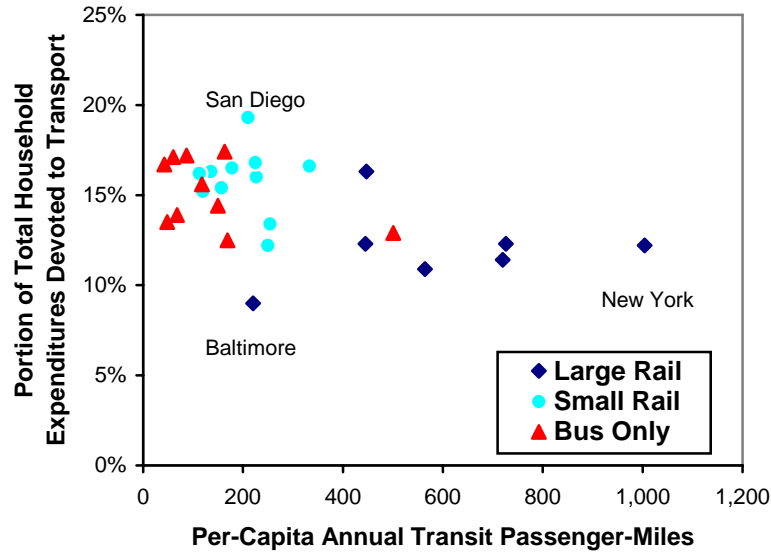
Portion of Demand Met	Transit Level-Of-Service
90% or more	A
85-89%	B
50-74%	C
25-49%	D
10-24%	E
Less than 10%	F

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).

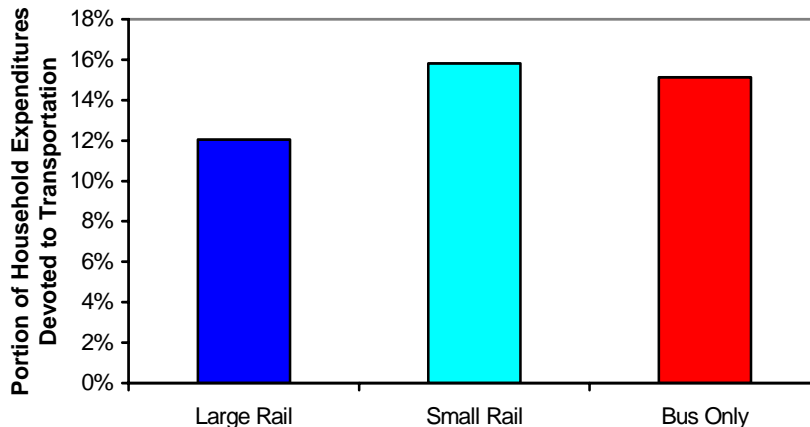
**Figure 7** Percent Transport Expenditures (Litman 2004)



*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).

**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](http://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**

A number of strategies can be used to increase housing affordability in accessible locations, increasing overall affordability. These include:

- Reduced parking requirements.
- Unbundling parking from housing costs (i.e., renting parking spaces separately from housing units).
- 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, particularly 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 (designed to encourage 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.

## **Conclusions**

Transportation affordability is an important economic and social issue. Unaffordable transport imposes significant financial burdens and reduces opportunities for disadvantaged people. 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).

As a general reference, transportation expenditures (excluding expenditures on luxury travel, such as long-distance vacation trips) can be considered unaffordable if they exceed 20% of a household's total expenditures, which is slightly higher than the national average. For higher income households this allows virtually unlimited automobile travel, but for low-income households, affordable accessibility requires multi-modal transport systems with high quality walking, cycling, public transit, carsharing and taxi services, plus accessible land use patterns, particularly affordable housing located in multi-modal locations well served by non-motorized modes and public transit.

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.

Increasing transportation affordability is one of the most effective ways to reduce stress on lower-income households and improve opportunity for disadvantaged people. This helps achieve both equity objectives, because it benefits disadvantaged people, and economic development objectives, because it increases people's access to education and employment

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