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Maximizing Mobility in Los Angeles – First & Last Mile Strategies

Volume II
APPENDICES

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APPENDIX 1

FIRST/LAST MILE STRATEGIES NOT ADVANCED FOR FURTHER CONSIDERATION

Private/Institutional Shuttle Services

Overview

Shuttle buses typically serve a clearly-defined group of riders in a well-defined area or along a specific route. Shuttle service is usually from point to point, or between one point and many to fill gaps or make connections with the broader public transit network, often for specific groups of individuals. Fares are usually free or nominal. Shuttles are an important aspect of first mile/last mile connectivity because they provide convenient and direct service to desired destinations.

Existing Conditions

Private/institutional shuttle services have gained enormous popularity in recent years. They serve as connectors to and from the regional transit system with employers or institutions, and can also provide important neighborhood circulation. Shuttles provide a service that is finely tailored to local needs. Some of the most successful shuttles are privately funded, or funded through public/private partnerships. Shuttle operations usually fall under three main categories or combinations thereof: 1) city supported and operated; 2) transit agency operated; and 3) employer operated.

There are several types of shuttle services that can be used to help fill first/last mile gaps. Some examples include:

- *Circulating shuttles*– typically carry passengers for short trips along busy corridors, including business districts, employment and education centers, and recreation areas. Circulating shuttles may connect major activity centers, such as a transit station and a commercial or employment center.
- *Jitney services*–privately operated transit services or jitneys typically operate along busy corridors or major thoroughfares. Riders are usually charged a modest fare. In developing countries these are often a primary transit service. In North America they can augment conventional public transit.
- *Mobility-to-Work*– Shuttle programs provide special reverse-commute services between low-income neighborhoods and suburban employment centers. These services may be operated by transit agencies, social service agencies, or private contractors funded through government grants.

Targeted shuttle services can bridge the first/last mile to public transit by providing a transportation alternative to solo driving. A successful shuttle may increase overall transit ridership, reduce reliance on the automobile, and decrease traffic congestion. Shuttle services could be used to “collect” passengers from lower density residential neighborhoods to a central transit stop, or provide direct transfers from regional transit stops to employment or retail centers, that are not considered a reasonable distance or path to walk.

Description of historical/existing services or programs

Many shuttles in Los Angeles offer travel between one or a few regional transit stops and one or several key destinations. Some demand-response bus services such as airport shuttles, express or other bus commute options are included in this category. These services are typically provided by private bus operators and can be important last mile connections.

The FlyAway Bus is one example of a shuttle bus which transports passengers non-stop to and from Los Angeles International Airport (LAX). The FlyAway is administered and funded by Los Angeles World Airports. Currently, there are three routes in service which begin at Union Station, Van Nuys Airport, and Westwood. One way fares for the FlyAway are six dollars from Union Station and Van Nuys and five dollars from Westwood. Shuttles run generally every half hour during morning and evening commute times and every hour mid-day. The FlyAway is part of the LAWA ground transportation initiative to improve passenger convenience, reduce traffic congestion and vehicle emissions pollutants by encouraging high-occupancy vehicle ridership as part of the LAX Master Plan Mitigation Monitoring and Reporting Program. LAWA reported the LAX FlyAway network serviced more than 1.5 million passengers in 2008; saving its passengers from driving a combined total of 23 million vehicle miles, and saving nearly one million gallons of gasoline.

DASH is a shuttle service run by L.A. Department of Transportation. Presently there are six Downtown DASH weekday routes and three routes which provide weekend service. The typical weekday span of service is 6:30 AM until 6:30 PM on weekdays, with frequent service throughout the day (5 - 10 minute headways). The weekend span of service is typically 10:00 AM until 5:00 PM. The weekday DASH primarily serves riders employed in or visiting Downtown, as part of their commutes and/or lunch hour activities. A major function of Downtown DASH is to serve as a link between regional transit services, parking facilities, and Downtown destinations.

Demand / ridership / usage

Ridership can vary greatly among shuttles services. The Santa Barbara Shuttle and Emery Go-Round (both described in further detail under Best Practices) carry an average of 48 passengers per hour. However, the Foster City Sunshine Shuttle, which is no longer in service, carried only 4.2 passengers per hour in FY2002. (see Figure 1).

Benefits

Shuttles can substitute for part or all of a vehicle trip, and can support many other TDM strategies. Shuttle buses often increase use of public transit, ridesharing, and non-motorized transit. Since shuttles are typically operated at times and in places where demand is high, they can provide significant congestion reduction benefits. They can reduce parking demand when they replace auto trips, or they can shift parking to less expensive locations. Shuttles increase travel choices, while providing environmental benefits by reducing single occupancy vehicle travel. There are many potential community benefits as well, including a reduced need for parking lots, air quality improvements, and a show of support for pedestrian-friendly policies.

Costs

Capital Costs

The capital cost items for shuttles consist of initial or startup capital expenses and vehicles. In addition to the cost associated with purchasing new vehicles, capital costs include customer amenities such as bus shelters, information displays, and bus stops and signs. Many shuttle bus operators are testing new technology that will integrate schedule information for shuttle services to complement the regional transit system. Capital costs vary greatly depending on whether the shuttle operator purchases or leases vehicles and if bus stop amenities are already in place.

Operating Costs

The main operating expense for any shuttle service is day-to-day operations which is typically expressed as an hourly rate to provide service. Operating costs vary; ranging from $50 to $100 per hour, depending on geographic location, clientele, vehicle type, level of service and amenities provided and/or coordination with other providers. Most shuttle services use a contractor for day-to-day operations. The contractor typically provides, stores, maintains, fuels, and insures the vehicles, as well as employs drivers to operate the service.

Another operating expense for a shuttle service is general administration. It includes management and oversight, marketing and public information, service evaluation, planning and budgeting.

Costs to Consumers

Shuttles are usually free of charge or have a nominal fare. Sometimes employers or other sponsors offer discounted monthly passes on public transit services and/or parking cash-out to employees or other constituents which also covers the shuttle fares. Free fares are a major incentive to encourage shuttle usage.

Best Practices

Emery Go Round

The Emery Go Round is a shuttle service providing a connection between the MacArthur BART station and major employment and retail centers in Emeryville. The Emery Go Round is free of charge and available to the general public. The service is administered by the Emeryville Transportation Management Association (TMA), a non-profit organization whose purpose is to increase access and mobility to and from Emeryville businesses. The TMA and the shuttle service is funded through a property- based business improvement district (PBID), with all commercial and industrial property owners in the City paying a fee to support the TMA and shuttle services.

The Emery Go Round provides service throughout Emeryville, with stops at the Emeryville Amtrak Station, Bay Street Center, and major employers such as Pixar and Novartis. The MacArthur BART Station in Oakland is a key transfer point for connections to regional transit. The service schedule has expanded its hours of operation and frequency has increased in the past several years. Weekday service runs from 5:45 am to 10:00 pm, Saturday service is provided from 9:30 am to 9:30 pm and Sunday service is available from 10:30 am to 6:00 pm. Headways range from 12 minutes during weekday peak hours to 45 minutes on weekends. Real time arrival information for all routes is provided by NextBus. Riders can get arrival times either online or by calling a phone number and entering a code for a particular bus stop.

The Emery Go Round has 12 buses in its fleet that have between 24 and 36 seats, and one van with nine seats. The TMA owns seven of these buses and leases the other six. Labor for the shuttle is provided through a contract with SFO Shuttle Bus Company. During the peak hour ten buses are in operation. Operating expenses in 2007 were $1.6 million, and the cost per passenger trip was $1.51. Ridership on the Emery Go Round has grown steadily since service began in 1997. Ridership in 2003 was 775,392, with an anticipated 1.3 million passenger trips in FY 2008. In 2008, the shuttle carried about 5,000 passengers every weekday. Approximately 80% of all Emery Go Round trips begin or end at MacArthur BART Station, supporting a

significant increase in patronage at the station and a shift in primary mode of access; clearly a successful first /last mile connection.

Caltrain Shuttle Program

Caltrain is a 75 mile rail service connecting San Francisco near the Giant's Ballpark to Gilroy in Santa Clara County, with 32 stops in between including San Jose and Palo Alto. Caltrain offers an extensive shuttle program throughout San Mateo and Santa Clara Counties. The goal of the program is to connect employment locations to Caltrain, enabling access to jobs that are too distant from the station for a convenient walk. Funding is typically from three sources – local employers, Transportation Fund for Clean Air (TFCA)[1]regional grant funds, and the Peninsula Corridor Joint Powers Board (JPB) local monies. The percent contributions from these three funding sources are approximately 25%, 25%, and 50%, respectively.

The shuttle program has proven to be a major contributor to Caltrain's commuter rail ridership growth over the past few years. One of the shuttle programs run by Caltrain is the Burlingame Shuttle. The Burlingame Shuttle bus program links the city's major shopping and employment areas with the Millbrae Station. There are three free shuttles that serve the City of Burlingame and all are managed by the Peninsula Traffic Congestion Relief Alliance, a local TDM agency.

1. The Burlingame Bayside Area Shuttle carries commuters from the Millbrae Intermodal Station to Burlingame businesses during the weekday morning and evening commute hours;
2. The North Burlingame Shuttle began July 1, 2003 and connects the Millbrae Intermodal Station with the Peninsula Medical Center and Sisters of Mercy educational facilities;
3. The Burlingame Trolley runs seven days a week from 12:00 noon to 9:45 PM with a break during the 3 o'clock hour, and serves Burlingame shopping areas and Airport Hotels. On Fridays, Saturdays, and holidays, the service continues with extended evening hours until 11:15 PM.

The Burlingame shuttles are paid for with a combination of public and private funds as described above.

Palo Alto Shuttle

The Palo Alto Shuttle consists of two shuttle routes, the Embarcadero and the Crosstown. The shuttle is publicly funded, free to passengers, and operates on weekdays and Saturdays. The Embarcadero route operates from the Palo Alto Caltrain Station to the office parks located in the East Bayshore area and Palo Alto High School. The Crosstown route links downtown Palo Alto with retail, social service, and community centers throughout the city. The Embarcadero Shuttle operates only during the weekday commute periods, 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM. The Crosstown Shuttle operates from 9:00 AM to 3:00 PM on weekdays and from 8:00 AM to 6:00 PM on Saturdays. Both shuttles operate every half-hour.

The City of Palo Alto pays the full amount of operating the shuttles from its General and Utilities Benefit Funds. The Parking Company of America operates the shuttle, charging the city between $36 and $45 an hour.

[1] These funds are administered by the Bay Area Air Quality Management District (BAAQMD)

Santa Barbara Shuttles

The Santa Barbara Metropolitan Transit District operates two shuttles within the City of Santa Barbara. One serves only the downtown area while the other circulates between downtown and the waterfront area. The fare is $0.25. Both the Downtown Shuttle and Waterfront Shuttle run from approximately 10:00 AM to 6:00 PM, seven days a week. The downtown shuttle operates on ten-minute headways while the waterfront shuttle operates every 30 minutes. The primary goal of the system has been to provide employees, shoppers, and tourists access to downtown Santa Barbara. The shuttle has been extremely successful, serving 49 passengers per hour in fiscal year 2000. During the spring and summer tourist season, many shuttles operate at capacity.

Summary

A summary of information on the shuttle services is presented in Figure 1. Although the type of shuttle service and the need for shuttle service may vary from community to community, the best practices review reveals that there are several key factors that make a shuttle successful including:

- Secure start-up and ongoing funding commitments, typically in the form of a public/private partnership;
- Integrated and coordinated with regional fixed-route bus or rail transit service
- Linking employment sites or residential areas with major transit stops or stations
- Partnerships between transit operator(s), local agencies, businesses and/or non-profit groups.

Other criteria for successful shuttles includes:

- Free or nominal fare
- Frequent service
- Strong marketing campaign important for gaining public support and recognition
- High tech marketing (Next bus real time information) and passenger convenience
- Coordinated time connections with regional transit service

Figure 1 ShuttleService Information

Shuttle Programs	Service Area	Routes	Annual Riders	Annual Cost	Fares	Funding Sources	Other Information
Emery-Go-Round	MacArthur BART, Emeryville employers, shopping, homes	4	850,000	$1.6 million	Free Open to all	Emeryville Property Improvement District	Real-time schedule info via Web (map) and phone EGR contracts with AC Transit for fuel, washing
Caltrain JPB	Caltrain stations, employers in San Francisco, San Mateo and Santa Clara counties	35	1,000,000	$3.2 million	Free Open to all	Caltrain, C-CAG, Measure A, Air District, employers	Funding usually 25% employer/city, 25% BAAQMD, 50% Caltrain Some managed by Peninsula Congestions Relief Alliance ("The Alliance")
Burlingame	Millbrae Caltrain/BART, high school, homes, hospital, hotels, shopping areas	2	8,240 +Trolley	$67,120 + trolley	Free Open to all	Burlingame, Mercy High, Mills Hospital, C/CAG	Burlingame shuttle M-F AM and PM peaks Trolley F, Sa, Holidays Noontime and Evenings Managed by The Alliance
East Palo Alto	East Palo Alto homes, senior center, shopping, Caltrain, schools	2	27,650	$210,000	Free Open to all	Federal JARC grant, Air District, C/CAG, Measure A Caltrain	Home-to-Caltrain shuttle runs 7 days a week AM and PM peaks Strong public and private support
Santa Barbara Shuttle	Downtown Santa Barbara and waterfront.	2	762,532	$892,200	$0.25 Open to all	81.5% farebox recovery. The transit District funds the rest.	Downtown and waterfront shuttle run 7 days a week, 10 AM to 6 PM Vehicles exceed capacity in summer

Source: MTC Transit Connectivity StudyTechnical Memorandum 7 - Plan for Last Mile Connecting Services. March 3, 2006

Expansion Potential in Los Angeles

Opportunities

It is important to understand the urban context in which a shuttle service might operate. Shuttle services are typically more successful in mixed-use and densely populated areas. Employer shuttles are one example of a successful shuttle model.

Los Angeles possesses a sizeable private transit industry, which includes airport shuttles, taxi fleets, dial-a-ride services, and vanpools.Shuttle services have the potential to offer greater transportation flexibility to persons living and working in Los Angeles and are cost effective compared to the cost of fixed-route bus operations. Since congestion is a significant problem in Los Angeles, people using shuttles mean fewer cars on the streets. Shuttle service can also serve as a tourist attraction and amenity that serves shoppers. Shuttles offer many other potential community benefits, such as a reduced need for parking, air quality improvements, and support of pedestrian-friendly policies.

New/pending policies, regulations, or incentives

Several public policies are critical for the establishment of a large commuter shuttle industry. Entry into the van transportation business would have to be deregulated, so that entrepreneurs are encouraged to try new ways of meeting transportation needs. The regional network of HOV lanes in Los Angeles offers a speed and time advantage that shuttles can utilize and commute voucher programs can also be used to encourage new transit services in the region.[2]

Joint partnerships

Successful shuttle services rely on public/private partnerships. Cities and other public agencies often provide administrative oversight and contribute public funds. Typical funding agencies include the Air Districts, transit agencies, local governments and sponsoring organizations. Public agencies sometimes provide in-kind services.

The private sector oftentimes contributes additional financial support. The private sector, broadly interpreted, can include employers, merchants, retail establishments, and business clubs such as the Chamber of Commerce or Lion's Club. Employers or merchants that benefit from the shuttle service may be interested in supporting it, particularly if a bus stop were located at their front door (maximizing convenience for their employees or customers).

Emerging political will / public opinion

Community input and support are necessary to form a success shuttle service. This is important not only for promotional purposes and attracting riders (making the shuttle an integral part of the community), but also for potential funding prospects.

[2] Poole, Robert W., Michael Griffin. Shuttle Vans: The Overlooked Transit Alternative. Reason Foundation. April 1994.

Challenges

There are many challenges to establishing and maintaining successful shuttle services. Some of the challenges include:

- Identifying and capturing new markets for shuttle services. This could include locations where parking is in limited supply or highly priced, or other circumstances where driving is undesirable.
- Finding a champion to take a lead role in organizing a shuttle service. The tasks can be daunting, from identifying customer needs and preferences, to developing a shuttle service and establishing an operating plan and negotiating funding arrangements, to ongoing communications with local agencies, transit providers and businesses and/or rider groups.
- Forging partnerships between public agencies and private organizations. This is especially critical when developing a funding strategy and ensuring longer term financial solvency.
- Coordinating with and complementing fixed-route bus or rail connections. Shuttles are most effective when transit operators are active partners in the provision of shuttle services.
- Designing a shuttle service that incorporates new technology, convenient connections, and customer amenities.
- Locating specific shuttle stops. A shuttle stop sign will help customers know where to wait for the shuttle that is safe and convenient.

Carpool

Overview

Carpooling is the shared use of a car by the driver—usually the owner of the vehicle—and one or more passengers. When carpooling, people either get a ride or offer a ride to others instead of each driving separately. Carpooling arrangements and schemes involve varying degrees of formality and regularity. Carpools may be formal - arranged through an employer, public website, etc., or casual, where the driver and passenger might not know each other or have agreed upon arrangements. This section focuses on formal carpools (for more information on casual carpools, see Chapter 4). Carpooling can be used as a first mile/last mile connector by efficiently connecting with public transit or other alternative commute modes.

Existing Conditions

Carpooling currently exists in Los Angeles. Los Angeles has an extensive network of facilities and High Occupancy Vehicle (HOV) lanes that make it convenient to share a ride (See Figure 2). CommuteSmart.info is a free service that provides public ridesharing services, including carpool information, in the Southern California region. Commute Smart is a collaboration of five countywide transportation agencies and serves five counties in Southern California, including Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. Roger Snoble, CEO of the Los Angeles County Metropolitan Transportation Authority (LA Metro), stated that "at 1.3 people per car, there would be no traffic congestion on our freeways."[3]

Description of historical/existing services or programs

The purpose of the HOV system in Los Angeles County is to enhance mobility for all residents and visitors by providing a variety of transportation options such as HOV lanes, park and ride lots, and transit stations along HOV corridors. The first HOV facility in Los Angeles County was opened in 1973 as a bus-only facility known as the El Monte Busway. The El Monte Busway, operating along the I-10 freeway corridor between El Monte and downtown Los Angeles, was opened to carpools of three persons or more in 1976.

There was little expansion of the Los Angeles County HOV system between 1976 and 1990. With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, regional planning agencies were encouraged to promote innovative ways to address transportation system deficiencies and to improve mobility and air quality in major metropolitan areas. HOV lanes and carpooling were identified in ISTEA as an appropriate transportation solution for addressing these problems.

[3] The Epoch Times. *Are we there yet?* September 1, 2008. http://www.theepochtimes.com/n2/content/view/3614/. Accessed April 2009.

Figure 2 HOV Lanes in Los Angeles

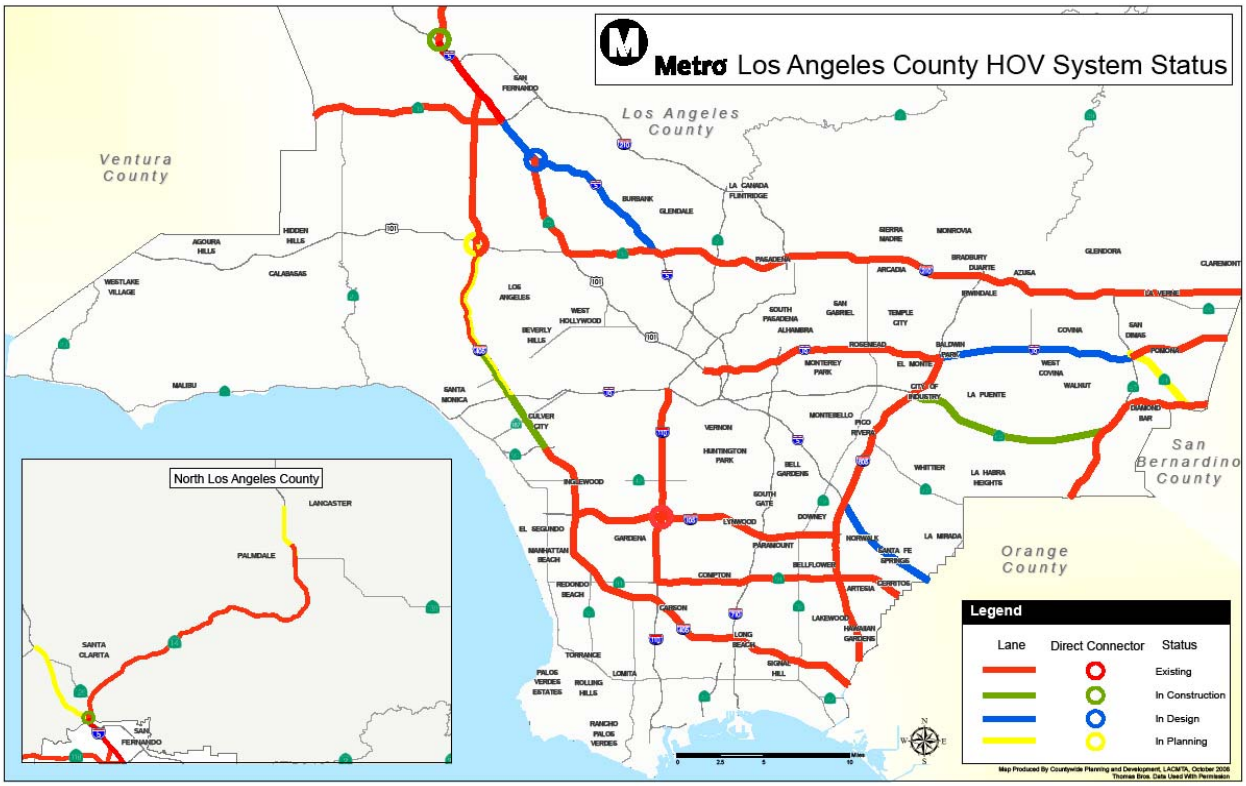
Source: Metro.net. HOV Performance Program, July 2002.

In 1992, the Los Angeles County Transportation Commission (LACTC), a predecessor agency of LA Metro, adopted the *Carpool Lane Plan* for Los Angeles County. The plan detailed a system of HOV facilities to serve Los Angeles County and established priorities for HOV system development. In June 1993, there were 58 lane miles of HOV lanes in Los Angeles County. By the middle of the following year, an additional 73 lane miles of HOV lanes had opened on freeways in LA County. Between June 1997 and June 2000, 111 lane miles of HOV lanes were added to the County HOV system. The Los Angeles County HOV system currently extends over 425 lane miles along fourteen freeway corridors, making it one of the largest HOV systems in the country.[4]

LA Metro, in cooperation with Caltrans, is in various stages of planning, designing and constructing additional HOV facilities for Los Angeles County. The Metro HOV Development Status map shown in Figure 3 on the following page illustrates the status of HOV projects currently programmed by Metro, in addition to the existing HOV system in Los Angeles County.

[4] LA Metro website: http://www.metro.net/projects_studies/hov/hov_system.htm

Figure 3 Metro HOV Development Status map



Source: LA Metro website: http://www.metro.net/projects_studies/hov/hov_system.htm

Demand / ridership / usage

The Los Angeles County HOV system serves the five counties of the Los Angeles metropolitan area: Los Angeles, Ventura, Orange, San Bernardino, and Riverside. Today, the Los Angeles County HOV system carries more people than any other HOV system in the United States, and is one of the few HOV systems in the country that has been able to sustain a growth in carpools.[5]

The entire County HOV system is open to HOV traffic only, 24 hours a day, seven days a week. With the exception of the El Monte Busway, all Los Angeles County freeway HOV lanes permit carpools with a minimum occupancy of two persons. Recent changes in California state legislation allow Ultra Low Emission Vehicles (ULEV's) to use HOV facilities throughout the state, regardless of occupancy. As of 1999, an average HOV lane in Los Angeles County accommodated some 1,200 vehicles or 3,100 people per hour during peak periods, and the HOV system serves approximately 233,000 vehicle trips or 529,000 person trips per day.[6] By the year 2015, it is projected that the Los Angeles County HOV system will serve more than one million person trips each day.[7]

[5] LA Metro website: http://www.metro.net/projects_studies/hov/hov_system.htm
[6] Caltrans District 7, "1999 HOV Annual Report - Executive Summary", April 2000
[7] Los Angeles County Metropolitan Transportation Authority, "High Occupancy Vehicle System Integration Plan - Executive Summary", Fall 1996

Benefits

There are numerous benefits to carpooling. Carpoolers can use HOV lanes, substantially cutting commute time. HOV lanes are most used during the peak travel periods when congestion is worst and the time savings compared to the general travel lanes is most significant.

Source: Metro.net. HOV Performance Program, July 2002.

Many organizations, like the Clean Air Campaign, offer reward programs to local carpoolers. People who carpool can log their carpool commute with these organizations and get cash rewards. Some insurance companies offer discounts to people who rideshare, and sometimes carpoolers receive access to special parking spots at employer sites.

Carpooling helps to protect the environment because fewer cars on the road reduces smog and congestion and helps to improve air quality. According to the Sightline Institute, the average car with a single driver emits 1.10 lbs of carbon dioxide per passenger per mile. When you carpool, an average car with three passengers naturally decreases that number by one-third - to only 0.37 lbs of carbon dioxide per passenger per mile.

Perhaps one of the most important benefits to commuters is financial. Hovering between $2.50 and around $3.00 per gallon, the cost of gas encourages people to consider alternatives to driving alone. The AAA estimates that operating costs (gas, tires and maintenance) average 17 cents per mile for 2008, all of which are shared in a carpool (See Figure 4). If ownership costs — such as insurance, depreciation, finance charges, and taxes — are also shared, the economic benefits skyrocket. Additionally, many employers offer financial incentives for employees who share their rides to work.

Traveler Benefits	Public Benefits
Time savings	Reduced congestion
Cost savings	Increased efficiency of the transportation system
Preferential parking	Reduced environmental impacts

Costs

Capital Costs

There are no capital costs associated with carpooling. The owner of the vehicle has already made an investment in their privately owned vehicle.

Costs to Consumers

Ridematching services are generally offered free of charge. The cost to commute will vary by distance, roadway and parking pricing, and other costs of owning and operating a personal

vehicle. Vehicle occupancy and the proportion of shared costs between the passenger(s)and the driver also influence consumer costs.

At a cost of $0.55 per mile to operate a motor vehicle, a driver with a 100 mile round-trip commute could save more than $25 if the cost to drive is split with just one carpool passenger.[8] Figure 4 below shows average operating costs per mile based on the AAA "Your Driving Costs 2008".[9] It does not include ownership costs (such as insurance and registration) or parking/toll fees.

Figure 4 Driving Costs

	Small Sedan	Medium Sedan	Large Sedan	Average
Operating Costs	per mile	per mile	per mile	per mile
Gas	9.4 cents	12.3 cents	13.3 cents	11.7 cents
Maintenance	4.0 cents	4.7 cents	5.1 cents	4.6 cents
Tires	0.6 cents	0.9 cents	0.8 cents	0.7 cents
Cost per Mile	13.9 cents	17.9 cents	19.1 cents	17.0 cents

Source: Cost estimate based on the AAA "Your Driving Costs 2008"

Best Practices

Rideshare programs can be implemented by a number of different organizations such as an individual employer as part of a Commute Trip Reduction program, a Transportation Management Association(TMA), a Campus Trip Management program, a transit agency, or a regional ridesharing agency. Large ridematching programs use computerized partner matching systems that take into account each commuter's origin, destination, schedule, and special needs. Smaller programs may simply manually match potential partners or use ride notice boards including sites on the web.

Online carpooling service Zimride uses social-networking tools to match riders and drivers on university campuses or at companies. By focusing on college, university and corporate communities, Zimride was able to build the critical mass of users. Social networking tools like Facebook Inc. are used to match potential riders and drivers. Zimride users can view profiles for common networks, interests and friends before deciding to share a ride. In April 2009 Zimride partnered with Zipcar, the largest national car-sharing company. This partnership allows carpoolers to share rides, even if they don't own a car (see the chapter on car-sharing for more information).

There are numerous vendors that provide information and ridematching services to commuters. These services are generally accessed via phone, online, or mobile web-enabled devices. By providing employees with information on all their transportation options, ridematching services

[8] Average cost per mile including operating and ownership costs. AAA "Your Driving Costs 2008"
[9] AAA website: http://www.aaaexchange.com/Assets/Files/20084141552360.DrivingCosts2008.pdf. Accessed April 2009.

can help them make better transportation decisions. Employers could contract with a private vendor or public agency to create an online service tailored to the unique transportation needs of individual employment sites. Several public ridesharing agencies and private information service vendors are discussed below.

San Luis Obispo Regional Rideshare

San Luis Obispo Regional Rideshare, a division of the San Luis Obispo Council of Governments (SLOCOG), is a one-stop-shop for transportation information. Its goal is to reduce reliance on driving alone and improve mobility for people living, working, and visiting San Luis Obispo County. San Luis Obispo Regional Rideshare promotes ridesharing to reduce the number of single occupant vehicles and vehicle miles traveled which keeps the air clean, roads clear and lessens demand on limited resources. SLO Regional Rideshare promotes carpooling in the region through use of TripLink. TripLink is a free service to that connects people who are looking to share a ride – either through carpool, vanpool, or School Pool.

RideSpring[10]

RideSpring is a for-profit vendor providing online ridematching services and information on alternative commute modes. Founded in April 2005, RideSpring provides company-specific web sites that provides participants with ridematching and rewards for alternative mode use. The Santa Cruz-based company awards "acPoints" ("alternative commute" points), to those who walk, carpool, bike, or take transit to work. By accumulating points, participants increase their chance of winning prizes in the "acLotto."

The company's biggest client is the City of Santa Cruz, which has utilized RideSpring since February 2006, and serves 25 percent of the city's 1,000 employees.[11] Overall, the city deems the program a success, and finds RideSpring's weekly reports on mode utilization especially helpful. Involvement seems to have reached a peak at 25 percent, with the city experiencing higher participation in the warmer months. The program is funded through the city's parking fund.

AlterNetRides[12]

AlterNetRides is a for-profit vendor that provides online ridematching services. Based in California, this six-year-old company operates nationwide and provides a web platform for ridematching across the country. A company or agency signs up and AlterNetRides creates a unique Applet accessed through the client's web site, making the service appear closely linked to the agency from the user's perspective. The Applet lists and maps available ridematches. If the user chooses to contact another person, AlterNetRides flags both peoples' e-mail addresses to ensure secure contacts.

Since AlterNetRides acts as a web service platform only, costs are low and the service can be efficiently used by organizations of all sizes, from a small company to a large transit agency. Since its founding, AlterNetRides has expanded to include vanpool formation and management,

[10] Information on RideSpring from 5/8/2007 phone interview with Paul McGrath (RideSpring Founder and CEO) and from www.ridespring.com accessed in May 2007.
[11] Information on Santa Cruz program from a 5/8/07 phone interview with Matthew Farrell, former Parking Program Manager for the City of Santa Cruz.
[12] Information on AlterNetRides from May 2007 phone interview with Mark Evanoff (AlterNetRides Founder and President) and from www.alternetrides.com accessed in May 2007.

administering commuter benefits, and other mobility services. AlterNetRides has more than 100 clients, ranging from universities to regional transit authorities to private corporations.

CoValuate[13]

CoValuate is a for-profit vendor whose core business is the development of software and user interfaces to provide better information on transportation conditions and options. CoValuate builds software that will integrate data from multiple sources and output to multiple devices and/or platforms, including web and phone interfaces for transportation system administrators and end users. Their software capabilities also allow for speech recognition and video feeds.

CoValuate's business model is to develop the software free of charge, run the interface in-house, and make money off of revenue from targeted advertisements. For example, if someone is calling for information about the availability of parking in a particular garage, then a short advertisement from an area retailer would stream while the occupancy data is being generated. Or if someone calls for the best route (least congested) from Point A to Point B, then a short advertisement targeted to the demographics of the trip origin can be streamed while the route is being generated.

An example of CoValuate's application in providing mobility information would be developing a software program that can process "parking ingress/egress" data from "loop detectors" (embedded in the pavement of a parking lot or garage) and automatically generate real-time parking occupancy information for administrators or users to access via phone or website. In addition, CoValuate can provide information on traffic conditions, such as the SMART Corridors project they completed for the Alameda County (CA) Congestion Management Agency. This project was a regional congestion management system which provided real-time information on traffic conditions and travel times to both transportation system mangers and commuters.

Expansion Potential in Los Angeles

Opportunities

There is potential to expand carpooling in Los Angeles through a personalized ridematching approach that is emerging in large employment centers and universities. Ridematching services facilitate carpooling and reduce peak-period vehicle trips by increasing commuters travel choices. CommuteSmart.com is available for employees throughout the Los Angeles region looking to match single or regular commute trips with formal and informal carpools.

It is necessary to identify a central drop off location in Los Angeles where carpoolers can access public transportation to reach their workplace. This is important to facilitate the last mile connection because carpooling is not always a door-to-door service. The Downtown DASH can be used as a last mile connector from a central carpool drop-off location to a nearby employment center in Downtown Los Angeles. For potential carpool partners who do not live in immediate proximity, a park-and-ride lot may be a good meeting place. The availability of park-and-ride lots may encourage carpool drivers who would otherwise be inconvenienced by picking up and dropping off passengers at their homes. Park-and-ride lots offer sufficient parking and public transportation as a backup alternative to carpooling.

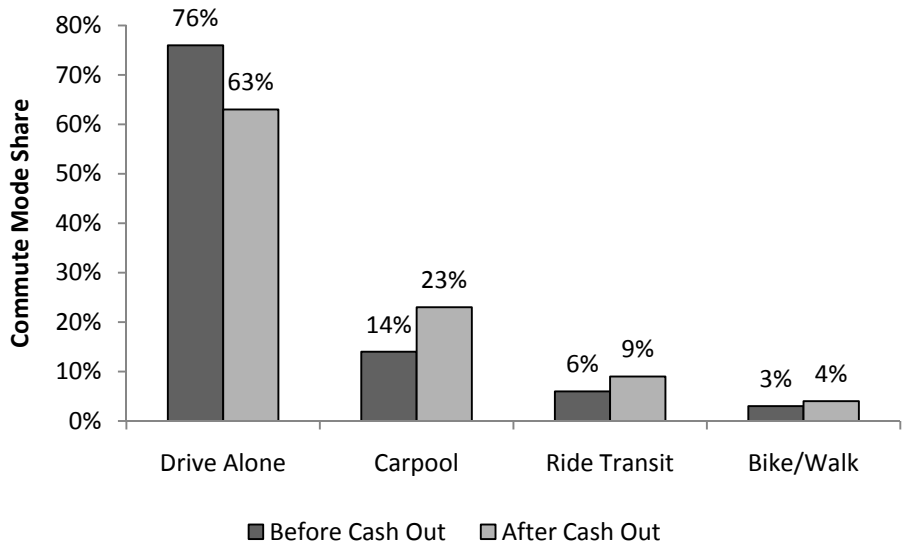
[13] Information on CoValuate from 5/18/07 personal interview with Andre Lockhart (President) and from http://covaluate.com accessed in May 2007.

New/pending policies, regulations, or incentives

Commuter financial incentives are often offered to reduce SOV commute trips and increase travel options. Employers can encourage employees to carpool by offering incentives ranging from reserving prime parking spots for carpools, to reduced parking rates, to prize drawings.

A parking cash-out program is an effective way that employers can reward carpoolers. Parking cash-out is a state law in California which requires certain employers who provide subsidized parking for their employees to offer a cash allowance in lieu of a parking space. The intent of the law is to reduce vehicle commute trips and emissions by offering employees the option of cashing out their subsidized parking space and instead ride transit, bike, walk or carpool to work. Shoup (1997) found that single occupancy vehicle trips declined by 13 percent and carpooling increased by nine percent after a parking cash out program was introduced at various urban and suburban worksites, as illustrated in Figure 5.[14] These automobile trip reductions tend to increase over time, as more employees find opportunities to reduce their driving and take advantage of the benefit.

Figure 5 Parking Cashing Out Impacts on Commute Mode



Joint partnerships

Carpooling programs operate best through various partnerships with municipalities, transportation agencies, employers or universities. Regional rideshare organizations can assist employees and students in locating potential carpool partners.

Emerging political will / public opinion

Due to the high price of gasoline and time saving benefits of HOV lanes, many people realize the benefits of carpooling. The HOV system in Los Angeles County affords travelers more reliable travel on freeways and provides a strong incentive for people to leave their cars at home and instead choose carpooling.

[14] Shoup, Donald C. 1997. "Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies" in Transport Policy. 4(4), p. 201-216.

The most common objections of switching from solo driving to carpooling is lack of flexibility and fear that there will be no way to get home quickly in the event of an emergency, such as picking up a sick child from school, or working unscheduled overtime. Part-time carpooling or casual carpooling may address the issue of flexibility, which is addressed in Chapter 4. A Guaranteed ride home(GRH) program provides commuters who regularly carpool, vanpool, bike, walk or take transit to work with a reliable ride home when an unexpected emergency arises. GRH programs are designed to rescue commuters who are worried about how they'll get home in the event of an emergency. Knowing there is a guaranteed ride home gives many people the back-up and security to carpool.

GRH programs may be established by individual employers. Usually the employer will pay for a taxi home in the event that an employee who is a carpool passenger has to leave in the middle of the day, and the carpool driver is unavailable. Some MPOs and local government shave also established regional or county-wide GRH programs for employees that register for the program. GRH tends to be a low-cost way to encourage carpool use.

Challenges

Market acceptance

Marketing and public information are key components to inform the public about ridesharing services. In order to match potential carpoolers, it is necessary to promote ridesharing services and the benefits of carpooling. Professor Donald Shoup believes that one reason that more people do not register for carpool matching may be that people are unaware of the density of employees in their neighborhood.[15] Several people who work at nearby locations may live within a short walk from each other, but are unaware of their neighbors as potential carpool partners. Carpool matching exhibits what economists call a network effect; if more commuters register for a carpool match, commuters can more easily find a match.

Conventional carpool matching systems fail to take full advantage of the network effect because people do not how many other potential carpool partners live nearby. To use a carpool matching system, one must first register with the matching system to connect with someone else who has already registered. Providing information on the number of nearby potential carpoolers may encourage more commuters to register and more fully explore the potential for carpooling.

UCLA is an example of where this challenge can be overcome. Transportation Services can test the idea that giving information about the density of potential carpoolers in a neighborhood will increase registration with the university's carpool matching system. Data on employees' home addresses can be geocoded to find a neighborhood that has a high density of UCLA employees. Transportation Services can then email these employees to tell them how many other UCLA employees live nearby and invite them to register with the carpool matching system. If some commuters respond to this invitation, the increased number of people looking for a carpool partner within the neighborhood should increase the likelihood of forming a suitable carpool. If enough people apply for a match, they could also form a vanpool.

This proposed system of density disclosure has the potential to reduce the cost of many people's commutes to UCLA. It can also show UCLA's leadership in developing new ways to help solve Southern California's problems of traffic congestion, air pollution, energy consumption, and greenhouse emissions. Additionally, it can become a model for other employers; if it works at

[15] E-mail correspondence. February 2009.

UCLA, it could work in many other places especially where there is a large concentration of employees.

Neighborhood Electric Vehicles (NEVs)

Overview

A neighborhood electric vehicle (NEV) is small, 4-wheel, electric powered personal vehicle with zero emissions[16]. It has limited range and can travel up to speeds of 25 mph. NEV's may look like a golfcart to the casual observer, but they are actually a motor vehicle requiring a driver's license, registration, and insurance. They are specifically designed to meet federal safety standards for "low-speed vehicles" as defined in Section 571.500, Title 49 Code of Federal Regulations.

Source: GEM e2 Model www.gemcar.com

While NEV's traditionally have not been used as a solution for the first or last leg of the transit journey, they are a well-suited for short, local trips up to 30 miles in length and thus could be operationally feasible as transit connectors provided that safe travel corridors and parking at trip origins and destinations are designated for their use.

Existing Conditions

Description of historical/existing services or programs

Based on publicly available industry information, it is estimated that there were approximately 15,000 or more NEV's in service in California as of 2003 in household and small fleet application.[17] This volume of NEV's represents the largest single geographic concentration of electric vehicles anywhere in the world. NEV ownership statistics for the Los Angeles region were not available at the time of this report.

Demand / ridership / usage

The majority of NEVs in deployment today are used for local community circulation and generally not for making first/last mile transit connections.

According to a 2003 study of NEV user behavior in California, NEV's are used as daily replacements for internal combustion engine vehicles more than two-thirds of the time. They are used usually in short trips characterized as "trips of necessity." The functionality of the NEV is underscored by users' reports of the high incidence of employing their NEV to carry goods or run errands.

The NEV is viewed by its owners as a viable tool in the toolbox of transportation options available to them. Most NEV users own more than two internal combustion engine vehicles, but the NEV

[16] NEVs are defined as a four-wheeled motor vehicle that has a gross vehicle weight rating of less than 3,000 pounds (1,400 kg) and a top speed of between 20 mph (32 km/h) to 25 mph (40 km/h). U.S. DEPARTMENT OF TRANSPORTATION National Highway Traffic Safety Administration 49 CFR Part 571 Federal Motor Vehicle Safety Standards

[17] NEV User Behavior in California, July 2003, Green Car Institute.

still replaces two-thirds of daily short-distance trips formerly taken with either of those vehicles. One surprising finding of the study is that NEV's are much more likely than a typical car to be carrying more than one person. While standard vehicles in California typically carry a single driver with no passengers, more than 70% of the time,75.4% of all NEV trips carry more than one person. Thus, NEV's are having an impact on congestion and carry an even greater positive environmental benefit than might be measured by simply counting vehicle cold-starts eliminated, trips taken and vehicle miles traveled (VMT).

Below is a sampling of average NEV user statistics in California. The statistics suggest that NEVs would be operationally feasible as a first/last mile strategy in Los Angeles, given the average trip length for these vehicles, but there are crucial caveats which are discussed in greater detail below in the "Expansion Potential" section.

Trip length:

- 39.2% usually travel less than 1 mile for a one-way trip.
- 35.7% travel 1-3 miles.
- 18.2% travel 3-5 miles.
- 03.1% travel 5-7 miles.
- 03.9% travel 7 or more miles.

Trip frequency:

- 7.56 trips per day are taken in a NEV.
- 75,600 trips per day are taken in the NEV fleet.
- 529,000 trips per week are taken in NEV's.
- 26.46 million trips per year are taken in NEV's.

Vehicle miles traveled:

- 1,258 miles is the average annual NEV mileage.
- 12.58 million miles are driven annually by the entire NEV fleet.

Vehicle occupancy:

- 24.6% usually drive alone.
- 50.8% usually have one passenger.
- 8.8% usually have two passengers.
- 15.8% usually have three passengers.
- 65.3% usually transport cargo in their NEV's.

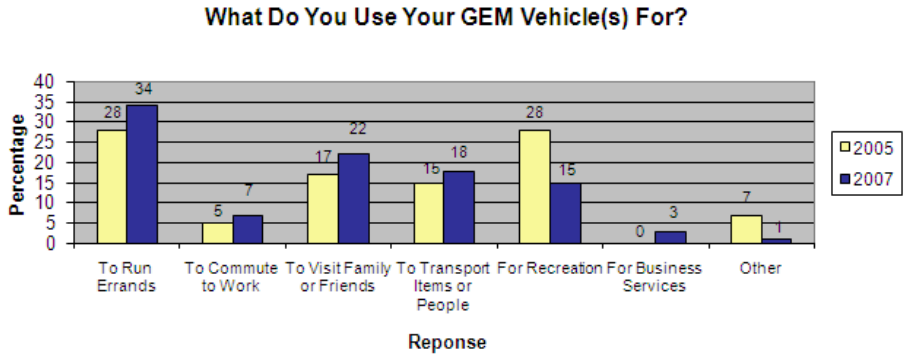
Figure 6 below shows the different categories of trip types that NEVs were used for in California in 2003 according to the Green Car Institute study. This data suggests that that NEVs are not traditionally used as first mile/last mile transit connectors. Rather, the majority of NEV owners use their vehicles to run local errands around town. Other trip purposes include personal recreation, to visit friends and family, and to deliver or transport goods for personal or business reasons.

Figure 6 Type of Trips for which NEV's are Used (July 2003)[18]

Trip Type	Households	Small Fleets	Total	Percent of 260 Total
Commute to work/school	21	5	26	10.00 %
Transport children to school	15	0	15	5.77 %
Transport children to recreation/sports/leisure activities	26	0	26	10.00 %
Transport business clients and associates	9	56	65	25.00 %
Run local errands	138	38	176	67.69 %
Personal mobility while at work	23	60	83	31.92 %
Visit friends/family	116	7	123	47.31 %
Personal recreation	122	6	128	49.23 %
Deliver or transport goods for business	115	69	84	32.31 %
Business services (such as a maintenance vehicle)	3	51	54	20.77 %
Other:	17	14	31	11.92 %

Figure 7 below shows user behavior results from an internal study that Global Electric Motor Cars (GEM) completed in 2007. GEM introduced its first electric NEV in 1998 and has more than 38,000 vehicles on the road today. The survey went out to GEM owners regarding the use of their vehicles. Survey results indicate that the majority of GEM owners also use their vehicles primarily to run local errands.

Figure 7 GEM User Behavior(July 2007)



[18] NEV User Behavior in California, July 2003, Green Car Institute

Benefits

The use of NEVs results in primary benefits of energy savings, air quality improvements, community cohesion, and in some cases, greater use of public transit.

Energy Benefits

According to a press release from GEM in 2007, electric vehicles have reached significant milestones related to energy benefits. The energy required to operate a NEV is less than one-fifth when compared to a conventional automobile. As of 2006, with more than 33,000 GEM vehicles on the road, 7.5 million gallons of gasoline had been saved.

Emissions Benefits

NEV's provide real, quantifiable emissions benefits for local and regional air attainment strategies. NEV's produce no tailpipe or evaporative emissions that contribute to air pollution and global warming, and NEV's do not contribute to the pollution caused by "cold starts." Cold starts occur because emission control systems on a gas-powered vehicle take time to rise to operating temperature, especially in winter." [19] According to the 2003 Green Car Institute study, NEVs helped eliminate 7.98 million cold starts per year. Additionally, in terms of vehicle displacement, 64.7% of NEV users replaced personal or company-provided internal combustion engine vehicles, 20.1% replaced electric or gasoline powered golf carts, 5.0% of NEV trips were "new" or "additional" trips not replacing any other mode of travel, and 10.1% replaced modes such as walking, biking, public transportation and other.

Community Benefits

NEV travel provides an opportunity to develop a cohesive community. NEV's travel at lower speeds and invite attention from passers-by. NEV use also supports local businesses. Since NEV's have a limited travel range (the typical NEV is designed to travel thirty miles on one battery charge.), NEV users will be more likely to shop locally. NEV's provide mobility and safety for people who cannot drive a high-speed automobile, including aging and disabled drivers. The slower speed at which a NEV travels is a contributing factor to the increased safety. Further, NEV routes can double as bicycle routes with proper design, thus creating miles of bike trails within a city and satisfying an often vocal contingent.

Increased Use of Public Transit

It appears that in some communities with high NEV usage, people are relying on their NEVs for local use trips and may be abandoning their surplus of traditional vehicles as a result.[20]Almost 40 percent of households own two vehicles in the United States, and an additional 20 percent own three or more vehicles (for a total of 54 million households with two or more vehicles).[21] If having a NEV in the household leads to a reduction in an individual's personal vehicle fleet, it also stands to reason that this person may be more likely to use alternative modes of transportation, such as public transit, for longer journeys as well. In short, NEVs can help create more 'human-scaled'

[19] A report to the California Energy Commission dated July 1, 2002, prepared by Arthur D. Little, Inc., stated:
"It is well documented that cold-start emissions have significant impact on air quality. Due to cold-start fuel enrichment, subsequent quenching of hydrocarbons in a cold engine, and the delayed attainment of proper operating temperatures of the catalytic converter, between 60 and 80% of the toxic air emissions from automobiles occur during the cold-start period.
[20] Study of NEV User Behavior in California, Green Car Institute, August 2005 Update
[21] Summary of Trends. FHWAU, .S. Department of Transportation, 1990, p. 14.

communities that rely less on the traditional automobile for every trip, regardless of length or purpose, which in turn, helps discourage the 'one-size-fits-all' mentality of the current transportation system at large.

Costs

Operating and Ownership Costs

The purchase price and operating costs of a NEV are substantially less than those of a conventional automobile. For example, the MSRP for a GEM vehicle starts at $6,795 and it operates for about 20% of the cost of an automobile[22]. Used NEV's are also available at reduced costs. Programs are in process and under development to support the use of NEV's through State and Federal incentives, grants and rebate programs. However, in most cases, these vehicles are at a price point that readily enable them to be purchased by individual drivers, and thus no large public investments are required

NEV's cost just pennies a day to operate. Fully recharging a NEV to run 30 to 60 miles costs less than $1. The average annual operating cost for a NEV including insurance, registration, fuel, and maintenance is $559. The same costs for a conventional automobile are $3,520; over six times the operating costs of an NEV[23]. This leads to the logical conclusion that NEV's can be a more effective and less costly solution than traditional programs designed to meet first mile/last mile transit needs, such as shuttle buses which often require hefty subsidies to operate.

Figure 8 Ownership Cost Comparison of NEVs[24]

	3-year Ownership Costs of a NEV*	3-Year Ownership Costs of Owning a Gasoline-Powered Vehicle**
Vehicle Cost	$7,500	$20,000
Insurance	$900	$3,000
Electricity or Fuel	$90	$450
Maintenance	N/A	$120***
Subtotal	$8,490	$23,570
Residual	*($4,000)*	*($10,000)*
Total	$4,490	$13,570

*Estimated cost of ownership based on a GEM e2 base model vehicle over a three-year period, driving 3,600 miles. Average cost based on independent research.

**Estimated cost of ownership over a three-year period, driving 3,600 miles. Average cost based on independent research.

***Average cost based on manufacturer's recommended maintenance schedule.

[22] Cosgrove, Tom, Councilmember, City of Lincoln, CA, et. al. July 2007, " Thriving with Neighborhood Electric Vehicles;" Final Paper presented at the "Transportation, Land-Use and Air Quality" Conference in Orlando, Florida.
[23] Ibid.
[24] See www.gemcar.com. This information is based on the estimated cost of ownership over a three-year period, driving 3,600 miles.

Best Practices

City of Lincoln, CA – NEV Transportation Plan[25]

The City of Lincoln, located in Placer County approximately 30 miles northeast of Sacramento, has developed a comprehensive NEV circulation system that represents the first major citywide NEV transportation project in the State of California. In August 2006, Lincoln's City Council formally adopted a resolution approving the Plan to provide safe and efficient access for NEV's to downtown and other commercial areas. Today, there are an estimated 600 NEVs traveling in the City, and that number is growing steadily[26].

Prior to 2005, federal law only permitted NEVs to operate on streets with a posted speed limit of 35 mph or less, but California state law, Assembly Bill (AB) 2353, established special provisions to define the use of NEV's on city streets. The legislation allowed NEV's to operate on streets with posted speed limits above 35 mph where designated NEV lanes are available. Through the efforts of Lincoln's Department of Public Works and City Council, AB 2353 was drafted to provide the City with flexibility in planning for NEV use within the city limits. It was approved by the California state legislature in 2004 and became law on January 1, 2005. This new law enabled both the City of Lincoln and the adjoining City of Rocklin, to develop NEV Transportation Plans based on their specific needs. A major design goal of the Lincoln plan was to provide infrastructure improvements such as combination NEV/Bike lanes to allow for the safe, smooth flow of NEV's with pedestrians, bicycles, and other motor vehicles and to allow NEV users access to every part of the city. Figure 9 below shows an example of a combined NEV bike lane in Lincoln.

Figure 9 Combination NEV/Bike Lane Pavement Marking and Striping in Lincoln, CA

According to the final Lincoln NEV Transportation Plan evaluation, published in January 2008, almost one quarter (24%) of NEV owners indicated that they had sold or disposed of a traditional

[25] Kevan Shafizadeh, Ph.D., P.E., PTOE, and Kimberly Fox, California State University, Sacramento; "A Report to the California State Legislature as required by Assembly Bill 2353," Neighborhood Electric Vehicle Transportation Plan Evaluation.
[26] Interview with Gayle Capik, Project Assistant, Bennett Engineering Services.

automobile after they acquired their NEV. Users also reported an average almost 15 one-way trips per week and a little less than 4.5 miles per trip. Based on these figures, the average NEV would travel almost 3,500 miles per year, which is over three times higher than previous estimates.

The evaluation indicates that NEVs in Lincoln have generated fewer auto trips, fewer bicycle trips, but importantly for this study, the same number of walking and transit trips. As such, the Lincoln model does not provide significant data to evaluate the use of NEV's as first mile/last mile transit connectors in Los Angeles(none of the Lincoln residents used transit as their primary transportation option for their journey to work according to 2000 Census Journey to Work). However, because many parts of Los Angeles are low-transit environments like Lincoln, the travel demand profile of NEVs in general suggests that NEVs could potentially be a feasible first/last mile strategy in certain areas of Los Angeles provided with the proper programmatic support and infrastructure, discussed in further detail below.

Community Redevelopment Agency of the City of Los Angeles (CRA/LA)
Green Transit Alternative Modes Trial Program[27]

In 2007, CRA/LA received LACMTA funding to begin planning a "Green Transit Alternative Modes Trial Program" in downtown Los Angeles. The program will develop a contractor-operated transportation service that offers commuters an alternative way to travel the 'last mile' from public transit at Union Station to the L.A. City Hall area utilizing fifteen Neighborhood Electric Vehicles and thirty electric-motor-assisted 2-passenger bicycle-transit type vehicles (similar to "pedicabs").

The vehicles will operate on a fixed route leaving from the west entry of Union Station and travel in a circuit to a location on Los Angeles Street and on Main Street, and then return to Union Station. Service will operate during peak hours from 6:30 am to 9:00 am and 3:30 pm to 6:30 pm. Vehicles will be available on demand and depart when occupied. Rides will be available at no charge to passengers showing Metro fare media and at a nominal fee for passengers not showing Metro Cards. The operator will generate revenue through fares from riders not using Metro Cards and advertising to be placed on vehicles. The expected roll-out of the program is planned for July 2010 with service predicted to operate for ten years.

CRA/LA estimates that it will cost $750,000 annually to operate this service (i.e., living-wage labor, maintenance, insurance, storage). The majority of revenue will be generated from advertising (e.g., $615K), with fares (from non-Metro Card commute riders and non-commute passengers) and vehicle leasing for special events (e.g., conventions, spectator events, filming) providing the balance of revenue.

CRA has identified some conceptual issues that need to be addressed in order to put together an operating plan for the program.[28] The three key issues are as follows:

- Pending safety and traffic concerns raised by LADOT, which include the following:
  - Potential for City to be held liable in the event of an accident

[27] Downtown LA Green Transit Alternative Modes Trial Program, Application for LACMTA Project Funding for 2007 Call for Projects, January 2007.
[28] Interview with Dave Neubecker, Assistant Project Manager, Downtown Region, CRA/LA

  - Potential for NEVs/pedicabs to cause additional traffic congestion during peak commute times
  - Potential for slow-moving pedicabs to cause accidents during off-peak times when traffic is less congested and average vehicle speed is higher
  - Potential for slow-moving pedicabs to cause lower average vehicle speeds during off-peak times
- Whether or not the pedicabs and NEVs should be subject to the same regulations as taxicabs. The pilot program will probably only involve pedicabs, since the taxicab companies would probably perceive NEV's to be a direct competitor.
- Whether or not the standard pedicab business model (targeting tourists and visitors in high pedestrian activity areas, with revenues from tips and signage sales) can be adjusted to satisfy LACMTA funding requirements for Transportation Demand Management (TDM) programs (which emphasize first/last mile connections for commuters, especially Metrolink riders arriving at Union Station per Metro staff). Traditionally the pedicab model substitutes for walking trips, whereas this program must demonstrate (in order to receive LACMTA TDM funding) that it is helping retain existing transit commuters and attract new commuters to transit that might otherwise be driving.

South Bay Cities Council of Governments

Neighborhood Vehicle Pilot Project: *Demonstrating Public and Commercial Uses*[29]

In December of 2008, the South Bay Cities Council of Governments (SBCCOG), a joint powers authority of 16 cities located in the South Bay of Los Angeles County, was granted funding by the Technology Advancement Office of the South Coast Air Quality Management District to pursue a pilot project that will demonstrate public and commercial uses of NEVs. The project should begin the planning stages in April 2009. The goal of the project is twofold:

- To demonstrate off-the-shelf NEV's as a substitute for gasoline-fueled vehicles for a variety of trips taken regularly by residents, businesses, and governments in the South Bay; and
- To evaluate the realistic opportunities for cost-effective NEV deployment and identify the barriers to the widespread use of NEV's throughout the South Bay.

About 525,000 motor vehicles were owned by South Bay residents in 2000. This is about 1.6 vehicles per household, or about 195,000 second and third vehicles. Those secondary vehicles are the primary targets for replacing with NEV's. Mixed-use neighborhoods in three cities are being considered as sites for the demonstration: Riviera Village in Redondo Beach, El Segundo downtown, and Peninsula Center in Rolling Hills Estates.

The goals of the project do not include demonstrating NEV's as first mile/last mile solutions simply because existing transit service in the South Bay is not adequate, with infrequent headways causing ridership to be relatively poor except in the places with the lowest incomes. Countywide major transit investments for the next 20 years do not include projects which are expected to significantly improve transit service within the South Bay. Nevertheless, the findings

[29] Neighborhood Vehicle Pilot Project: Demonstrating Public and Commercial Uses; Grant Application to AQMD's Technology Advancement Office, December, 2008

of this technology demonstration project should be useful to cities and sub-regions throughout Los Angeles County, particularly in those suburban areas that lack good public transit service. In addition, this pilot project points out the need to deploy NEVs in areas with adequate transit service if the goal is to attract new choice riders (rather than simply displacing short automobile trips).

Station CarDemonstration Projects

The following projects do not involve Neighborhood Electric Vehicles as classified, but are included in this report because of their specific transit connection.

- *NYPA/TH!NK Clean Commute.™*Launched in 2001, this New York Power Authority program made a fleet of 100 TH!NK city electric cars from the Ford Motor Company available for leasing to MTA commuters at seven New York City area railroad stations for periods ranging from 24 to 30 months. As depicted in Figure 10 below, the Th!nk is a battery-powered, crash-tested car with a range of up to 80 miles per charge and a top speed of 65 miles per hour. The final NYPA leases expired in early 2005 but the agency is planning to build on this demonstration program as soon as a suitable new electric vehicle comes to market.[30]Th!nk suspended its U.S. production in December 2008.

Figure 10 TH!NK City Electric Vehicle[31]

- *New Jersey Department of Transportation's Power Commute program.* Similar to the NYPA's Clean Commute, this program connected potential transit riders with the Morristown, NJ train station via electric car. The idea was twofold: get new commuters onto the system who would normally commute against the flow of traffic and also clean the air by using electric vehicles.
- *The San Francisco Bay Area Station Car Demonstration.* This program was a field test sponsored by Bay Area Rapid Transit (BART) and Pacific Gas & Electric from 1995 to 1998, using 40 prototype electric vehicles (two-seaters). It was implemented to determine the viability of electric vehicles for making short, everyday trips. The vehicle was a two-

[30] NYPA web site: "NYPA Clean Commute™ Program", http://www.nypa.gov/ev/NYPAcleancommute.htm
[31] Source: www.think.no/

seat battery-powered electric vehicle (EV) made by Personal Independent Vehicle Company (PIVCo). Charging ports were installed at selected BART stations.

Expansion Potential in Los Angeles

Opportunities

Deploying NEV's in new master-planned communities for local circulation remains the best near-term opportunity for building a lasting NEV market in Los Angeles County. Deploying NEV's as first mile/last mile transit solutions in built environments may have promise and they are well-suited to this application, but this is likely to be a longer-term application due to the combination of rigid federal safety standards and traditional roadway designs that don't accommodate slower vehicles. However, NEV deployment, whatever its form, can be viewed as one step in a larger and longer strategy of encouraging a competitive market for neighborhood transportation that could include a range of technologies, private services and short-haul public transit.

Given new legislation being proposed at the federal and state levels, NEVs regardless of their specific application, may begin to play a big role in helping California successfully implement its groundbreaking laws to fight climate change, such as AB 32 and SB375, due to the emission benefits described above.

New/pending policies, regulations, or incentives

Federal

Newly introduced federal legislation S271, called the FREEDOM Act of 2009, would revise the 1986 Internal Revenue Code providing tax credits for the manufacture, conversion and acquisition of plug-in electric vehicles. The bill would increase the number of plug-in vehicles able to receive the tax credits from 250,000 to 500,000. The tax credits would expand beyond conventional four-wheel automobiles to include three-wheel and two-wheel vehicles, as well as low-speed neighborhood electric vehicles. Under this legislation, electric vehicles would receive a tax credit equal to a percentage of the purchase price up to $4,000.

S271 builds on legislation introduced in 2007 that provided up to $7,500 for consumers buying new plug-in electric vehicles. This bill was enacted into law last October as part of the Energy Bill of 2007.

California

In 2008, California Treasurer Lockyer announced financial incentives to encourage zero-emission vehicle manufacturing in California.

Existing state law exempts the California Alternative Energy and Advanced Transportation Financing Authority's (CAEATFA) from paying the sales tax on equipment used to manufacture advanced transportation products. Under the new policy – developed in coordination with the Governor's Office – CAEATFA will pass through that tax break to qualifying zero emission vehicles (ZEV) manufacturers under "sales-lease-back" agreements.

Here's how the sales-lease-back arrangements work:

- A ZEV or ZEV component manufacturer applies to CAEATFA to have a project approved pursuant to the policy. If approved, CAEATFA buys the equipment, and finances the purchase by taking out a loan or selling bonds. CAEATFA does not pay the sales tax on

the transaction. The manufacturer makes lease payments to CAEATFA for use of the equipment, and CAEATFA uses these payments to repay the bonds or loan.

- Under the lease arrangement with CAEATFA, the manufacturer has the option to purchase the equipment outright. If it purchases the equipment, the manufacturer obtains the benefit of the sales tax exemption, saving seven percent to nine percent on the purchase price.

The tax incentive policy approved by CAEATFA covers several ZEV technologies, and any qualifying ZEV manufacturer can apply. The eligible technologies include fuel cell electric vehicles, battery electric vehicles, plug-in hybrid electric vehicles, hydrogen internal combustion engines, advanced technology partial ZEVs and neighborhood electric vehicles.

Joint Partnerships and Funding

Federal Congestion Mitigation and Air Quality (CMAQ) funding is available to help implement NEV projects. To receive CMAQ funding, the City must successfully demonstrate the cost-effectiveness of the funding dollars, based upon several factors such as trip length, traffic volumes, emission reduction factors, auto trip reduction, and capital recovery factor.

California AB 118 funds may be available to fund NEV demonstrations, provide community education, and sponsor drive events as a way to stimulate the market place.

Local governments can also help NEV efforts by providing public charging opportunities and preferential parking in public lots, as well as sponsoring special promotions to the target neighborhoods through lead business organizations, neighborhood associations, and senior housing centers.

Retailer organizations, employer associations, and neighborhood associations can provide NEV demonstrations and explain their long-run implications to their constituent. They confirm support for the demonstration, solicit privately provided charging options, and identify candidate businesses to participate and residents interested in purchasing NEVs.

Policy Support

The adopted local policies that could support NEV efforts and other green transit modes include the following:

Regional Transportation Plan – SCAG/2004:

- Maximize mobility and accessibility for all people and goods in the region.
- Maximize the productivity of our transportation system.
- Preserve and ensure a sustainable regional transportation system.
- Protect the environment, improve air quality, and promote energy efficiency.

City of Los Angeles' Transportation Element of the General Plan (1999)
Goal A: Adequate accessibility to work opportunities and acceptable mobility.
Objective 1: Expand neighborhood transportation services and programs.

- Policy 1.4: Develop innovative new community-based services.
- Policy 1.5: Actively pursue demonstration projects to test innovative transit services.

- Policy 1.6: Seek maximum opportunities for entrepreneurial services and other private-sector initiatives when developing community-level accessibility plans.
- Policy 1.7: Provide improved transportation services to support Citywide economic development.

Objective 2: Mitigate the impacts of traffic growth, reduce congestion, by implementing a comprehensive program of multi-modal strategies.

- Policy 2.2: Cooperate with regional agencies to establish regionwide Transportation Demand Management (TDM) programs to achieve regional trip reductions and/or increased vehicle occupancy.
- Policy 2.17: Initiate shuttle bus programs to serve transit stations and work with the private sector and LACMTA to secure adequate funding.
- Policy 2.3: Promote the development of transportation facilities and services that encourage mass transit ridership.

Objective 3: Support development in regional centers…as designated in the Community Plans.

- Policy 3.8: Promote the provision of shuttles and other services that increase access to and within regional centers.
- Policy 3.11: Develop programs for new development to implement both transportation improvements and demand reduction programs which mitigate the circulation impacts.
- Policy 3.14: Promote the provision of shared parking facilities in appropriate centers.

Objective 6: Incorporate available local, state, and federal funding opportunities to provide sufficient financing for transportation improvements and programs.

- Policy 6.10: Encourage participation of small business enterprises in implementing new transportation projects.

Challenges

Los Angeles, like most communities within the U.S., has been zoned for many decades in a way that was designed to separate residential neighborhoods, shopping centers, places of employment, secondary education sites, and even recreation areas. The transportation system was then designed to connect each of these single-use land uses with relatively high speed thoroughfares(at speeds exceeding that available to NEVs) with the expectation that a traditional motor vehicle will be used for almost all trips. Even on roads where the speed limit is 35 mph, a legal speed for a NEV, the far heavier conventional vehicles are often driven well over the posted limit, leading to very high speed differentials. These factors of vehicle weight and speed differentials have inhibited the adaptation of NEVs in many established cities.

Thus, transportation infrastructure improvements are usually needed to deploy any type of NEV strategy. These improvements could include retrofitting existing arterials to handle mixed-mode traffic (which could include joint use NEV/bike lanes), re-striping certain targeted parking lots (thereby increasing their capacity without construction) and adding charging stations at convenient locations.

Another improvement that would allow for safer use of NEVs would be to lower the speed limit in certain areas of the City, which would reduce the differentials between NEV operating speeds

and conventional automobile speed. For instance, in a collaborative effort between the City of Lincoln and Caltrans, the speed limit on a 400-foot stretch of Highway 193 within Lincoln was successfully reduced from 55 mph to 35 mph to safely accommodate NEVs. As mentioned above, further support from Caltrans included the design of "experimental" signage, striping, and pavement marking standards. Since these changes in road design are not easily or quickly accomplished, a faster "fix" to encourage NEV use as a first mile/last mile strategy may be to reduce speed limits within a 3-5 mile radius of selected transit stations.

Balancing the needs of bicyclists and pedestrians can be another important challenge. Organized bicyclists have struggled for years to get adequate bike paths and bike lanes. Some bicyclists are willing to use new NEV lanes but are reluctant to see an existing bike lane converted to a wider shared bike/NEV lane. To our knowledge, there is no data or studies to suggest that are any safety issues with NEVs and bicycles sharing an on-street striped lane.

Regulatory

NEVs are required to have a California license plate in order to utilize public roads. NEVs may travel on any street with a posted speed limit of 35 miles per hour or less if certain conditions are met. The conditions are that the vehicle is licensed and displays plates, the vehicle is insured for liability, the vehicle operator must have a valid driver's license, and the vehicle may not cross a highway with a speed limit over 35 miles per hour, unless certain criteria are met.

Even though a city, by local ordinance or resolution, may restrict or prohibit the use of NEVs,[32] California has fully adopted the Federal Standard 500 rule which reclassified NEV's as "low speed vehicles" so that they need not comply with the Federal motor vehicle safety standards for passenger cars.[33] As low-speed vehicles, NEVs are subject to Federal Motor Vehicle Safety Standard No. 500 (49 CFR 571.500) which requires them to be equipped with headlamps, stop lamps, turn signal lamps, tail lamps, reflex reflectors, parking brakes, rearview mirrors, windshields, seat belts, and vehicle identification numbers.

In order to encourage NEVs as a viable transportation mode that can compete with the traditional automobile for short trips, changes must be made in rigid safety regulations and standardized infrastructure designs that discriminate against small vehicles, and in traffic control rules that serve only large vehicles.

Market acceptance

In order for NEVs to become established as viable first mile/last mile connectors in Los Angeles, the City would have to identify locations where NEV travel would be most suitable and safe, based on many factors such as traffic speeds, traffic patterns, and level of transit usage. The most common reasons given NEV users perceive their communities to be suitable for NEV travel were[34]:

- Short distances between destinations
- The presence of 35 mph or less streets in their communities
- The weather is fair most of the time

[32] Local authorities may regulate the operation of these types of vehicles on public highways under their jurisdiction if the regulations are consistent with the motor vehicle code.
[33] DEPARTMENT OF TRANSPORTATION, National Highway Traffic Safety Administration, 49 CFR Part 571, [Docket No. NHTSA 98-3949], RIN 2127-AG58, Federal Motor Vehicle Safety Standards.
[34] NEV User Behavior in California, July 2003, Green Car Institute.

Bikes-on-Buses

Overview

Integrating bicycles with transit combines the long-distance coverage of bus travel with the door-to-door service of bicycle riding. Transit use can overcome large obstacles to bicycling, including long distances, hills, riding on busy streets, riding at night, inclement weather, and breakdowns.

Providing space for bicycles on buses can increase the feasibility of transit, especially in lower-density suburban areas, where transit stops are beyond walking distance of many residences. People are often willing to walk only a quarter- to half-a-mile to a bus stop, while they might bike as much as two or more miles to reach the same stop. As the majority of bus stops do not provide long-term, secure parking options for bicycles, most people who ride to a bus stop will want to bring their bicycle with them on the transit portion of their trip.

Bicycle accommodation on buses can also increase the feasibility of transit in higher density urban areas by reducing the number of transfers and associated waiting time at bus stops. In addition, some transit users in urban areas prefer to access the nearest express bus line by bicycle rather than taking a feeder bus.

Typical equipment for bike-on-bus accommodation is a rack mounted to the front of the bus, which holds two bicycles. Bus routes serving populations that are more likely to bicycle, such as colleges and low-income areas, may have capacity issues with two-bike racks. If the rack is full, the bicyclist typically has to wait for the next bus. This problem has led several transit agencies to explore different options, such as three-bike racks, rear-mounted racks, and allowing bicycles on the bus. Each of these options has its own set of considerations, discussed in this Chapter.

Existing Conditions

Description of historical/existing services or programs

The majority of buses in Los Angeles have front-mounted racks that hold two bicycles. The Los Angeles County Metropolitan Transportation Authority (Metro) is the primary transit provider in the City. It is their policy to provide front-mounted bicycle racks with space for at least two bikes on all buses. Most other municipal and regional bus lines serving the City also provide bike racks. The City of Los Angeles provides front-mounted bike racks on Commuter Express buses, but not on neighborhood DASH lines. Figure 11 shows examples of bike racks used on LA Metro buses.

If racks are full, cyclists generally cannot bring the bicycle on board; they must wait for the next bus. The exception is folded bikes, which can be brought onto the bus. Tandems, bikes with motors, solid wheels, large racks, child seats or other attachments are not allowed at any time. Metro bus drivers may allow bicycles inside buses at their discretion, particularly when racks are full or inoperable, on routes with long headways, or when they are operating the last bus of the night. The popularity of the program has led local agencies to consider expanding capacity by installing front-mounted bicycle racks with capacity for three bicycles. Currently, Metro uses three-position racks on all of its Orange Line Bus Rapid Transit (BRT) buses in the City of Los Angeles.

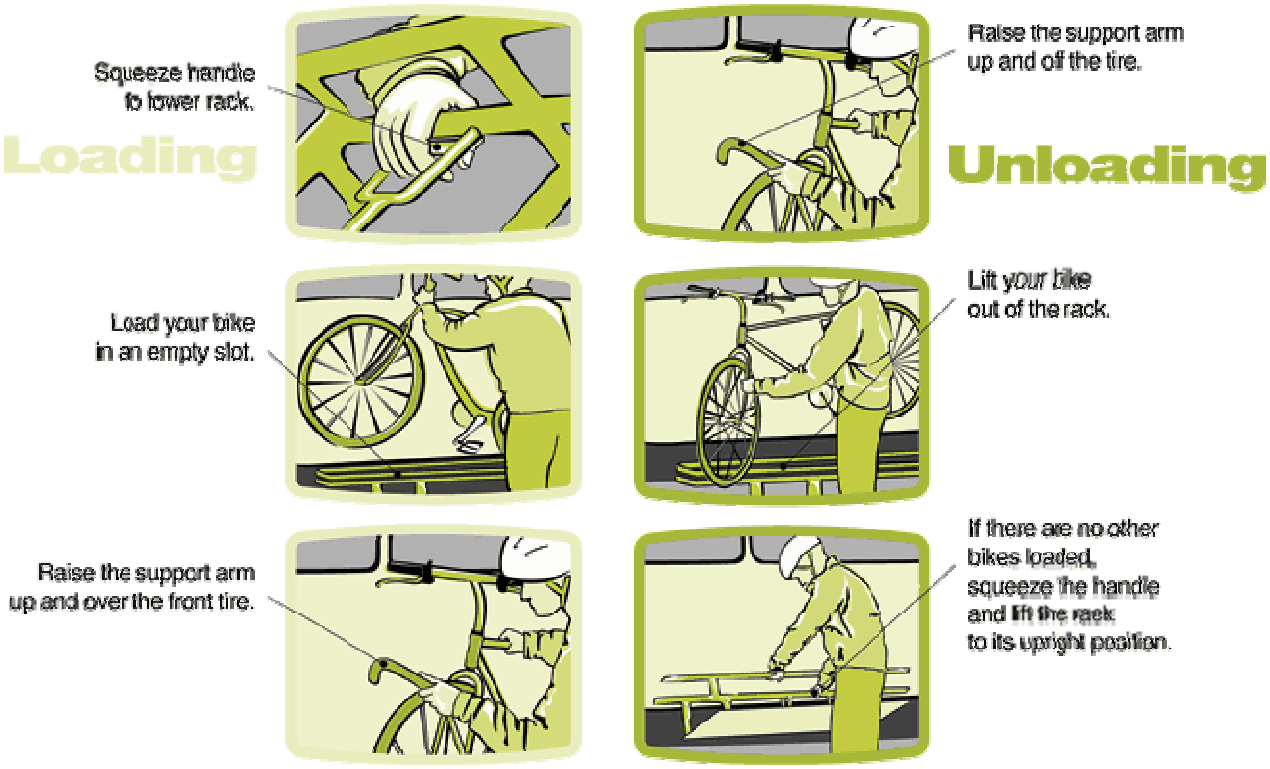
Figure 11 Bike Racks on Metro Buses

Metro Rapid two-position Rack

Metro Orange Line (BRT) three-position rack

The Los Angeles Department of Transportation (LADOT) website provides instructions for safe and proper use of the bus-bicycle racks, as shown in Figure 12.

Figure 12 LADOT Bike Rack Instructions



The Los Angeles Department of Transportation provides online instructions for using front-mounted bicycle racks on buses. Image from LADOT.

Demand / ridership / usage

Nationwide, as of 2005 transit agencies reported serving as many as 575,600 bicyclists per year. The Transit Cooperative Research Program (TCRP) report, *Integration of Bicycles and Transit* (2005) found anecdotally that young adults, students, and low-income commuters are the most frequent users of bike-on-bus systems.

> "Metro wants to make cycling a viable choice that is safe and easy, and to finance bike projects that link to public transit and improve access throughout our built and natural environment."
> – Metro Website[35]

Every day in Los Angeles County, over 13,000[36] connections are made to transit, by bicycle. While many of these riders park at stations, many riders are also taking their bicycles with them on the bus.

As shown in Figure 13, use of bike racks on buses has increased substantially over time, as people become more familiar with the system and confident about its usage. The integration of bicycles with buses is hindered by two-bike capacity bike racks, used by most transit agencies. These racks quickly fill, forcing bicyclists who need to use the rack to wait for the next bus or leave their bicycle at the station. These delays discourage the use of bicycles with transit. Installing racks that can carry three bikes encourages bicycle use by increasing the amount of bicycles that can be carried simultaneously on a bus.

Figure 13 Changes in Bike-on-Bus Use Over Time

Transit Agency (Location)	Year Bike-on-Bus Service Started	Description of Changes in Use
Ann Arbor Transportation Authority (Ann Arbor, MI)	2002	Increased from 11,145 to 13,045 bicyclists (17%) in second year.
Hillsborough Area Regional Transit (HARTline) (Tampa, FL)	1995	33.5% increase from FY 2003 to FY 2004.
Mountain Express (Crested Butte, CO)	1980s	Bikes increased from 5,400 to 7,000 between 1998 and 2004.
Penticton Transit System (Penticton, British Columbia)	1998	Use has increased gradually since the racks were introduced. The system now carries about 10 bikes per day.
Regional Transportation District (RTD) (Denver, CO)	1992	Summer 2000 (local and limited service) = 1,559 bike boardings. Summer 2004 (local and limited service) = 2,614 boardings. Increase in bike boardings by 68%.*
Tompkins Consolidated Area Transit (Ithaca, NY)	1996	Systemwide use increased from 500 uses a month to 1,500 uses a month during the first three years.

Note: Includes agencies that responded with specific numbers.
*Weekday, single-day counts.

Source: TCRP Synthesis 62. Integration of Bicycles and Transit, 2005.

[35] Accessed in March 2009.
[36] MTA Ridership Stastistics, September 2001

Benefits

Accommodating bicycles on buses is advantageous to both bicycling and transit modes. It enables bicyclists to avoid potentially difficult situations, including large hills, busy streets, long distances, and inclement weather, or riding at night. It also reduces the fear of being stranded in the case of bicycle equipment failure or rider fatigue. For transit riders, being able to bring a bicycle on the bus makes transit more viable.

Transit agencies responding to a survey conducted as part of the 2005 TCRP report felt that "their bicycle services increase transit ridership by:

- Extending the range that customers can travel to reach transit stops and stations,
- Increasing the flexibility that passengers have to reach destinations at the end of a transit trip,
- Providing 'seamless' transportation between bicycle and transit modes; and
- Offering an additional amenity to customers that increases the attractiveness of transit."

In addition, current bicyclists are very supportive of bicycle-on-bus programs, and if accommodated effectively can become advocates for enhanced transit services.

Reasons For Providing Bicycle-Related Services

- "Increasing the number of multimodal trips made in a community;
- Removing motor vehicles from roads and parking lots so that space can be used by others;
- Enhancing the quality of life in the community by reducing air pollution and automobile traffic congestion;
- Increasing the visibility of bicycling as a viable transportation options;
- Improving the public image of transit to generate allies in the bicycling community who support additional transit funding;
- Contributing to regional commuter assistance programs;
- Providing an alternative for bicyclists so that they can bypass areas that are barriers to bicycling, such as bridges, tunnels, steep hills, roads with traffic, and avoid riding at night or during adverse weather conditions; and
- Providing public infrastructure to support active living and prevent health problems related to a lack of physical activity."

Costs

Capital Costs

The capital costs of a bike-on-bus program typically include only the purchase of the rack units. In 2005, most transit agencies paid between $500 and $1,000 each for equipping two-bicycle racks on buses. King County Metro paid $660 per rack for a three-rack design from Sportworks Northwest. Purchasing new buses with bike racks already installed can increase the transit agency's capital costs slightly but reduces the agency labor cost of retrofitting the buses with racks.

Bike racks typically need to be replaced after 6-7 years, often due to rust or colliding with other objects. Many transit agencies have taken measures to reduce capital costs by protecting their existing supply of bike racks on buses by adding deployment indicator lights to show when a rack is down. If a rack is left down without a bicycle on it, drivers may be unaware that it is deployed which could lead to the driver inadvertently damaging the rack. This has been mitigated with an indicator light warning drivers that they have a larger "sweep" area when turning.

Operating Costs

The staff time required to maintain bicycle-on-bus programs varies depending on the size of the transit agency. Larger agencies maintain a full-time staff person to manage the program, or combine these responsibilities with other bicycle-related activities such as managing bicycle parking and bike-on-rail programs.

Sportsworks Northwest recommends a minimal visual inspection of the rack each day, as well as a 30-day general maintenance inspection, which consists of tightening bolts and checking for wear and tear.[37] Maintenance of the bike racks is minimal – about $50 to $100 per rack per year.

Costs to Consumers

Some bicycle-on-bus systems require users to have a permit. The goals of a permit requirement are to ensure that users are knowledgeable about system usage and to offset the cost of the program. However, permitting requirements are generally viewed by transit operators and bicyclists as discouraging casual riders and increasing administration and enforcement costs. For these reasons, only one transit agency charged for the service as of 2005.

Best Practices

The majority of transit agencies in the Unites States have some sort of accommodation for bicycles on buses. The most prevalent options are: bike racks on the front of buses, bike racks on the back of buses, and allowing bicycles inside the vehicle. Each of these options is discussed below, including examples of transit agencies that have pioneered each approach.

Operational

Front –Mounted Bike Racks

The majority of transit agencies that allow bikes on buses use a rack placed in front of the bus. Most bike racks hold two bicycles, but some transit agencies have been testing bike racks with capacity for three to five bicycles. When not in use, the bike rack folds up on the front of the bus. When a bicyclist wants to use the rack, he or she pulls it down and places the bicycle onto the device. The front-rack method requires the user's ability to lift their bicycle onto the unit. Some buses are capable of kneeling, to help with the bicyclist lift the bicycle onto the rack.

The two-bike front racks add six to nine inches of length to the bus, requiring additional storage in the bus yard. Racks accommodating more bikes are longer, and when closed sit higher on the front of the bus. The change in size increases the "swept area" of the bus. The increased length on buses results in a longer turning radius and the racks can interfere with windshield wiper operation, as well as headlights and turn signal lights on some types of buses. In hillier regions such as Seattle, buses have had problems with bottoming-out as they turn up large hills.

The design of the three-bike rack has been improving, and several transit agencies now use a redesigned rack produced by Sportsworks Northwest. The company has sold over 4,000 three-position racks since 2003 to almost 200 transit agencies in the United States and Canada.[38]

[37] Sportsworks Northwest. Bike Racks for Buses: Service and Maintenance. http://www.bicycleracks.com/busrack_support_maintenance.asp Accessed 3/19/2009.
[38] Sanden, Derek, Sportsworks Northwest. Personal Communication, 3/18/2009.

Rear-Mounted Bike Racks

Rear-mounted racks have been experimented with by some transit agencies, but present some unique issues. Rear mounted racks block access to the engine and bicycles can also get dirtied by exhaust at the rear of the bus. Rear-mounted bike racks also raise concerns about user safety and vandalism as drivers cannot see the rack and monitor the safety and security of bicyclists as they load and unload their bicycles. The buses should be deployed with mirrors or rear-view cameras to allow the driver to see a cyclist mounting a bicycle. A dashboard light can show the driver when the rack has been deployed. In addition, passengers should be encouraged to speak with the driver, to warn him that they will be using the rear rack.

Bikes-in-Buses

Another option for bikes-on-buses is to allow the bicycle into the bus. This can be done either by allowing bicycles in the aisle or passenger area, providing a dedicated space or interior rack for bicycles, or putting bicycles in cargo hold areas, typically below the passenger area of the bus.

This method is problematic in crowded buses, and often requires the bicyclist to lift the bike up stairs. In these situations, bus drivers are usually given the authority to decide when to allow bicycles on the bus. In a few cases, where buses have additional space for luggage, bicycles are allowed to be stored in this compartment, often underneath the bus. The option of bringing the bike on the bus should be offered as a back-up option when the exterior racks are full.

Folding Bicycles

By themselves, folding bicycles can solve two problems that transit agencies face: how to get more commuters to use mass transit and how to accommodate additional transit users. LACMTA feels that folding bikes can help them convince more commuters to adopt transit for their daily commute, which would then empower transit administrators to improve infrastructure. As for the benefits to the rider, a folding bike is highly convenient for anyone who lacks the space to store their bicycle at any point in their journey or work day. Folding bikes can be easily stored in the office or cubicle and unfolded and ready to ride in seconds.

The primary advantage of the folding bicycle is its ability to use a minimum of space on the rail/bus system while avoiding the ‘peak period’ policy issues of its larger counterparts, thus allowing for more efficient movement of people. Many of the popular bus routes in Los Angeles may regularly exceed the two bike rack carrying capacity, thereby forcing bus passengers to leave their bikes behind or stop taking the bus with their bike. Folding bikes would increase the bike carrying capacity both on buses and on rail without additional expense to LACMTA

Demand Management

In recent years, transit operators have typically attempted to stimulate demand for bicycle carrying capacity on buses through the provision and marketing of bike racks, and by removing fees, permits, and other restrictions to use. Due to the success and popularity of these programs and the inherent capacity limitations, agencies may consider strategies to better manage demand.

Providing safe, convenient bike parking at bus stations and stops may help alleviate demand for bicycle carrying capacity on buses by providing an alternative for users who do not need their bicycle on the other end of their trip. Bike parking at bus stops could be prioritized along bus

routes with high demand for bicycle carrying capacity, such as express bus lines. (See Chapter 12 Bike Parking at Transit Stations).

Certain types of bicycles are sometimes prohibited for clearance or visibility issues. Some examples include: recumbents, tandems, tricycles, unicycles, electric bicycles, and other non-standard cycles. Some agencies have a minimum age for using the racks, and others limit usage to people who can load their bikes themselves.

Marketing

Current transit riders and bicyclists are the most likely "early adopters" and frequent users of a bike-on-bus program. First time and/or infrequent users may be concerned about how to load their bicycle on to the bus or have fears about whether the racks will be time-consuming or prohibitively difficult to use. For this reason, a bike-on-bus program should be marketed to potential users. This could include advertising, events, and specialized outreach efforts aimed to attract those most likely to use the racks. Information about how to use bicycle racks should be promoted on transit websites. Additionally, online videos have been effective at demonstrating usage.

Tri-Met, in Portland, OR, has a model bike rack which they bring to transportation-related events and mobility fairs at employment centers. This allows users to experiment with the system before having to depend on it. Similarly, in Chicago representatives of a mayor's bicycling education program staged demonstrations of bike-on-bus racks at community events in order to provide hands-on training.

Access

Allowing bicycles on transit is only one step in promoting bus-bike integration; good bikeways to transit stations are required, and secure bike parking at transit stations and bus stops is important in case of capacity overload (see Chapter 12). In addition, access management should be considered, such as how the bicyclists navigate to the bus stop waiting area. Transitions from the bikeway network to bus stops should also be taken into account as most bus stops are located on city sidewalks. Maps of the bicycle network can be provided near stops, and wayfinding signage and/or pavement markings should guide bicyclists from the nearest bike path to the major bus stops.

Fiscal

Most bike-on-bus programs are funded by the transit agency or City that operates the buses, or by a federal grant. In addition, potential funding sources include: FTA Section 5307 and Section 5309 Formula Funds, CMAQ program funds, and Surface Transportation Program Enhancement Funds.

San Luis Obispo, California

Due to the large number of transit riders who bring their bikes with them on the bus, San Luis Obispo Regional Transit Authority (SLORTA) installed three-bike racks on the front and back of their buses in 2003 (as shown in Figure 14). Users have had concerns for the safety of their bicycles, while drivers were nervous about the danger of encouraging people to stand behind the vehicle. However, with the installation of rearview cameras and a light to indicate that the rear rack has been deployed, the system has resulted in few problems. In addition, passenger

outreach educated cyclists of the need to inform the driver that they would be using the rear rack, and again when leaving the bus.

Figure 14 SLORTA front and rear racks

The SLORTA transit coordinator noted that despite the capacity for six bicycles on each bus, the system still experiences capacity issues.[39]

Long Beach, California

Long Beach Transit (LBT) uses three-position bike racks on all of its 40 and 60-foot buses (193 total buses). As one of the early adopters of this higher-capacity rack, they realized that the early model blocked a turning indicator light when in the stowed position. This issue was reported to the manufacturer and has since been corrected. LBT also realized that operation of the three position rack was slightly more complicated than the two-position racks familiar to most users. In order to address this issues the agency partnered with the Long Beach Bikestation to provide a "training rack" that potential users could use for practice in a controlled environment rather than trying to operate the rack for the first time in front of an idling bus. The Long Beach Transit system also requires the use of a "Rack Pass" to load a bicycle on the bus. Riders are required to show the pass to the driver prior to loading the bike on the bus. The "Rack Pass" can be printed from online, and warns users that Long Beach Transit is not responsible for property damage when using a bike rack. Users must be ten years or older, or accompanied by an adult to use the bike rack.

Everett, Washington

The (SWIFT) is a Bus Rapid Transit system currently under development in Everett, Washington. The vehicles will be stylized 60-foot articulated diesel-electric buses with three doors. One door will be for the majority of passengers, one door for riders with disabilities, and one door for bicyclists, with access to onboard bike racks. This system is designed to maximize ease of use for bicyclists and to encourage bike-on-bus boardings.

The planning of the system prioritizes bus routes without parallel bicycle routes for bike-on-bus accommodation.

[39] Gillespie, Jason, San Luis Obispo Regional Transit Authority. *Personal Communication.* 3/18/2009.

Seattle, Washington

In 2007, King County Metro in Seattle, WA received a federal grant of Surface Transportation Program (STP) funds to install three-bus racks to expand capacity for bicycles on the buses. Due to safety issues by the new design, full implementation of the three-bus racks has been delayed.

All of the transit agencies in the area agree that; while there have been issues with the design of three-bike racks, it is essential to provide the additional capacity for more than two bikes on every bus. However, the agency has not reached a final determination of the success of their experiments with three-bike racks for buses.[40] The three-bike racks are still in development.

Expansion Potential in Los Angeles

Most buses in the LA Metro system currently provide a two-bike rack. Expansion of the system may include switching to three-bike racks, particularly on routes with high demand. Metro can consider bus drivers on the most appropriate location for bikes on board buses in order to reduce conflicts with passengers and overall capacity within the bus.

Opportunities

New/pending policies, regulations, or incentives

The California Vehicle Code (CVC) length limit has been specifically modified to allow for bike racks to be installed transit buses. Both two and three-position bike racks can be installed on all standard-size buses under the CVC. The current policy of Metro is to only install three-position bike racks on fixed guideway BRT lines such as the Orange Line based on internal concerns that the three-position rack may be more likely to induce users to stray into the overtaking travel lane when loading and unloading. None of the transit operators interviewed for this study have expressed this concern.

Joint partnerships

If the City of Los Angeles and/or Metro decided to increase bicycle carrying capacity on their bus fleet through the provision of three-position racks on an expanded number of buses, education and marketing partnerships may prove useful. In order to educate the public on the use of three-position bike racks, the City of Los Angeles and Metro could potentially partner with non-profit organizations, bike shops, and bike rack manufacturers to distribute information about the use of rack and to provide hand-on instruction. A precedent for this is the 2004 Southern California Bicycle Expo, where Metro provided a bus with a two-position bike rack and the Los Angeles County Bicycle Coalition staff and volunteers provided instructions on its proper use.

Emerging political will / public opinion

There is a general consensus among City officials that demand for greater bicycle accommodations in all aspects of the transportation system has increased in recent years.

[40] Kadesh, Eileen. King County Metro. *Personal Communication.* 3/19/2009.

Challenges

If significant demand for bikes on buses exists, the system could quickly develop capacity issues. This would require high-quality, long-term parking at transit stations, particularly transit centers and park-and-ride facilities.

Regulatory

In general, all bus service providers in Los Angeles County provide bike racks on buses. Policies towards allowing passengers to take bikes on board buses varies between providers. However the largest provider of bus service in the County (Metro), allows bicycles on board at the driver's discretion.

Financial

There is cost a challenge, especially for lines where capacity issues require upgrades from the standard 2-bike front of bus racks.

Political

Balancing the capacity needs of all riders with the legitimate desire of bicyclists to bring their bikes on board buses requires careful prioritization of the most cost-effective strategies. Particularly in situations where bicycles share priority seating areas with other passengers, expanding capacity for bicycles can be difficult. Where possible, bicycle accommodations on buses should provide separate space that does not conflict with other users, to maximize public acceptance and political viability.

Market acceptance

Marketing efforts and improvements to the quality of the broader transit and bikeway systems will be required to increase cultural acceptance of mass transit and the use of bicycles for transportation. Marketing should be targeted toward different user groups: people who currently bicycle may decide to bus for part of a trip, and want to know how to do so easily. Non-bicyclists will be more comfortable knowing that buses have racks, can be brought on board in various circumstances, and that folding bikes can be brought on board. If designated space is allotted for bicyclists on board, this will help reduce conflict and the misconception that bicycles are not welcome on board buses.

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Bikes on Rail

Overview

The role of rail in a public transit system is usually to provide faster, more comfortable service on more limited corridors as compared to bus routes. As a result, passengers are more likely to travel longer distances to reach the rail station (either by car, bus, bicycle, or on foot) than they generally would travel to reach a typical bus stop. As with bike-on-bus programs, allowing bicycles on rail can overcome large obstacles to bicycling, including distance, hills, riding on busy streets, night riding, inclement weather, and breakdowns.

Rail stations more frequently offer bicycle parking than bus stops. In the Netherlands, one-third of all transit passengers ride their bicycles to the train station, and most store their bicycle in expansive long-term parking facilities.[41] However, most U.S. bicycle-rail passengers prefer to bring their bicycle with them. This is primarily because of concerns of security of bike parking at rail stops, and because in the U.S. land use context, they are likely to need their bicycle at both ends of the rail trip, as many origins and destinations are not within walking distance from the rail stop. For these reasons, accommodating bicycles on rail transit vehicles can be an effective strategy to overcome first- and last-mile obstacles to transit use.

Figure 15 Bicyclist Using Rail Transit

Bicyclist boarding a MAX light rail train in Portland OR. Many bicyclists are willing to use transit for all or part of their trip. Image from Bicycle Transportation Alliance. Used with permission.

[41] Netherlands Ministry of Transport. (2007). *Cycling in the Netherlands*. Public Works and Water Management.

In North America, bicycles are permitted on railways, subways, or trolleys in the San Francisco area, Chicago, San Diego, San Jose, Los Angeles, Atlanta, Miami, Washington D.C., Boston, Philadelphia, Portland, Montreal and Toronto. All bike-on-rail programs allow bicycles inside the rail car. In some situations, a designated area for bicycles is provided in the train car, while in others, bicyclists share space with other passengers. The hours bicycles are allowed, the number of bicycles permitted per car, and the charge to bring a bicycle on the train varies depending on the system.

While there are many concerns regarding the additional loading and off-loading time, as well as the space requirement of holding bicycles, most cities have found that the additional incentive to ride transit and reduction in single-occupancy vehicles has warranted the costs.

Existing Conditions

Description of historical/existing services or programs

Passenger rail in Los Angeles is provided by three operators. The Los Angeles County Metropolitan Transportation Authority (Metro) operates three light rail transit and two subway lines within the City. Metrolink provides commuter rail service between Union Station in downtown Los Angeles and suburban areas to the north, east and south of the city. Amtrak provides intercity passenger rail service to Union Station. There are also Amtrak stops at two locations in the San Fernando Valley (Chatsworth and Van Nuys). Bicycles are currently accommodated to some degree by all three passenger rail providers serving the City of Los Angeles.

Metro

Bicycles were first allowed on Metro Blue line in 1991 during specific times of day. The *Metro Bicycle Transportation Strategic Plan* was adopted in 2006 and guides future planning for bicycles-on-transit for LA Metro. Prior to September 2002, bike permits were required to bring a bike on rail. At that time, the Board allowed bicycles more liberal access to rail, recognizing "bicycles as an integral part of the countywide transportation system."[42] According to a 2001 survey, just over one percent of Metro Rail passengers used a bicycle at one or both ends of their trip.

Bikes are prohibited on Metro Rail during the morning weekday rush hour (6:30 AM-8:30 AM) on the following lines:

- Metro Blue Line: Long Beach to 7th/Metro
- Metro Green Line: Norwalk to Marine
- Metro Red Line: Union Station - Wilshire/Vermont (both directions)
- Metro Gold Line: Union Station - Sierra Madre Villa (both directions)

Bikes are prohibited on Metro Rail during the afternoon weekday rush hour (4:30 PM-6:30 PM) on the following lines:

- Metro Blue Line: 7th/Metro to Long Beach
- Metro Green Line: Marine to Norwalk

[42] MTA Countywide Bicycle Policy, http://www.metro.net/about_us/library/images/Countywide%20Bicycle.pdf Accessed 3/15/08

- Metro Red Line: Union Station - Wilshire/Vermont (both directions)

While no dedicated space is currently provided for bicycles on Metro trains, bicyclists tend to stand with their bicycles wherever they can find sufficient space—typically near doorways, inward-facing seating areas, the articulated sections of light rail vehicles. The only clear location-related instruction for bicyclists is that they are prohibited from blocking the conductor's door.

The 2004 publication, "Enhanced Public Outreach Project for Metro's Bicycle Transportation Strategic Plan"[43] recommended the provision of dedicated space for bicycles on Metro Rail. It also called for the elimination of peak hour restrictions for bicycles, as the majority of bicycle trips to work or school is the highest during the restricted periods.

Metrolink

Each Metrolink train can accommodate up to two bikes in the lower level of each car. Bikes are secured with both wheels touching the floor using the installed Velcro straps. No special permits or passes are required, but passengers with bikes must purchase a regular Metrolink ticket or pass. The conductor may require a bicyclist to relocate to a different car or wait for a later train due to crowding. Motorized or three-wheeled bikes are not allowed on Metrolink trains.

Figure 16 Metrolink Bicycle Area

On Metrolink, Bicycles Use Part of the Priority Seating Area. Image from Alta Planning + Design. Used with permission.

Amtrak

Amtrak provides intercity rail service to Los Angeles. Amtrak generally uses the same routes as Metrolink, but with limited stops, and honors Metrolink tickets. The Pacific Surfliner is the only line serving Los Angeles that accommodates bicycles on board rail vehicles, providing vertical storage spaces for up to three bicycles near the passenger car entrances. Bicycles can be checked as baggage on any Amtrak route serving Los Angeles (e.g. Coast Starlight) as long as checked baggage service is provided at both the origin and destination.

[43] Los Angeles County Bicycle Coalition for LA County MTA. (2004). Enhanced Public Outreach Project for Metro's Bicycle Transportation Strategic Plan http://bikeoven.com/epop/ Accessed 4/6/2009.

Best Practices

Many transit agencies value bicycle riders as an important segment of their constituents. Marketing efforts have been organized in order to communicate to this population that bicycles are allowed on trains. Other important marketing messages include time restrictions, permitted locations for bicycles, and any other limitations or campaigns (such as required bicycle permits, folding bicycle promotion programs, etc.). Locations for marketing messages include placards in train, bus side boards, posters at transit stops, brochures, and billboards. Many transit agency websites have a page for bicyclists explaining the program and any requirements.

Transit agencies can design materials about their bikes on transit program that can be handed out at bicycle events and distributed through individualized marketing projects and bicycle organizations.

The Chicago Transit Authority created a “Bikes Ride Free on CTA” marketing campaign to let the public know that they were allowed to bring their bicycles on trains and that there was no additional cost for the service. The campaign included well-designed brochures and placards on trains and buses.

Integrating Bicycles with Transit

Allowing bicycles on transit is only one step in integration; good bikeways to transit stations are required, and secure bike parking at transit stations is important in case of capacity overload. In addition, access management should be considered, such as how the bicyclists bring their bikes though turnstiles or onto the platform. Transitions from the bikeway network to the station should also be taken into account. Maps of the bicycle network can be provided near stops, and wayfinding signage and/or pavement markings should guide bicyclists through the station.

The station configuration may also be a limiting factor for bicyclists. Some older stations still have turnstiles that do not allow access by wheelchairs or bicycles, and escalators and stairs are more difficult for bicyclists than elevators. As a rule of thumb, if a station is not ADA accessible then it is likely to be not accessible for bicycles either.

These issues are discussed in greater detail elsewhere in this report.

Operations

Allowing bicycles to board the rail system is an important component of creating a multi-modal transportation network. Transit agencies across the United States have determined that incorporating bicycles with trains allows people to maximize their transportation options by combining modes in order to reach their destination without using a personal motor vehicle. This creates a system where the origin and destination point can be significantly further from the transit station than walking allows.

Placement of Bicycles

Train cars that allow bicycles can be categorized by whether or not they have dedicated space for bicycles. Many times the dedicated space for bicycles is shared with the seating for disabled passengers or the priority seating area. Since the two parties are competing for the same space, transit policy generally prioritizes priority seating for those passengers with special needs. Passengers with bicycles need to board a car with space available in the priority seating section.

This is often communicated to passengers through signage on the train car and through the transit website in its policies section.

Some light rail and/or commuter train designs have developed designated space with a hook or rack system for bicycles to hang or mount. The benefits of such a system are that it removes the need for the passenger to stand with their bicycle and reduces the footprint of the bicycle by hanging it vertically. However, the inability of certain passengers to lift their bicycle onto the hook presents problems for this system. In several of these systems, if the racks are full the passenger may use the unoccupied priority seating or wait until the next train with available hooks.

Some commuter rail systems that travel on heavy rail tracks have assigned a car specifically dedicated to bicycles; an example of such a practice is the San Francisco Bay Area's Caltrain system. The benefit of such a system is multiple bicycles being allowed on a train. The downside is that it replaces potential seating for passengers and can be expensive to retrofit an existing car to incorporate a rack or hook system. In addition, if the dedicated bicycle car fills up (such as during peak commuter hours), bicyclists can get "bumped" and have to wait for the next train.

Figure 17 Dedicated Bike Car

The dedicated car for bicycles should be clearly marked and easy to access, as in this example from Germany. Image from Alta Planning and Design. Used with permission.

Timing Restrictions

Transit agencies also establish policies regarding appropriate times of the day when bicycles are allowed on trains. Many agencies have peak-hour restrictions on bicycles boarding the train. Often the restricted times include 7-9 AM and 4-6 PM during the weekdays. These restrictions may be directional (e.g. inbound restrictions in the morning and outbound restrictions in the evening). Peak-hour restrictions are enacted because the train cars are often times too crowded to accommodate bicycles. However, time restrictions may discourage ridership by those who use their bicycles as part of their multi-modal commute, especially where high-volume, high-security bicycle parking facilities are not provided as an option. For example, according to the onboard and web survey administered by TriMet in Portland, OR as part of the Bike-Max Survey 2007-08, respondents were asked how they would make their trip during peak hours if bike-on-MAX was not an available option and 39% of respondents said they would drive.[44]

[44] TriMet Bike Programs. (2007-2008). Tri-Met Bike-Max Survey.

New York City's Metropolitan Transit Authority does not have any rush hour restrictions for their bicycle-on-trains policies. This allows the transit rider more options for incorporating bicycles into their commute. However, many trains are so full during rush hour times that it may be physically impossible to board with a bicycle. However, because peak-hour service is so frequent in the MTA system, bicyclists who can't board a train will likely not wait long for another train with more space.

Marketing

LA Metro has an extensive marking operation for promoting commuting by bicycle, including a website,[45] customizable bicycle routes and maps, guidance and suggestions for commuting, and links to area resources.

LA Metro also conducted outreach to ensure that bicyclists' opinions were included in the Bicylce Transportation Strategic Plan.[46] Outreach included informational displays, maps, photos, incentives for participation and interactive surveys with bilingual interviewers.

LA Metro also sponsors a Bike to Work day, with prizes and incentives for participating. The website[47] includes bike safety tips, a free screensaver, and many other resources for bicycling in the County and using public transit.

Demand / ridership / usage

The only local indicator of existing bike-on-rail use is a 2001 passenger survey indicating that, just over one percent of Metro Rail passengers used a bicycle at one or both ends of their trip.[48] Although this result does not distinguish between those who parked their bicycles at transit stations and those who carried their bicycles on-board trains, we can assume that the number of Metro Rail passengers who carried a bike on a train is less than one percent. It should be noted that this survey was conducted at a time when the time restrictions for taking bicycles on Metro trains were significantly more onerous than they are currently.

Transit agencies surveyed as part of a 2005 Transit Cooperative Research Program (TCRP) Report on the integration of bicycles and transit reported serving as many as 575,600 bicyclists per year.[49] The report found anecdotally that young adults, students, and low-income commuters are the most frequent users of bike-on-bus systems. It should be noted that most transit systems do not accommodate bicycles, so this number should not be viewed as a reflection of demand. Demand is much higher than current use, as seen by huge growth in bicycle ridership on systems that do allow bicycle access, and as seen by increasing demand from bicyclists around the country for access to rail transit systems. For example, since TriMet in Portland, Oregon added space for bicycles to be carried onto MAX light rail cars, the portion of passengers carrying a bike on rail has been measured at nearly four percent.

[45] http://www.metro.net/riding_metro/commute_services/commuting_bicycle.htm Accessed 4/6/2009.
[46] Los Angeles County Bicycle Coalition for LA County MTA. (2004). Enhanced Public Outreach Project for Metro's Bicycle Transportation Strategic Plan http://bikeoven.com/epop/ Accessed 4/6/2009.
[47] http://www.metro.net/projects_studies/bikeway_planning/biketowork/default.htm
[48] Los Angeles County Bicycle Coalition for LA County MTA. (2004). Enhanced Public Outreach Project for Metro's Bicycle Transportation Strategic Plan http://bikeoven.com/epop/ Accessed 4/6/2009.
[49] Transit Cooperative Research Program. (2005). Intergration of Bicycles and Transit: A Synthesis of Transit Practice. http://onlinepubs.trb.org/Onlinepubs/tcrp/tcrp_syn_62.pdf Accessed 3/16/2009.

Benefits

Because rail vehicles travel long distances, they allow bicyclists to travel significantly farther than they would be able to bicycle in the same time. In addition, having a bicycle with them allows transit riders to access destinations that are farther than a quarter-mile from the station. Accommodating bicycles on rail transit vehicles increases the market or catchment area as well as the feasibility of transit in low-density areas.

Transit agencies responding to a survey by the Transit Cooperative Research Program for the report *Integration of Bicycles and Transit.* (2005) felt that "their bicycle services increase transit ridership by:

- Extending the range that customers can travel to reach transit stops and stations
- Increasing the flexibility that passengers have to reach destinations at the end of a transit trip,Providing "seamless" transportation between bicycle and transit modes
- Offering an additional amenity to customers that increase the attractiveness of transit"[50]

Costs

Capital Costs

The costs associated with adding bicycle racks to trains and creating policy about bicycles on rail cars are minimal. TriMet (the regional transit agency in Portland, Oregon) spent $35,000 to retrofit twenty-seven rail cars with hooks to accommodate four bicycles per car. Drafting policy about bicycles on rail requires staff time to coordinate approval among stakeholders.

Operating Costs

Direct costs associated with operating bicycle storage space on rail vehicles would likely be nominal. Agencies will want to inform security staff and fare inspectors about any limitations to bicycle access so they can add these to their enforcement activities, but permitting bicycle access should not significantly increase the enforcement burden on agencies. The cost of marketing and promotion is also nominal relative to existing agency marketing budgets, which should include promotion of bicycle access to and use of transit.

Costs to Consumers

Some transit agencies have policies requiring payment to bring a bicycle on board. Minneapolis/St.Paul's Metro Transit previously required users to pay $1.75 for off-peak and $2.25 for peak hours in order to bring their bicycles on their light rail. These costs are minimal, but discourage use of the system and can invite fraud, which then requires enforcement resources to be utilized.

Over 2,000 or 3.8 % of weekday passengers on TriMet's MAX line in Portland, OR brought a bicycle with them in August 2007. TriMet provides a dedicated space near the door of each car for a bicycle – four per car. Due to the popularity of the service, the agency has been experiencing capacity issues. The design of the MAX light rail system and Portland's historic short city blocks limits the length and number of trains in service, such that additional capacity is not possible during rush hours. At this time, if the train is overcrowded, passengers with bicycles

[50] Transit Cooperative Research Program (2005). *Integration of Bicycles and Transit.*

must wait for a less busy train. TriMet is also looking into solutions to expand bike-on-train capacity.

Figure 18 Bike Hook

On TriMet trains in Portland, OR, passengers hang their bicycles near the door of the car. Image from Alta Planning and Design. Used with permission.

A web survey administered as part of the TriMet Bike-Max Survey 2007-08 found that over half of respondents made a combined bike-light rail trip at least a few days per month. There are many reasons why people take their bicycles onto a rail car. The reasons respondents gave for making a bike-on-MAX light rail trip include:

- Distance of my trip too long to ride my bike (77%)
- Need my bike to reach my destination (76%)
- Taking MAX is faster than riding my bike (72%)

This survey found a number of recurring times when bicyclists take light rail, including in the afternoon, during seasons of inclement weather, when good alternative bicycle routes do not exist, and to avoid barriers such as steep hills.

Caltrain, California

Caltrain vehicles can either accommodate16 or 32 bicycles, depending on the train. The trains have designated space for bicycles with racks on specific trains. Trains that allow for bicycles are marked with a bike symbol on the outside of the car. Bicycles can use the priority seating space to store bicycles if the hooks are full; however, passengers with special needs have priority. If the train is already full, the cyclist must wait until the next train.

The Caltrain vehicles often experience capacity issues and rider complaints. Issues include a lack of spare cars and difficulties maintaining on-time performance. The agency also acknowledges that as their trains become faster and more reliable, cyclists are more likely to take transit, and bring their bicycles with them. Caltrain is currently looking into making more efficient use of existing capacity and finding ways of increasing capacity and recently agreed to provide additional on-board bicycle capacity. Another strategy is to provide additional bicycle parking facilities at train stations, so that passengers who biked to the station can leave their bicycles, but this approach is not useful to passengers that require a bicycle on both ends of the trip (unless they store a bicycle at both the origin and destinations stations).

Minneapolis/St.Paul, Minnesota

MetroTransit in Minneapolis/St.Paul provides bike racks on Hiawatha Line, which connects downtown Minneapolis to the airport and the Mall of America. Bringing a bicycle on the trains is free of charge. As in most transit stations, bicyclists cannot ride their bikes at the station or on the platforms. Similarly to the TriMet example, bicycles are lifted and vertically hung on a hook, with a hoop at the bottom to stabilize the rear wheel of the bike.

Practice bike racks are available in five locations, so potential users can practice using the system before boarding an active train with a bicycle.

Copenhagen, Denmark

On rail cars in Copenhagen, bicyclists are directed to use a designated bicycle car with markings on the outside of the car. On this system, seats raise and underneath are racks that hold a bike when wheeled directly in. This system reduces passenger space in lieu of bicycles; however, up to 14 bicycles can share the space. The trains run frequently, so when this capacity is full, cyclists can wait a short time for the next train.

Figure 19 Under-Seat Supports

On the dedicated bicycle car in Copenhagen, seats can be raised, revealing racks that hold several bicycles.
Image from Alta Planning and Design. Used with permission.

Fiscal

Transit agencies can apply for federal funding to help initiate bikes-on-rail projects. Funding can be available from the following programs:

- FTA Section 5307 and Section 5309 Formula Funds
- CMAQ program
- Surface Transportation Program Enhancement Funds

As most of such projects are developed as part of the transit capital project, rather than having the bicycle accommodations added to a rail car after is has been operational, it is often difficult to differentiate the costs of bicycle-related projects from the overall rail project. In one previously-mentioned retrofit example, TriMet (the regional transit agency in Portland, Oregon) spent $35,000 to retrofit twenty-seven rail cars with four hooks to accommodate four bicycles per car, resulting in an average cost of almost $1,300 per car or $324 per hook.

Expansion Potential in Los Angeles

Opportunities

While the City of Los Angeles does not operate passenger rail service, the City is supportive of efforts to improve bicycle access to transit through appointees to the Metro Board of Directors and through City representatives on various Metro committees. Metro has made efforts to improve accommodations for bicycles on rail vehicles. While previous policies limited hours when bicycles were allowed on the train and required a paid pass, these restrictions have since been loosened. However, in order to make bicycle commuting a viable option for those who need a bicycle for both the home and activity ends of their trips, more dedicated space for bicycles on rail vehicles will be necessary.

Many other transit agencies, such as TriMet and Caltrain, are currently exploring options to expand the capacity of rail vehicles for bicycles. The City of Los Angeles will benefit from these experiences in other cities.

Challenges

The key challenge to accommodating bicycles on board rail vehicles is the availability of sufficient on board space during peak periods. In order to successfully accommodate bicycle on rail vehicles effort must be made to identify the most appropriate locations for bicycles on board rail vehicles and these locations must be apparent to users.

Regulatory

There are no known regulatory obstacles to providing bicycle accommodations on transit vehicles.

Financial

Retrofitting existing rail vehicles will require financial resources in the form of staff time and capital improvements. Previous experience at TriMet in Portland, OR indicates that hooks cost approximately $350 per hook.

Political

Balancing the capacity needs of all riders with the legitimate desire of bicyclists to bring their bikes on board railcars requires careful prioritization of the most cost-effective station access strategies. Particularly in situations where bicycles share priority seating areas with other passengers, expanding capacity for bicycles can be difficult. Where possible, bicycle accommodations on rail should provide separate space that does not conflict with other users, to maximize public acceptance and political viability.

Market acceptance

Marketing efforts and improvements to the quality of the broader transit and bikeway systems will be required to increase cultural acceptance of mass transit and the use of bicycles for transportation. Marketing should be targeted toward different user groups: people who currently bicycle may decide to use rail for part of a trip, and want to know how to do so easily. Non-bicyclists will be more comfortable knowing where the bicycle-on-rail area is. Bicycle

accommodations separated from priority seating areas will be more publicly acceptable than those that create conflicts between transit users.

Additional Resources

- CalTrain, *Bicycle Frequently Asked Questions.* http://www.caltrain.com/caltrain_bike_FAQs.html Accessed 3/18/2009.
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- MTA Countywide Bicycle Policy, http://www.metro.net/about_us/library/images/Countywide%20Bicycle.pdf Accessed 3/15/08
- MTA Bike-on-Rail Policy, http://www.metro.net/about_us/library/images/bike_on_raill.pdf Accessed 3/15/08
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Bike Parking at Transit Stations

Overview

High-quality, secure, and ample bicycle parking facilities are essential for encouraging bicycle-to-transit connections. Bicycle parking at transit stations is most commonly used on the home end of a transit trip, but may also be used on the activity end. Providing parking at high-volume transit stations can reduce demand for bicycle space on transit vehicles; shift current drive-to-transit trips to bicycle; and expand the market capture of each transit stop. Providing well-designed and conveniently-located bicycle parking can also improve station function by reducing the number of bicycles parked in undesirable locations such as access ramps, stairwell railings, or landscaped fence lines. While bicycle parking can be a simple outdoor rack, many bicyclists are unwilling to lock their bicycle for more than a short time because of concerns about theft and vandalism. Most bicycles today cost $350 to over $2,000 and are one of the most-often stolen items in all communities, with components frequently stolen even when a bicycle is securely locked in public. Theft can be a serious deterrent to bicycle riding. In order to achieve significant usage of bicycle parking, higher-security parking should be provided that affords weather, theft and vandalism protection. Bicycle parking facilities can consist of a series of outdoor bicycle racks, bicycle lockers, automated access-controlled facilities, or attended facilities.

Existing Conditions

Bicycle parking at transit stations in the City of Los Angeles is provided by the City of Los Angeles Department of Transportation (LADOT) and the Los Angeles County Metropolitan Transportation Authority (Metro). LADOT provides bicycle racks and lockers at Metrolink (commuter rail) stations in the San Fernando Valley. Metro provides bicycle racks and lockers at all light rail, subway and bus rapid transit (BRT) stations. In some cases, particularly light rail or subway stations where there is insufficient space for bicycle parking facilities, LADOT provides bicycle racks on sidewalks near station entrances. The Los Angeles County Bicycle Coalition (LACBC) manages bicycle locker programs for both LADOT and Metro. Two attempts have been made to provide bicycle commuter centers similar to the Bikestation concept in the City of Los Angeles: at Chatsworth Metrolink station and the Hollywood and Western Red Line station. The project at the Hollywood and Western Red Line station has been stalled, but the Community Redevelopment Agency of Los Angeles (CRA-LA) is still pursuing an operator for the facility.

Description of historical/existing services or programs

Details on different types of bicycle parking facilities at transit stations in Los Angeles are provided in this chapter. In its 2003 *Bicycle Parking Plan*[51], Metro acknowledges that different types of bicycle parking attract different users; free racks are attractive to younger and more frequent users, while customers who are willing to pay for secure parking prefer bicycle lockers tend to ride farther and sometimes store their bikes in lockers at the activity end of their trips.

The optimal parking type for a given location is dependent on the anticipated demand for facilities, safety concerns, space availability, and cost.

[51] MTA. (2003). Bicycle Parking: A Plan for the Los Angeles County Metropolitan Transportation Authority. http://www.metro.net/projects_studies/bikeway_planning/images/bicycle_parking_plan.pdf Accessed March 16, 2009.

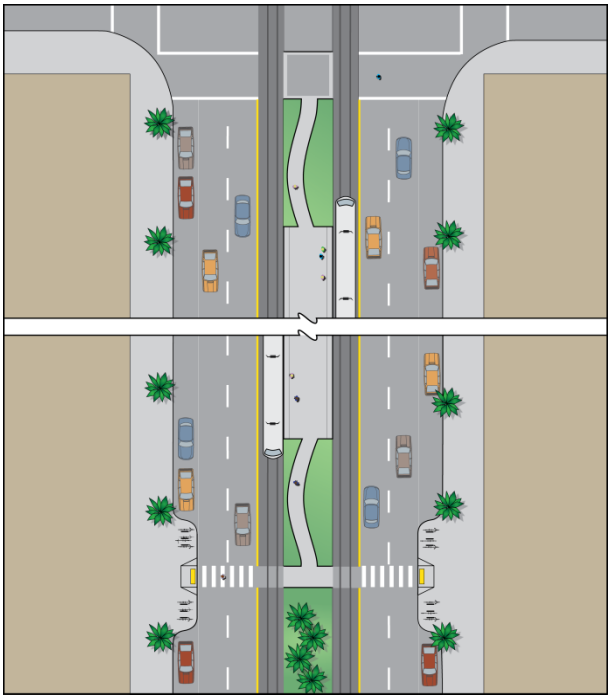
Basic Racks

Usually considered short-term parking, inverted U-racks or wave racks can be designed and placed in a way that bicyclists may be willing to lock their bicycles for the length of a transit trip. In Los Angeles, bicycle racks have typically been located wherever space is available near station entrances. Along the Metro Orange Line, bicycle parking areas were designed into each station. Bay Area Rapid Transit is currently experimenting with providing basic racks within the paid area, under the assumption that security will be improved by placing racks within view of station attendants and due to the fact that station gates are locked overnight. This arrangement may be relevant in Los Angeles, especially in underground stations where space is limited at street level (i.e. 7th Street / Metro Center / Julian Dixon Station in Downtown LA) or where theft is a problem.

To facilitate longer-term parking with basic racks, it is essential that they are located in well-lit areas, within view of security personnel, and covered wherever possible. Lockers for hourly or monthly rental can be placed on the end of the row of racks for more secure and dependable options (see Lockers section below for more detail).

If there is insufficient space on the sidewalk near the station or bus stop, or if on-sidewalk bicycle parking will interfere with pedestrian movement, converting an on-street automobile parking space to bicycle parking is an affordable and simple solution. Alternatively, bike racks can be placed on a mid-block or corner curb extensions, as long as the minimum 4' Paved Accessible Route (PAR) is maintained as required by the Americans with Disabilities Act (ADA) Public Rights of Way Advisory Guidelines (PROWAG).

Figure 20 On-Street Bike Racks



The City of Berkeley, CA has converted a few on-street parking spaces to provide a large amount of bicycle parking (right). The graphic at left shows how a curb extension can provide space for bicycle parking while improving mid-block crossing conditions for pedestrians. Image from Alta Planning and Design. Used with permission.

These on-street bike racks in Copenhagen, Denmark enhance pedestrian comfort by providing an additional buffer zone between the street and sidewalk (right). The photo at left shows how on-street bicycle parking can make storefronts identifiable as a landmark to passing pedestrians. Image from Alta Planning and Design. Used with permission.

Racks Inside a Cage or Room

A higher-security variation on basic racks is a bike cage that restricts access solely to the bicycle's owner. The cage can be fitted with a gate and an electronic passcard access to provide unsupervised parking. When there is a high demand for parking, several small cages provide more security than one larger one can, as they reduce the number of people who have access to each room.

Parking inside an enclosed room is more secure, but also more expensive than cages. The downside of both is that bicyclists must have a key or know a code prior to using the parking facilities, which is a barrier to incidental use. In addition, some bicyclists feel bike cages are less secure because multiple users (including non-bicyclists who have obtained a key or code) can access all the bicycles parked in the cage, as opposed to other parking infrastructure discussed below in which each bicyclist has sole access to his or her bicycle.

Automated Bicycle Parking

Automated bicycle parking provides secure, unmonitored outdoor parking. There are several different types of automated parking in use around the world. Most of them have a hook, slot, or other mechanism, on which the user places the bicycle, and which removes the bicycle from street level. These units can be accessible at all hours of the day for users to retrieve their bicycles. Automated parking is a good option for a location that requires bicycle parking to have a small footprint or in situations where surveillance may be difficult. Examples include:

- "Bike Trees" use a smart card technology and move bicycles up into an umbrella-shaped cover, which reduces theft and vandalism. This type of parking does not provide space to store bicyclists' accessories other personal belongings; only the bicycles are lifted up for storage. At least seven Bike Trees have been installed in Geneva, Switzerland.[52] Bike Trees are not used anywhere in the U.S. at present, but could provide significant user benefits, as well as reducing street space needed for secure bicycle parking if a locale pursued implementing them in the U.S.

Figure 21 Bike Racks in Cage

Placing bicycle parking spaces within a locked area increases safety, as shown in this example from a Portland OR employer-provided bicycle cage. *Image from* Alta Planning and Design. Used with permission.

- Spain and Japan have developed multi-level automated bicycle parking facilities to store a large number of bicycles. As shown in Figure 23, Bicibergs are automated systems that store the locker underground (see case study, following). They have the advantage that the user can store bags and raingear in the locker without fear of theft. In Japan, the bicycle is rolled onto a platform, which descends into the parking facility and is rolled into an underground storage unit. Usage fees are often minimal.

Figure 22
Biceberg Automated Bicycle Parking

Automated parking such as the biceberg system in Spain minimizes footprint while providing secure bicycle parking. Image from biceberg, Used with permission.

[52] Bike Tree Website: http://www.biketree.com/

Lockers

Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle. San Francisco BART design guidelines for lockers states that lockers should provide enough space to accommodate the bicycle and accessories and should only be accessible to one user at a time, in contrast to a locked or guarded storage cage. Some lockers do allow access to two users – one from each side - which is more secure than a cage. A partition separating the two bicycles can help ensure users feel their bike is secure. Lockers can also be stacked, reducing the footprint of the area, although that makes them more difficult to use.

Automated bicycle parking garages are about to hit the tipping point. Tokyo (not surprisingly) was one of the first to provide the innovation (see previous entry) for hundreds of bikes at their congested train stations. Meanwhile, a company in Spain, Biceberg has figured out how to mass produce them in more manageable sizes. One of the most innovative government agencies in the U.S., the NYC Department of Transportation is probably already looking into similar solutions.

What's the big deal? Not only does parking for 92 bicycles replace the space for parking only 4 cars, but it doesn't require an on-ramp and it removes one of the largest inconveniences of using a bike… securing it. Because the bike is stored in its own container, you can even leave other personal items in it.

It takes approximately 30 seconds to retrieve your bike, which to many is about how long it takes to lock/unlock their ride, and the cost is less than $30/year.

Biceberg's 'bikeparks' are in use in the Spanish cities of Zaragoza, Huesca, Blanes, Vitoria and Barcelona, with Catalonia, The Basque Country and Aragon on the way, followed by other cities in Europe.

The company even has civil engineering and installation documentation for construction and technical requirements on its website

New federal security guidance recommending that locker contents be visible has highlighted a tradeoff between security and perceived safety. Federal Transit Authority (FTA) transit Security Design Guidelines state, "if bicycle lockers are on-site, agencies should try to locate them away from critical structures and dense areas, or designed so that the interiors are visible. While bicycle racks are less problematic, bicycle lockers may provide hiding spaces for bombs, weapons, etc. unless constructed of transparent or translucent materials" (6.3.1.4 Protecting Critical Assets). Though these measures are designed to increase station security, bicyclists will perceive the contents of their locker to be less safe if they are visible and will be more reluctant to use them.

Traditionally, bicycle lockers have been available on a sign-up basis, whereby cyclists are given a key or a code to access a particular locker for a month or a year. Lockers can also be made available for one-time use, provided there is an e-mail address or call-in line where a user can obtain a code, which has to be changed regularly.

New computerized on-demand systems allow users to check for available lockers or sign up for them online and are the best option to serve both regular and incidental system users. Models from eLocker and CycleSafe allow keyless access to the locker with the use of a SmartCard or cell phone. Advance reservation systems are being tested that would enable users to depend on a locker being available. With an internet connection, centralized computerized administration allows the transit agency to monitor and respond to demand for one-time use as well as reserved lockers.

Lockers available for one-time use have the advantage of serving multiple users a week. Monthly rentals, by contrast, ensure renters that their own personal locker will always be available.

Bicycle lockers in Los Angeles are provided by LADOT and Metro. LADOT provides lockers for free with a $15 key deposit. Metro provides lockers for $24 for a six month lease plus a $50 security deposit. LACBC who manages both programs has expressed concern that the free lockers and $15 key deposit encourage inefficient use of the lockers and do not provide sufficient

incentive for users to return keys. Metro has experimented with electronic shared-use lockers that can be managed in a way that improves overall efficiency of use, but abandoned the program after a series of equipment malfunctions.

Figure 23 Bike Lockers

Bicycle lockers and racks on the Orange Line are located adjacent to the bike path that parallels the transit line. Image from Alta Planning and Design. Used with permission.

Two-Tiered Racks

Two-tiered racks can increase the ratio of bicycle parking spaces to the footprint of the bicycle parking area and are used at attended and unattended bicycle parking facilities throughout the United States and Europe. Two-tiered racks offer a mechanized assist for storing bicycles on two levels. These are somewhat more difficult to use than more traditional racks, as some users will favor using the racks on the lower level. These systems provide the greatest ease of use when an attendant is available to receive the bicycles and store them on the racks. These racks do not accommodate recumbent bicycles or tricycles. Josta is the most common brand of two-tiered racks. Two-tiered rack systems are currently used at the Long Beach Bikestation and the Del Mar Gold Line Station in Pasadena. LADOT purchased 30 two-tiered rack spaces for the proposed Hollywood and Western bicycle commuter center. These racks are currently in storage as CRA-LA attempts to find an operator and a contractor to handle improvements to the proposed site.

Figure 24 Two-Tiered Racks

These racks pull down for ease of use. Image from Alta Planning and Design. Used with permission.

Bicycle Commuter Center

Bicycle commuter centers or bike depots (often referred to by the trade name “bike stations” in the U.S.) are full-service parking facilities typically located at major transit locations that offer secure bicycle parking and other bicyclist amenities. There is no universally accepted terminology to describe different types of full-service bicycle parking facilities. While each ‘bike station’ is unique, they often provide:

- Attended or restricted-access parking spots
- Shared-use bicycle rentals
- Access to public transportation
- Commute trip-planning information
- Other bicyclist amenities such as:
  - Restrooms, changing areas, and/or lockers
  - Showers
  - Bike pump, workspace and/or shared bike tool ‘library’ for do-it-yourself repairs
  - Bicycle mechanics on duty providing fee-for-service repairs
  - Vending machines selling food, drinks, and even small bicycle parts (tubes, etc)

The VeloParking facility in Basel, Switzerland, offers 1,750 spaces, of which 850 are automated. Spaces can be rented with season passes, and 200 spaces are made available for daily use. The space also has a café, fast food, bicycle accessory sales, repairs, rentals, an air supply and battery recharging station, as well as bathrooms, showers, and tourist information. Lockers are available, in addition to racks in a garage.

The company BikeStation™, which runs several parking facilities in California and Washington, offers free parking during business hours and key-card access after-hours for members. Paying members enjoy a number of services. Services, which differ by location, may include bicycle repairs, bicycle rentals, sales and accessories, restrooms, changing rooms and showers, and access to vehicle-sharing, such as ZipCar. They can also incorporate restaurants or other services. Existing BikeStations™ are located in the following cities:

- Berkeley, CA
- Embarcadero, CA
- Palo Alto, CA
- Santa Barbara, CA
- Seattle, WA

In addition, BikeStation™ is working with Washington, D.C. to develop a bike-transit facility near Union Station. Also, BikeStation™ has partnered with Los Angeles County MTA to develop a network of bike-transit centers along MTA lines in the communities of Pasadena, Norwalk, Santa Monica, and North Hollywood.[53]

Figure 25 Bicycle Commuter Center ('bike station')

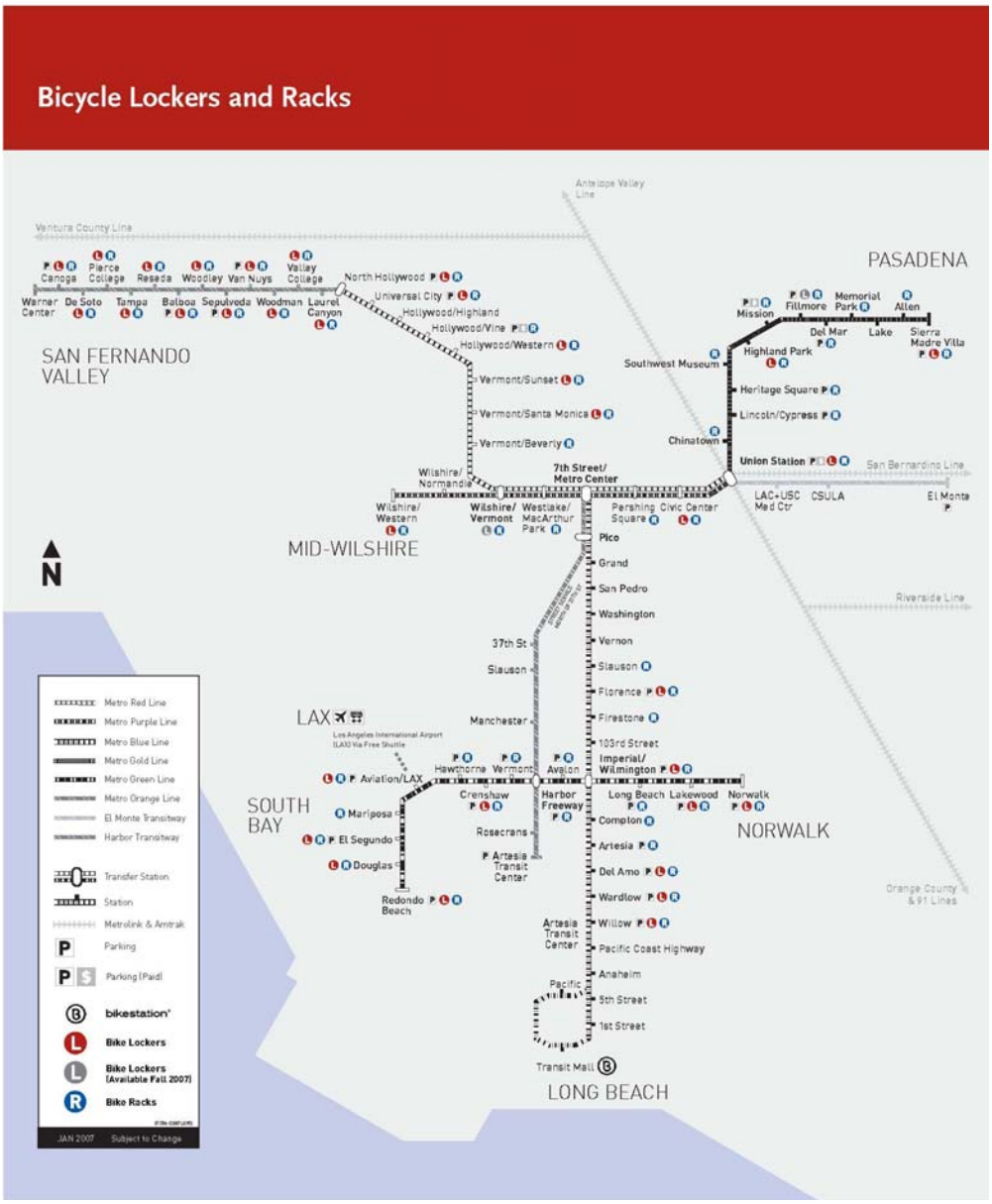
The BikeStation in Berkeley, CA is a social gathering place, in addition to providing bicycle parking. Image from Alta Planning and Design. Used with permission.

[53] BikeStation™ (2009) Bike-Transit Center Implementation Plan Project Results. http://www.bikestation.com/images/Acrobat/ProjectResults.pdf Accessed 4/6/2009.

Existing Conditions in Los Angeles

As shown in Figure 27, currently, most Los Angeles Metro Rail and Metro Orange Line stations have short-term bicycle parking (freestanding racks). In addition, many of the stations have bike lockers available for rental. Thirty-five of fifty Metro Rail stations have bike racks or lockers. Racks are available to cyclists on a first-come, first-serve basis. Bicyclists can rent a locker for six months or a year for a small fee.

Figure 26 Bike Racks and Lockers in LA



This map shows the location of bicycle racks and lockers on the Los Angeles Metro system. Image from Metro.

Demand / ridership / usage

Bikes are always allowed on LADOT and Metro buses that have bicycle racks.

According to the MTA's 2003 Bicycle Parking Plan, approximately 220 of 478 bike racks at Los Angeles transit stations are usually occupied during weekday working hours.[54] There is considerable demand for parking beyond what is provided, and cyclists often park their bikes on fencing, railings, signpoints, lampposts and small trees. The bike lockers have been less in demand; there are 195 bicycle lockers at 23 Metro Rail stations, with 60 rented as of 2003.[55]

In 2005, 24 new stations were added with the opening of the Pasadena Gold Line and the San Fernando Valley Gold Line Extensions. The Exposition Light Rail Transit (LRT) will also add stations in the future.

Renting a locker costs $24 for six months plus a $50 refundable security key deposit. Interested cyclists must call the Bicycle Parking Coordinator and mail a check. Rentals are managed by the Los Angeles County Bicycle Coalition.[56]

Benefits

People combine bicycling with transit for a number of reasons. A 2007-2008 Bike-MAX Survey by the Portland, Oregon transit agency (TriMet) bike program found bicyclists use the MAX for trips that are too far or would take too long on a bicycle, in order to avoid transfers and hills and to take advantage of the speed of trains. During peak months, 3.8% of MAX passengers bring their bicycles on the light rail. Thirty-nine percent of respondents, when asked what their alternative would be if bicycles were not allowed on the MAX, reported that they would drive, and only 28% would take transit without their bicycle.

The survey results suggest that inadequate bicycle parking is one reason that more people do not bike to transit. Three-quarters of riders surveyed said they were not willing to leave their bicycles at light rail stations instead of bringing them onboard and 40% agreed that lack of safe bike parking was a reason they brought their bike onboard. However, 41% of people interested in bicycling to MAX would consider using bike parking, and participants responded favorably to bike parking options that are not currently available in Portland. Finally, the survey also found the average access and egress distance to and from MAX to be two miles, a distance that suggests improved provisions for bicycles might substantially increase station catchment area.

Providing secure bicycle parking at transit encourages both transit use and bicycling, while not limiting transit capacity by requiring passengers bring their bicycles with them on transit. It encourages people to bicycle to the transit station, which can increase the catchment area of a transit center in a low density area. It also provides people with an alternative on a route where the bike rack on the bus or rail is usually full, and they would otherwise be required to wait for the next bus or train.

[54] MTA. (2003). Bicycle Parking: A Plan for the Los Angeles County Metropolitan Transportation Authority. http://www.metro.net/projects_studies/bikeway_planning/images/bicycle_parking_plan.pdf Accessed 3/16/2009.
[55] The project team has requested more recent data on local bicycle locker use.
[56] Los Angeles County MTA. (2009). Instructions for Renting a Bike Locker. http://www.metro.net/riding_metro/bikes/images/locker_rental_instructions.pdf Accessed 3/17/2009.

Costs

Capital and operating costs (as well as costs to consumers) are discussed below. It is important to note that these are order of magnitude costs based on historical data from existing facilities.

Capital Costs

The cost of long-term bicycle parking at transit centers varies depending on the type and security. The following table shows the costs for the bicycle parking types described above.

Facility Type	Approximate Capitol Cost
Basic rack	$36-63
Racks inside a cage or a bike room	$25,000 or more
biceberg automated parking: 92-space unit (4 levels) 23-space biceberg unit (1 level)	 $6,000 per space $10,000 per space
Lockers: Single-user Cycle-Safe lockers Shared-use e-Locker costs	 $950 per space without viewing windows $2900 per space
Two-tiered racks	$250-$300 per space[57]
Bike Depots	$25,000 to $3 Million

Operating Costs

On their own, bike racks require very little operational oversight: due to their inexpensive cost, most agencies replace racks if they are damaged. Racks placed inside a cage or a room with a part-time attendant cost $25,000 to 30,000 per year.[58]

A fully-staffed bike depot can cost $150,000 to $200,000 per year.[59] A facility that is only staffed during commute hours costs approximately $60,000 per year to operate.[60]

Costs to Consumers

Bicycle racks are typically provided on a first-come, first-served basis at no cost to the user. Bicycle lockers are typically free or require a nominal fee. Attended parking may cost $3-$5 for a single-use. The Seattle Bikestation™ charges $96 per year, $12 per month, or $1 per day, in addition to a $20 annual administrative fee. Appropriate pricing can potentially improve the efficiency of higher-security bicycle parking systems such as bike lockers and bicycle commuter centers.

Best Practices

Operational

An important consideration of providing bicycle parking at transit is to determine the appropriate type and quantity of facilities, which is dependent on the security of the station and future demand

[57] Josta and Saris
[58] BikeStationTM Santa Barbara
[59] BikeStationTM Berkeley
[60] BikeStationTM Embarcadero

for bicycling accommodations. Regardless of parking type, cyclists must also be able to easily and safety access the facility.

Long Beach, California

The BikeStation™ in Long Beach a is good example of a facility that provides full-service parking for cyclists, as well as establishing a center for the bicycle-related economy and social area (see Figure 28).

Figure 27 Long Beach Bikestation

While providing secure, long-term bicycle parking, this Bikestation has an outdoor café that creates an additional source of revenue. Image from Alta Planning and Design.

The Bikestation in Long Beach, California was the first bicycle-transit center and was constructed in 1996 and renovated in 2006. As of 2008, the Bikestation includes:

- Secure, indoor 24/7 bike parking
- Valet bike parking during staffed hours
- Bicycle repairs, rental and retail
- Tools and repair stands to use free of charge
- Café
- Educational classes on bike maintenance, routes, rights and responsibilities, and more
- Bicycling and transit information
- Bicycle registration
- Access to transit for multi-modal trips

- Bicycle and electric car sharing (demonstrated in Long Beach and Seattle)
- Shower and bathroom
- Bike tours

As the Long Beach Bikestation was able to use existing buildings, the costs were $450,000 for Phase 1. Funding came from the California Bicycle Transportation Account and matching funds from the Long Beach Redevelopment Agency. Operational costs are $130,000 per year, of which the City pays $48,000 and fees from rentals, retail, repair and parking make up the difference. Membership costs $1 per day, or $12 per month, or $96 per year.

> "A bike-transit center can become a symbol of a city's commitment to bicycling as well as a functional piece of public art that elevates the status of bicycling by incorporating striking architecture and design."
>
> *–Long Beach Bikestation Website*

Security

Security is a key factor when determining what type of bicycle parking is appropriate for different situations. In London, bicycle parking facilities at rail and underground stations must be able to be viewed by CCTV and are always covered from the elements. In addition, there is a concern that terrorist activities may occur in bicycle lockers, so they mandate see-through doors in addition to being placed in a well-lit and monitored location to minimize this concern. A similar mandate has been adopted by the U.S. Department of Homeland Security.

It is possible to increase real and perceived security of bike parking by locating parking facilities in locations that meet one or more of the following criteria:

- in a locked room or area enclosed by a fence with a locked gate;
- within view or within 100 feet of an attendant or security guard;
- in an area that is monitored by a security camera; and/or
- in a location that is visible to attendants.

The level of security required will vary by station. It is likely that users' perceptions of safety have a considerable impact on willingness to park a bicycle at a certain location, and the design of the facility should address these concerns. Factors to consider include previous experience of theft or vandalism at the station and the number of cyclists expected to use the facility regularly, and for how many hours of the day.

Anticipating Demand

When considering station area bike parking improvements to provide an alternative to bringing a bicycle on board, it is important that the amount of parking supply provided exceeds the average demand, as users should be able to depend on facilities being available. Demand determines not only the amount of parking, but the type of facility provided as well.

The following are examples of guidelines used by other agencies around the nation and world:

- Bicycle parking at stops should be between one space per 150 entrants (at Tube termini and the last three stations) and one space per 1,000 entrants (at Central London termini),

based on a 2002/2003 study of underground and street-level stations across London depending on station type and use. Source: The London Underground[61].

- Bicycle parking should be 50-80% occupied on average. If parking is at a location that is likely to experience considerable growth or if there are regular overflow periods (i.e. the station would be popular for use during a large event), it should be closer to 50% occupied and built with the ability to expand easily. Source: The CROW Design Manual for Bicycle Traffic.
- The number of lockers provided should exceed the current demand for lockers (measured by counts of bicycles parked at racks and the current usage and wait list for locker at a station) by 10% to allow for fluctuations and growth. Source: Bay Area Rapid Transit (BART).
- 'Bike stations' should be considered when the demand for long-term parking exceeds 100 bicycles. Source: Bay Area Rapid Transit (BART).

Best practices for providing sufficient bicycle parking at transit stations to accommodate existing usage and encourage access by bicycle requires constructing more parking than existing demand. Bay Area Rapid Transit (BART) in San Francisco uses a formula to determine the potential demand for bicycle parking when building a new station by considering a variety of factors, including service area demographics and bicycle access growth potential. (See Appendix A for additional information.)

Access

It is important that bicyclists are able to safely and easily access bicycle parking facilities. The following are examples of safety guidelines from other agencies.

According to the Transit Cooperative Research Program (TCRP) report *Bicycle and Transit Integration*, the following factors improve the safety of cyclists accessing transit:

- Bicycle paths through park-and-ride lots.
- Priority siting of parking equipment near the bus/train loading zone.
- Clearly visible signs for bicycle routes, parking facilities, and bus stops serving bicyclists.
- Station design and siting accommodating bicycles (e.g. curb cuts at parking locations, locating parking equipment so that the cyclists are not required to carry bicycles up or down stairs or through large crowds of travelers, and locating parking equipment in the clear view of the general public, and /or station attendants).

Additional factors to consider in the location (access safety) of the facility include:

- Proximity of parking to the entrance of the station, the bicycle network, and the boarding area.
- Potential obstruction of pedestrian flow.
- Within view of an attendant or video monitored.
- Traffic calming and signage to make drivers aware of the presence of bicyclists.

[61] Transport for London. Cycle Parking Standards: TfL Proposed Guidelines. http://www.tfl.gov.uk/assets/downloads/corporate/Proposed-TfL-Guidelines.pdf Accessed 4/6/2009.

- Access ramps, if necessary, should be at least 10 feet wide, with a preferable gradient of 6-7%.

It is important to incorporate bicycle parking into the design of all new transit facilities, as access management should be considered from the beginning. If the bicycle parking facility is integrated into the transit station, it will limit conflicts between bicyclists and cars, as well as bicyclists and pedestrians.

Signage

Signage should be clear and indicate a safe and direct path from the bicycling facility to the parking. It should list rules and regulations about parking facility usage, including costs and hours. Lockers and parking facilities should be marketed along with other bicycle-transit marketing activities (such as brochures and websites) that inform bicyclists about parking locations, equipment options, fees, and contact information for bicycle issues. Bicycle maps of the surrounding areas should be posted and, where possible, provided to patrons. Where access to the bicycle parking facility requires bicyclists to share the roadway with motor vehicles, the bicycle route should be indicated through striping or signage.

A three-part system of signs might include:

1. wayfinding signage to indicate where bicycles should travel;
2. signs that identify the location of the bicycle parking facility; and
3. various types of informational signage (e.g. providing usage instructions for bike parking, local bicycle routes and destinations, etc.).

Figure 28 Bicycle Parking Signage

The location of bicycle parking should be well-marked with signage.
Image from Alta Planning and Design.

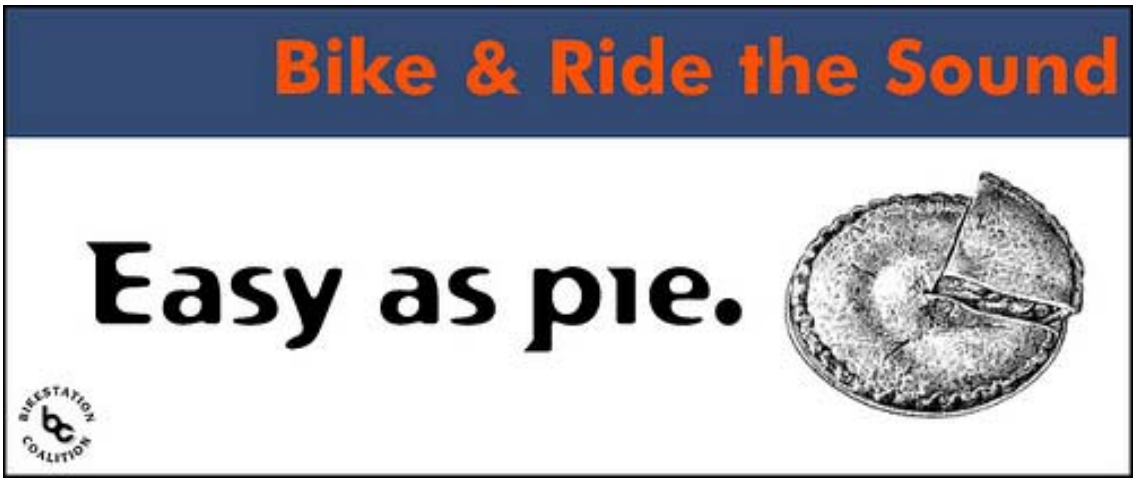
Marketing and Promotion

A marketing and educational campaign can promote use of improved bicycle parking facilities. People are unlikely to change from established patterns unless they are persuaded that parking bicycles at the transit stop is easier than bringing their bicycles with them, that spaces will be available, that they will be able to retrieve their bicycles easily upon their return, and that it is not going to cost them too much additional money or time. Placards on LA Metro buses and trains and Metrolink trains can advertise parking as an alternative to missing a bus or train, waiting for an available bike rack, or negotiating a crowded train with a bicycle. Improved parking can be marketed as more secure and convenient than parking provided by employers.

In conjunction with these marketing elements, providing incentives can be a successful way of encouraging people to try the new facilities. Incentives could include coordination with bike-to-work day and the Los Angeles County Bicycle Coalition's bicycle commuter challenge, free transit or rideshare passes for bicyclists, rideshare benefits, and discounts at local bicycle shops.

Seattle, Washington

Figure 29 Seattle Bikestation



Puget Sound Transit developed a successful marketing campaign to encourage bicycling as a first/last mile strategy.
Image from Alta Planning and Design.

Seattle Bikestation™ members receive discounted ZipCar and Bicycle Alliance of Washington memberships, as well as access to repair services, rentals, and a library of bicycling resources. They also offer a guaranteed ride home program, which reduces the fear of being stranded by a flat tire or other malfunction.

The Bikestation Demand Methodology is used by the Puget Sound Regional Council. The model assumes that the market share for a Bikestation facility is determined by using the number of residents and jobs in the surrounding area and the bicycle and transit mode share within three miles of the Bikestation (the Magnet Zone). This system allowed Puget Sound Transit to optimize their investment in bike depots and other bicycle parking facilities.

In addition, Puget Sound Transit developed a marketing campaign called Bike-and-Ride the Sound, which included:

- A regionally recognizable network of bicycle-and-transit facilities with consistent branding.
- Bikes-and-Transit brochure to provide information about different types of bicycle parking available through the system, with description and examples of each.
- Advertising campaign, including: billboards, placards inside and outside of buses and Sounder commuter rail cars, transit stops, printed publications, public service announcements, television and radio commercials.
- Information about location, type, user cost, quantity, and how to sign-up was also available online.

This targeted marketing ensured that transit riders and bicyclists know about the options for bicycle parking.

Fiscal

Businesses and private developers are potential partners for investing in bicycle parking infrastructure at transit stations. The operation of locker facilities, bike depots, and automated bicycle parking facilities can be performed by a local bicycle advocacy group or a private firm.

Biceberg, Spain

Biceberg automated parking facilities exemplify fiscal best practices for providing bicycle parking at transit, as the advertising space provided helps fund their operation. The Biceberg is an innovate bicycle parking system that stores bicycles underground, securely protecting bicycles form theft or vandalism and minimizing on-street space (see Figure 31). Bicebergs are currently in use in Zaragoza, Huesca, Blanes, Vitoria and Barcelona, and plans to expand into Catalonia, The Basque Country and Aragon in the future.

Figure 30 Biceberg Model

This model Biceberg facility shows how bicycles are inserted into a container, which is securely stored underground.
Image from biceberg. Used with permisison

Cyclists opt-in to the system and receive a card with a personal code to access the parking facility. A storage unit rises to ground-level and opens, for the cyclist to roll the bicycle inside rear-wheel first. The storage units have additional space for raingear or other accessories. When finished, the cyclist presses a button and the unit is brought into the underground storage space. To reclaim the bicycle, the user swipes the card and enters their code again, and the unit lifts to ground-level. The company approximates that the time to access each parking space is 30 seconds.

In the Town of Zaragoga, the system is free with paid monthly system and users can store their bicycles for a maximum of 24 hours. In Huesca, the system charges EUR 0,12 per hour of use. Employees of the City of Aragón receive a free ticket annually, while the public must purchase a yearly pass and parking is free with a 24 hour maximum.[62]

For construction, the biceberg system requires a watertight underground space with an interior diameter for 24.5 feet (7.5 m). The height requirement depends on the model – models are available to hold 23, 46, 69 or 92 bicycles. In addition, the models require an electricity supply, broad band telephone line, a submersible pump, electrical installation and sockets, and a ventilation system. It is possible to install safety glass to minimize safety concerns for misuse of the system. In addition, it contains a microwave radar that prevents the storage of non-authorized loads such as living animals or fuels. Video surveillance can also help improve safety.

The biceberg structure can be used for advertising space on three sides, and in some cases has digital advertising as well as print. Studies of the early European models indicate that the advertising revenue can be between EUR 6,000 and EUR 18,000 ($8,000 to $24,000) annually, depending on the location and frequency of advertising impact. European countries can receive funding from the European Commission to build biceburgs.

In 2005, the biceberg company conducted a study of usage patterns and demand for biceberg parking structures.[63] They developed structures differentiated to anticipated usage. For example, the “sports complex” model is designed for shorter-term use during particular times of the day. The recommended model for transit agency use anticipates an average of six hours, or typical range of three to nine hours of use. The company recommends the biceberg in locations with a high number of transit users, and a range of times and types of users.

Expansion Potential in Los Angeles

Opportunities

New/pending policies, regulations, or incentives

There are no known policies, regulations, or incentives which may provide opportunities for the expansion of bicycle parking facilities at transit stations.

Joint partnerships

The potential to consolidate the management of bicycle parking facilities citywide or regionally could be of benefit to the agencies providing bicycle parking and the end user. The fact that

[62] biceberg, Automated Parking for Bicycles: Operation and Management. http://www.biceberg.es/imagenes/07%20biblio/english/02%20operation%20and%20management.pdf Accessed 3/18/2009.
[63] ma-SISTEMAS. (2005) Study of Financing and Amortization: biceberg, automated underground bicycles parking.

LACBC manages bicycle lockers for both the City of LA and Metro allows potential users to be directed to a single entity. However, further integration of the two programs (i.e. pricing consistency) could be of benefit to both the operating agency and the end user.

Emerging political will / public opinion

Demand for bicycle access to transit has increased in recent years in response to fluctuating fuel costs and environmental concerns.

Challenges

Poor bicycle access to transit stations in Los Angeles is an obstacle to the use of bicycles with transit in general. A primary obstacle to the provision of high quality bike parking at or near transit stations is the fact that many existing stations were not designed with a dedicated space for bicycle parking. The Orange Line in the San Fernando Valley is an exception. Another key obstacle is high land values and the resulting competition for space at new or redeveloped transit stations. Space for off-street bicycle parking facilities is often lost in negotiations with developers; on-street bicycle parking often must compete with other sidewalk furniture/infrastructure needs.; bicycle parking in the curb lane is often resisted when on-street parking and loading is in high demand.

Regulatory

There are no known regulatory obstacles to the provision of bicycle parking facilities in Los Angeles.

Financial

Automobile parking is generally seen as a necessity and the cost of constructing, operating, and maintaining automobile parking at transit stations is included in the capital and operating costs of a transit system. The provision, operation, and maintenance of bicycle parking is often an afterthought and not included in routine transit operations. Operating funding for bicycle locker programs and bicycle commuter centers is difficult to obtain.

Political

Market acceptance

Increased market acceptance of bicycling as a legitimate form of day-to-day transportation will be required in order for bicycling access to transit to become a legitimate first/last mile strategy for choice transit commuters.

Another obstacle in Los Angeles is the expectation that parking at transit stations should be abundant and free to users. The answer of one respondent to the 2003 Metro Bicycle Locker Survey illustrates the competition between modes in the first/last mile of transit trips:

> ***Q: Why do you travel [to the transit station] by bicycle?***
> *A: Because you have not provided nearly enough parking for cars.*
> *I'd drive if I could ever find a parking spot.*

The fact that automobile parking is free and abundant at many transit stations acts as a disincentive to use free or paid bicycle parking. Conversely, as evidenced by the previous quote,

the scarcity of automobile parking can be an incentive for bicycling to transit, if safe and convenient bicycle parking is available.

Additional Resources

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Appendix A

Bay Area Rapid Transit (BART) in San Francisco uses a formula to determine the potential demand for bicycle parking by considering a variety of factors, including the following factors:

- Demographics of the service area
  - 2000 Population within 1 mile of station (Low, Medium, High)
  - 2000 Employment within 1 mile of station (Low, Medium, High)
  - Households with no cars within 1 mile of station (Low, Medium, High)
- The extent of the bicycle network in the station area
- Current bicycle capacity
- Mode share of passengers accessing the station
- Planning goals for the area

Other factors to consider when estimating demand include:

- Current bicycle parking use at the station
- Current use of bike-on-bus racks
- Type of transit service (bus, light rail, or commuter rail)
- Presence of employment and/or major employer near stop
- Projected regional growth (possible future category)
- Bicycle access growth potential; based on:
  - Home based ridership
  - Station ridership
  - Bicycle mode share in AM Peak
  - 2000 population within 1 mile of station
  - Households with no car within 1 mile of station
  - Topography/traffic/barriers

The following table outlines a series of questions that help determine the type and quantity of parking at a particular transit station.

Factor	Adjustment
Results of the bicycle parking demand model:	
How many bicyclists are estimated to park at the site?	Facility should provide parking for at least 20% more bicycles than estimated to regularly use the facility.
Will a particular segment of potential market demand be emphasized over others due to the location?	Hours of parking availability should be convenient for workers and students; marketing efforts should be targeted to potential users.
For each station, how reliable is it to find space for bicycles at rush hour?	Quantity of parking should be sufficient to meet bicycle-on-bus or -train capacity.
How much does the demand for park-and-ride spaces exceed supply?	In areas where Park and Ride lots are at capacity, improved bicycle parking can capture a proportion of would-be drivers.
Is there evidence of current bicycle activity (e.g. parked bicycles) at the site?	Facility should provide parking for at least 20% more bicycles than regularly use the facility, and more if demand is estimated to increase.
Type of public transportation	
Does the station connect to a bus route?	Parking should be provided to accommodate riders who may not find space for a bicycle on their connecting bus.
Does the station connect to a rail transit station?	Provide adequate spaces to accommodate current bike-on-train demand and consider potential latent demand.
Does the transit line offer a time savings as compared with bicycling (i.e., connecting distant destinations with few stops)?	Transit lines offering travel time savings over bicycling should provide more long-term parking.
Does the transit short-cut a hill or other barrier to bicycling?	People are more likely to take transit with their bicycles if they can avoid a large hill, or if transit is significantly faster than bicycling. Increased parking facilities should be provided. In addition, the transit agency may want to work with the responsible agency to remedy the barrier.
Surrounding employment and commercial density	
How many jobs fall within biking distance of the site?	Accommodate transit users who may be interested in storing an additional bicycle at the non-home trip-end.
Will the number of jobs within biking distance of the site grow in the future?	Ensure that there is space for expansion in locations that are likely to be close to future employment.
Potential to generate operating revenue	
Is there a need for bicycle repair and accessory sales in the immediate vicinity?	People will use the resources available at the bicycle parking if the community does not have them available otherwise; this is likely to increase the use of bicycle parking and bike-to-transit trips.
Is there a need for some other complementary business activity in the immediate vicinity?	It is possible to recoup some of the expenses of providing bicycle parking by linking complimentary uses, such as bicycle rentals/fleets and food sales.

Pedestrian Connectivity and Amenity

Overview

Walking is free transportation option for accessing public transit, and is available to most people within a quarter to half mile of transit stations and stops. Thus creating a safe, comfortable, and convenient walking environment is a key element in supporting transit. A well-designed network of streets with a high degree of pedestrian amenity is an important factor in enhancing pedestrian accessibility and connectivity to transit.

Existing Conditions

Description of historical/existing services or programs

Pedestrian conditions throughout the City of Los Angeles vary greatly; from higher density, mixed-use neighborhoods with a fine-grained grid network of small blocks and pleasant walking conditions to auto dominated areas with multilane roadways, long blocks, and very little pedestrian amenity. While the predominate image of Los Angeles is often a city where everyone drives, walking is a viable and highly utilized transportation mode.

The City of Los Angeles currently invests significant resources in maintaining and improving the pedestrian environment and has produced a number of planning documents to guide further improvements to the pedestrian realm. For example, the City of Los Angeles Planning Department has developed several plans which will further improve pedestrian conditions within the City in the future; two of these are discussed below.

The *Draft Downtown Design Guide: Design for a Livable Downtown* is a set of context-sensitive street standards which emphasize walkability, sustainability and transit options. The guide was developed by the Department of City Planning, Community Redevelopment Agency, Department of Transportation and Public Works together with urban design, transportation and environmental consultants. This plan is currently in the adoption process.

The *Greening of 21st Century City Plan* is a planning document, led by the City Council in cooperation with urban design consultants, which introduces a number of urban design innovations and guidelines to achieve the following principles:

- Create a better pedestrian environment and experience for Century City of Los Angeles
- Enhance connectivity between pedestrian and transit
- Create a more beautiful public realm within Century City
- Develop an updated identity for what 21st Century City can be
- Develop a more sustainable Century City

The City of Los Angeles' Public Works Department is responsible for the construction and maintenance of the City's infrastructure. Within the department, the Bureau of Street Services oversees the construction and maintenance of sidewalks and streets as well as other streetscape elements and services such as landscaping and street cleaning. The Bureau of Street Lighting is responsible for the design, construction, operation, maintenance and repair of the City's Street Lighting System. Both the City of Los Angeles Department of Transportation and Planning

Department undertake planning initiatives which impact where new pedestrian investments will be made.

Funding for streetscape improvements comes from a wide variety of sources, such as the Department of Public Works, Business Improvement Districts, Community Redevelopment Agency, City of Los Angeles' Targeted Neighborhood Initiative, local propositions, Los Angeles County Metropolitan Transportation Authority, and state and federal funding.

Usage

According to the 2000 U.S. Census, about three percent of people walk to work in the Los Angeles Metropolitan area, the same as the United States as a whole and slightly higher than the State of California.[64] In cities such as West Hollywood and Santa Monica the percentage of commuters who walk to work is even higher than the national or state average. In West Hollywood 5.5% of commuters walk to work and in Santa Monica 6.3% of commuters walk to work. Additionally, discretionary trips such as trips to the grocery store and shopping area are often made on foot; because census data only measures commute trips, the percentage of all trips made on foot in Los Angeles is likely much higher than 3%.

It can be difficult to estimate precisely how much walkability investments affect travel, since it is often accompanied by investments in other alternative transportation modes and changes in land use. However, the studies described found that there is a direct connection between a high quality pedestrian environment and usage of travel modes other than driving:

- Walking is three times more common in a community with pedestrian friendly streets than in otherwise comparable communities that are less conducive to walking. [65]
- Residents in a pedestrian friendly community walk, bicycle, or ride transit for 49% of work trips and 15% of their non-work trips, which are 18- and 11-percentage points more than residents of a comparable automobile-oriented community. [66]
- Investments in the pedestrian environment have positive impacts on all road users. It reduces auto-dependency and air pollution, improves livability, increases mobility for low-income households and even increases retail sales and property values. [67]

In addition to the studies discussed above, a significant amount of research had been conducted on how urban form affects travel behavior. Urban design elements that impact pedestrian access such as street patterns (grid versus cul-de-sacs), topography, ease of street crossings, sidewalk continuity have been shown to reduce VMT and daily vehicle trips.[68] In another study which examined how urban form variables affected the number of pedestrian trips for recreation and shopping, it was shown that perceived safety, shade, and the frequency and desirability of seeing

[64] According to 2000 U.S. Census the percentage of commuters who walked to work is 2.93 for the United States and LA-Long Beach, PSMA and 2.8 for the State of California.
[65] Moudon, et al. (2003) *Effects of Site Design on Pedestrian Travel in Mixed Use, Medium-Density Environments*, Washington State Transportation Center, Document WA-RD 432.1.
[66] Cervero, R. & Radisch, C (1995) *Travel Choices in Pedestrian Versus Automobile Oriented Neighborhoods*, UC Transportation Center, UCTC 281.
[67] Local Government Commission (2001) *The Economic Benefits of Walkable Communities*.
[68] 1000 Friends of Portland (1993) *The Pedestrian Environment: LUTRAQ Report Volume 4A. Parsons Brinckerhoff Quade & Dougles*

people while walking had a significant impact (for shopping trips, distance, the ease of walking and comfort were significant variables).[69]

Benefits

Improving pedestrian connectivity and accessibility can encourage transit use by providing safe and direct connections between transit stops or stations and also enhances all transportation choices because, with few exceptions, all travel modes involve a pedestrian element. The studies discussed above show that the pedestrian environment can influence people's decision to use transit and that neighborhoods with a more pedestrian friendly environment have increased levels of transit usage compared to less pedestrian friendly communities.

Beyond encouraging transit use, improved pedestrian accessibility and connectivity has a number of other benefits including improved public health, reduced greenhouse gas emissions and other environmental impacts associated with auto trips, as well as potential cost savings with respect to maintenance and construction costs.

Costs

Capital Costs

Capital costs for streetscape improvements and redesign projects can vary widely depending on the materials used and the size and complexity of the project.

For San Francisco's *Better Streets Plan* the urban design firm Community Design + Architecture, developed a range of costs for a variety of streetscape elements. The figure below shows their current estimated capital costs for a number of streetscape elements.

Figure 31 Capital Costs for Streetscape Improvements in San Francisco[70]

Infrastructure	Construction/Replacement Cost
Roadways	$14-20 per SF
Sidewalks	$8-12 per SF
Curbs	$30-40 per LF
Curb Extension (Corner Curb Extension)	$75,000 each
Moving Catch Basin	$10,000 +/- each
Mid- Block Curb Extension with Trench Drain	$10,000 +/- each
Re-Route Fire Hydrant	$20,000 each
Re-Route Fire Hydrant	$20,000 each

The City of San Monica is currently working with Nelson\Nygaard and several local urban design and landscaping firms to redesign the streets within the Borderline Neighborhood to convert existing residential streets into shared streets. A component of this project was the development

[69] Handy, Clifton, and Fisher (1998) The Effectiveness of Land Use Policies as a Strategy for Reducing Auto Dependence : A Study of Austin Neighborhoods. Research Report SWUTC
[70] Community Design + Architecture "Better Streets Plan Management and Maintenance Chapter", City of San Francisco, 2008

of capital cost estimates. Figure 33 below highlights the costs of a number of streetscape elements that will be included in this project.

Figure 32 Capital Costs for Streetscape Improvements in Santa Monica[71]

Infrastructure	Construction/Replacement Cost
Roadways (asphalt)	$6 per SF
Sidewalks	$14.75 per SF
Curbs	$14 per LF
Colored Concrete	$10 per SF
Permeable Pavers	$22 per SF
Street/Traffic Signs	$150 each
Landscaping (irrigation, soil, trees, plantings, groundcover)	$100 per SF
Pedestrian Street Lighting	$1,362 each

When developing capital cost estimates, consideration should be given to not only aspects that are directly quantifiable but also those that are affected indirectly. A complete cost analysis should include: [72]

- Payback resulting from increased upfront costs in terms of extended usable life.
- Extended usable life due to incremental or preventive maintenance programs.
- Costs for all city agencies. The increase in maintenance or reconstruction costs when one agency improves a system may decrease the direct costs of another agency. For example, adding stormwater management facilities within curb extensions may increase routine maintenance costs, yet will decrease costs for stormwater treatment at wastewater treatment plants and increase public safety due to traffic calming effects.
- Durability of materials. Upfront capital costs may be higher for high-durability materials, but maintenance costs of those

Analysis done for San Francisco's better streets program illustrates how investing in streetscape improvements for pedestrians can have a number of direct and indirect benefits. For example, the cost for complete reconstruction of a street in San Francisco is currently $14-$20 per square foot, with a varying serviceable life that averages around 20 years. The cost of replacing a city sidewalk is $8-$12 per square foot, with a useful life of up to 50 years (more than twice that of roadway).

By conducting a simple cost comparison, an average difference of $6-$8 per square foot can be saved if sidewalks, rather than roadways, are installed. Thus, when normalized to a similar time frame of approximately 40 years, a present-value cost savings of $20-$28 can be realized for every square foot of roadway converted to sidewalk, as a second reconstruction will likely not be necessary after 20 years. In the near term, the cost of moving curb lines is often considered a constraint, but long-term analysis counters this claim.

These continued future savings could be applied to the installation and maintenance of streetscape amenities and landscaping. Additionally, indirect cost savings can be realized in a number of ways:

Increasing the area dedicated to plantings and landscaping within the ROW reduces the cost of storm water conveyance and treatment by reducing both total and peak runoff volumes.

Stormwater facilities that function as traffic-calming measures increase safety for those riding in vehicles, bicyclists, and pedestrians.

Promoting street use by pedestrians will increase property owners' perceived value, which typically results in improved maintenance of both buildings and the adjacent ROW spaces.

[71] Sherwood Engineers "Borderline Construction Costs", City of Santa Monica, 2008
[72] Community Design + Architecture "Better Streets Plan Management and Maintenance Chapter", City of San Francisco, 2008

materials will be lower in the long term. Durable and natural materials should be considered as a cost-effective alternative during analysis.

- Common materials. Common materials that are currently and locally produced should be considered. Uncommon and exotic materials may be just as durable but are not guaranteed to be as available or cost-effective during future maintenance or repair, thus adding potential future premium costs to standard maintenance practices.
- Future costs of materials. Conventional materials are generally chosen based on current cost and use considerations. However, increases in costs of raw material and construction could push future replacement costs much higher, making these materials difficult to replace.
- Use of modular facilities. Upon failure of a defined system, infrastructure could be designed such that only a portion of a system needs repair, rather than the whole.

Operating Costs

Maintenance and operating costs for pedestrian amenities such as streetscape improvements, landscaping, and street furniture are a significant and on-going expense. Determining exact maintenance costs, however, is difficult for a variety of reasons including:

1. Presence or lack of ongoing routine maintenance will greatly adjust the lifecycle of a facility and the cost to repair or replace it,
2. Division of labor for maintenance operations varies from city to city and costs for a specific task such as sidewalk repair may not be broken out from general costs making it difficult to assign costs, and
3. An increase labor for one maintenance task may lower the labor required for another task, such as increased trash pick-up reduces the need for street sweeping.

Experience has shown that it is usually most cost-effective to allocate funding to routine and timely maintenance; extending the life of infrastructure while helping to delay or prevent the need for more costly rehabilitation or reconstruction.

Costs to Consumers

Walking provides first/last mile access with no financial or waiting time costs.

Best Practices

San Francisco Better Streets Plan

The San Francisco Better Streets Plan (BSP) is the result of unprecedented interagency coordination to create unified pedestrian-oriented street design policies and practices. Despite density, climate, and land use patterns that make San Francisco a great walking city, many of its streets and public spaces can be quite hostile for pedestrians. And yet streets are the primary component of the City's public realm, making up more than 25% of the total area of the City (parks, including Golden Gate Park, comprise just 17%). To create a safer, more attractive, and more human-scale City, the BSP developed street design standards, guidelines, and implementation strategies to foster a holistic approach to designing, building, and maintaining public streets and sidewalks.

Key components of the plan include best practice design guidance for shaping curbs and crossings to promote pedestrian safety and amenity and unified design standards for typical streetscape elements including lighting, furniture, landscaping. In addition, the BSP contains a comprehensive street typology for each major street type in the city to guide how streets are to be shaped and streetscape elements are to be implemented. In addition to involving multiple city agencies and an interdisciplinary consultant team, the BSP also included a robust and innovative community involvement process to ensure the broadest possible participation in planning for better streets. New "public realm plans" based on the principles of the BSP are now being developed for a number of corridors and districts in San Francisco, including major public realm improvements for the world-famous Fisherman's Wharf District.

Operational

The division of labor for the maintenance, construction, and planning of streets and sidewalks is typically split between a city or town's public works department, transportation, department and planning department. The City of Los Angeles follows a similar division of labor with the Public Works Department overseeing the construction and maintenance of the City's street infrastructure and the City of Los Angeles Department of Transportation and Planning Department undertaking planning efforts to determine where future investments in the pedestrian network should be made.

Fiscal

There are a number of funding mechanisms and sources which can be used to fund pedestrian infrastructure investments. The following list identifies a number of potential funding strategies:

- Community and agency partnerships
- Community benefit districts
- Community parking benefit districts
- Mello-Roos community facilities districts
- Requiring property owners to repair adjacent sidewalks at time of sale
- Annual property owner streetscape assessment fee similar to what the City of Los Angeles currently does to fund the City's Street Lighting System
- Pedestrian-realm development impact fee
- Deferred assessment districts
- Municipal bonds

Expansion Potential in Los Angeles

Opportunities

New/pending policies, regulations, or incentives

People living within a quarter to half mile radius of a transit station are more likely to walk to transit than those living more than a half a mile from transit service. By targeting pedestrian improvements to the area immediately surrounding transit stations there is an opportunity to encourage and support those persons most likely to walk to transit.

The City of Los Angeles has developed a number of planning documents to help guide improvements to the pedestrian realm and encourage walking. The *Draft Downtown Design Guide: Design for a Livable Downtown* is a set of context-sensitive street standards which emphasizes walkability, sustainability and transit options. The *Greening of 21st Century City Plan* describes a number of urban design innovations and guidelines to improve the public realm and walking environment with an emphasis on sustainability.

Joint partnerships

There are a number of opportunities for joint partnerships between agencies and the public and private sector. Partnerships between educational intuitions, private businesses, research institutions, non-profits, community development corporations, and regional agencies are just a few potential partners that the City of Los Angeles may be able to coordinate with. Additionally, there are opportunities to partner with groups outside of the field of transportation such as public health or environmental sustainability, as pedestrian related projects play an important role in achieving these objectives.

Emerging political will / public opinion

There is already a tremendous amount of walking occurring in Los Angeles and the support and promotion of walking by elected and appointed officials has resulting in a number of recent pedestrian planning efforts within Los Angeles.

Challenges

Regulatory

Improving pedestrian amenities and access can be hampered by inter-agency jurisdiction and coordination issues.

Financial

Improving pedestrian amenities and access can be very costly.

Political

Improving pedestrian amenities and access often requires reallocation of the right-of-way from parking and vehicle travel lanes.

Market acceptance

Contrary to the common image of Los Angeles as a city where everyone drives, walking is a viable and highly utilized transportation mode. Despite this, there still exists a great opportunity to attract those persons who would be described as choice walkers; people who have multiple transportation options and currently do not walk. Since this demographic has the financial ability to drive if they so choose it will be important to emphasize other benefits that arise from walking, such as improved health and minimizing negative environmental impacts. Additionally, creating a high quality pedestrian environment will be key to changing the perception that walking is a only a novelty or a secondary option to driving.

Additional Resources

- Community Design + Architecture "Better Streets Plan Management and Maintenance Chapter", City of San Francisco, 2008
- http://www.urbandesignla.com/downtown_guidelines.htm
- http://cityplanning.lacity.org/Urbanization/GreenCentury21/TOC.pdf