SACOG

SACOG Board of Directors

Item #06-1-17
Workshop

January 12, 2006

Metropolitan Transportation Plan Issue Papers

Issue: Presentation of issue papers.

Recommendation: None, this item is for information purposes only.

Discussion: Staff is continuing work on topical issue papers for the MTP 2030. A key goal of the effort is to improve the information base of the current Board and help frame issues for discussion in advance of the major public outreach activities during the spring of 2006. Each paper is being incorporated into public education materials under development. Two to three papers will continue to be presented to the Board each month through February 2006.

Papers on road expansion, transit expansion, and freeway high-occupancy toll (HOT) lanes are attached. Comments from the Transportation & Air Quality Committee (TAQ), Regional Planning Partnership, and Transit Coordinating Committee are reflected in the papers.

The road expansion paper begins to lay out the issues related to the region's need for additional roadway capacity over the MTP planning horizon. The paper addresses some of the key issues concerning road expansion. Important issues for decision makers to consider are: What are the objectives and consequences of expanding roads? How does congestion relate to road expansion? How should roads serving local access be treated differently from roads serving through trips?

The transit expansion paper explores the issues and choices that underlie the expansion of transit services over the MTP planning horizon. Policy questions addressed include: Who will demand transit services? Should transit's primary role be to serve the transit dependent or should it be to provide another choice to those who currently choose to drive? What mix of transit services and connections would make transit effective enough to attract more ridership? How should the expansion of transit service relate to urban density and growth? How much will a significant expansion of transit cost, and how will we pay for it?

The road pricing paper provides definitions, objectives and policy considerations for high occupancy toll (HOT) lanes, fast and intertwined regular (FAIR) lanes, and tollways, HOT lanes combine High Occupancy Vehicles (HOV) and pricing strategies through allowing single occupancy vehicles to gain access to HOV lanes by paying a toll. The lanes are "managed" through pricing to maintain free flow conditions even during the height of rush hours. FAIR lanes are similar in concept, but do not involve HOV lanes—instead, the freeway lanes are divided into "fast" (priced) and "regular" (free) lanes. Tollways require payment from all drivers to use the facility. In assessing opportunities and challenges for HOT lanes in the Sacramento region, the paper highlights relevant applications elsewhere and summarizes potential features and management strategies.

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SACOG ISSUE PAPER ON ROAD EXPANSION

The Current Road System and its Use

- Much of the region's road network was built in 1950s & 1960s, designed for 20 years of excess capacity
  - Gas taxes 2½ times larger in real terms than today's supported the robust highway construction program of the 1950s & 1960s
  - Since 1970, Vehicle Miles Traveled (VMT) have increased by 190%, while population increased by 110%, but lane-miles of road (space on the roadway system) increased only by 30%
  - These trends inevitably lead to increased congestion: drivers faced daily congestion on 17% (27 out of 160 miles) of greater Sacramento urban freeways in 1993 during peak periods, but 38% (61 miles) of freeways are congested today
- Currently more than 93% of all travel goes by vehicle on roads: driving alone, in carpools, or riding buses
  - Out of 9 million daily trips, 4.2 million (47%) drive alone, 1.8 million (20%) drive w/passengers, 2.4 million (26%) ride in autos, 80,000 (1%) ride in transit, 100,000 (1%) ride bicycles, and 450,000 (5%) walk
  - About 550,000 trips per hour take place during the morning and afternoon peak hours (6:00-9:00 AM and 3:30-6:30 PM), and drive alone and transit shares are highest in the peak hours
- Road capacity varies with design and use: freeways carry 50% more people than arterials per lane, carpool lanes carry twice the people of mixed-flow lanes, and bus service at ten-minute intervals can carry up to six times what autos carry
  - A typical freeway lane running at capacity carries 2200 people per hour in autos, while a carpool lane running full carries 3000-4000 people per hour, more if it includes express bus service
  - Arterial street capacity varies but averages about 1500 people per lane per hour; a full bus carries 50 people seated (80 or more with standees) and uses less than ½% of one lane of an arterial's capacity
  - State highways are the workhorse of the road system, carrying about 50% of Vehicle Miles of Travel (VMT) on only 7% of the system's lane-miles
- Excess capacity from the 1970s has been filled up and road use continues to increase
  - SACOG's Metropolitan Transportation Plan (MTP) forecasts 40% more trips by auto by 2025

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  - More compact Blueprint land uses shorten trips and change travel choices: 81% by auto, 3% by transit, and 16% by bicycle and walking – but population increases more than 40% and overall travel increases by 50% by 2030
  - Even with more compact Blueprint land uses the region expects 30% more trips by auto by 2030: 11.1 million auto trips per day versus 8.4 million today
  - Truck trips are growing three times faster than auto, and that rate seems likely to continue
- As auto trips continue to increase, it will make a big difference where on the system they go, and whether people drive alone or travel in carpools, but clearly at least in certain locations road system expansion will be called for
  - Trip patterns will be different in 2030, using the road system differently than today, increasing traffic in some places while holding level in others
  - The bus system - the backbone of transit service – loses operating efficiency and attractiveness to riders when bogged down in traffic congestion
  - Carpools and transit become more attractive when given faster travel lanes compared to congested mixed-flow roadways

Congestion

- Increasing traffic congestion is an inescapable result of robust economic activity and life in modern metropolitan areas, but it is not an economic benefit
  - Good transit does not solve congestion: cities with the best transit systems – New York, Washington DC, Boston, San Francisco Bay Area – also have some of the nation's worst traffic congestion
  - Extensive roadway capacity does not solve congestion: cities with the largest highway systems – Los Angeles, Houston, San Diego, Atlanta - also have some of the nation's worst traffic congestion
  - Congestion is much worse in most large cities around the world than in the US
  - Excessive congestion delay due to lack of road capacity irritates the public, wastes time unproductively, drives up neighborhood cut-through traffic, impedes business interactions especially for trucking, can undermine property values, and reduces choice of where to live and work
  - The Texas Transportation Institute reports the average loss to congestion delay at $520 per person per year in the 75 largest urban areas, with Sacramento coming in at $374
- The statement "We cannot build our way out of congestion" is essentially correct, because large metropolitan regions lack the resources, community will, and ultimately the space to provide for uncongested travel by auto
  - Roads designed for peak period traffic cost too much, take too much land, are underused too much of the day, and cause unacceptable community and environmental impacts

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- The fact that a parking space is 20% larger than a typical office space illustrates space limitations on drive-alone auto commuting in larger, denser metropolitan areas
- Once an urban road network becomes extensively congested, new road capacity attracts traffic from other congested routes, often attracts new growth to the nearby area, and may reduce excessive localized congestion delay and shorten the length of the peak congested period somewhat, but does not substantially lessen overall congestion levels on the road system

- Sacramento, with a population greater than 2 million, has reached the size and activity level where congested auto travel would be the expected norm, and accessibility replaces mobility as a transportation objective
  - US50 east of downtown Sacramento now carries more traffic outbound in the morning peak than inbound, and has become the region's first section of freeway with two-way congestion both morning and afternoon
  - Some of Sacramento's worst congestion occurs on crosstown suburban arterials: Watt Avenue, Sunrise Boulevard, Florin Road, Douglas Boulevard
- Congestion and delay can be triggered on a regular basis by peak auto demand that exceeds capacity, and on an ad hoc basis by traffic incidents or distractions
  - About 50% of congestion delay comes from areas where demand has reached or exceeded capacity, usually due to system features that constrict capacity: on ramps, slow vehicles, hills or grades, limited sight distance, and signals, bus stops, driveways, turn movements, pedestrians and bicycles on arterials
  - About 50% of congestion delay occurs from incidents, where capacity is compromised: accidents, stalled vehicles, spilled loads, roadside distractions, police stops, work zones, weather
  - Although traffic may increase gradually over time, and the roads may seem more full, congestion appears at about 85% of road capacity and worsens dramatically with an increase of only a few hundred autos in the peak period
- When corridors become congested, modes all complement each other, serving specific types of trips, instead of competing
  - Autos and bus transit both depend on roads, bicycling and walking typically also use road corridors, so when a corridor becomes congested it is important to accommodate all modes effectively so travelers have a real choice
  - Carpooling, various forms of transit, and bicycling each offer certain time, cost, convenience, and personal comfort advantages as an alternative choice to driving, and can become more attractive for certain drivers and certain trips
  - In the downtowns of major cities such as San Francisco and Chicago, pedestrian congestion often exceeds vehicle congestion
- Strategic road expansion yields benefits, even if it does not reduce or eliminate congestion, but land use and travel effects become critical decision factors

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Road Expansion and Land Use

- New road capacity may relieve local congestion directly but also indirectly exerts strong effects on growth in the corridor or area
  - Correlations among road capacity, development patterns, congestion, and travel behavior may not always represent cause and effect
  - Adding capacity has different effects in the urban interior and near the suburban edge: the dominant effect from strategic improvements to interior road capacity tends to support infill development, whereas the dominant effect from added capacity nearer the urban edge tends to enable sprawl
  - Radial freeway expansion in suburban areas since the 1950s has drawn development outward along those corridors
  - Road access is essential for greenfields development, and unused capacity serving greenfields areas acts as a subsidy to development there
  - Recognizing the essential nature of road capacity to every development, developers increasingly accept the need to pay for improvements to arterials, interchanges, and freeways to ensure access off-site
  - Expanded capacity for interregional travel, including trucking, can also be used for commuting, thereby working at cross purposes to enable sprawl development to the edge of the region and beyond
- Congestion may affect economic development: too much congestion can be a factor in shifting development from one area of the region to another (or more rarely to other regions)
  - The economy has decentralized, and limited access to the central business district helps drive jobs to suburban locations with better access
  - There is an optimum amount of road capacity: too much yields low return on investment of scarce funds, too little is an economic drag on productivity
- With Blueprint as a key regional goal, road expansion policy and investments can become tools to shape land use objectives, rather than a reaction to the spread of congestion
  - Road expansion policy in the 2002 MTP primarily reacted to projections of current traffic and recent land development patterns
  - Blueprint focus on infill and compact development leads toward a different transportation investment policy, tending more to strategic operational improvements for roads, improved transit service, and more emphasis on facilities for walk access
- Sacramento faces a chicken-and-egg dilemma: it must go through a transition in development patterns to achieve a transition in travel choices, and both transitions will proceed incrementally

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- The region must design road and transit capacity investments strategically in both timing and place, to keep infill communities accessible during a transition time from edge sprawl dominated by auto travel to more compact infill where walk, bike, and transit become preferable
- A 1 million population increase will require both strategic improvements for interior road access and transit expansion to match infill redevelopment as it proceeds, given today's starting point with 95% auto ownership and prevailing residential and office park densities in auto-oriented suburban areas
- Transit expansion must rely substantially on buses, given the cost of rail and the gradual evolution in employment and residential densities to support rail transit, and good bus service depends on an ability to bypass or avoid major congestion

Road Expansion and Travel

- The willingness of people to continue driving under extreme congestion in Los Angeles, the Bay Area, and other large metropolitan areas shows lack of road capacity and congestion are not primary factors in travel behavior
    - People make individual travel choices for personal convenience, not for better transportation system performance, hence the public grumbling about worsening congestion, ramp meters, carpool lanes, traffic calming
    - People in urban areas today expect and accept congestion to some degree, and readily tolerate a 20-40 minute commute
    - Commuters place a high value on predictable and reliable travel time, a significant cause of diversion to neighborhood streets to bypass congestion
    - Congestion adds delay cost on top of the higher cost of driving; when carpooling, transit, or bicycling can become competitive in travel time some drivers switch, particularly higher income drivers who tend to be more sensitive to time delays
    - High parking or fuel costs also add to the cost of driving; some drivers switch to carpools to share cost or to transit or bicycling to avoid cost, particularly lower income drivers who tend to be more sensitive to out-of-pocket costs
    - More than 90% of the total costs of auto travel are private costs - to own, fuel, insure, and maintain vehicles - totaling more than $8000 per year on average, with the remaining 10% being the costs of the roads and public impacts
- Road expansion can be targeted to foster certain kinds of travel patterns and auto use, recognizing that dependence on auto travel fundamentally comes from suburban development patterns and densities
    - The combination of low density, separation of residential, commercial and employment areas, and the common 8-to-5 workday are the real causes of high vehicle miles traveled and congestion
    - Only Sacramento downtown and limited, scattered locations elsewhere have high enough density currently to support transit as an effective and efficient alternative to driving

- Today's transportation system as a whole benefits equally whether a person driving alone switches to fill an empty seat in a carpool or on transit
- Capacity improvements shift traffic patterns, which may or may not yield higher vehicle miles traveled, but lack of capacity may also increase vehicle miles traveled as drivers go out of direction to escape congestion
- Urban centers depend on street capacity for access just as much as suburbs: Manhattan has as high a street density as any city in the U.S. but it is used differently - by transit, taxis, and pedestrians rather than single-auto drivers

- Public polls show support for increased investment in transit but the public continues to favor driving alone, by increasing percentages
  - Polling around the state has consistently shown about 75% support more investment in transit, but 75% of those say transit is "for the other guy"
  - Polling for Sacrament Measure A yielded similar results, and indicated that the measure would not pass without some road expansion in the program
  - National Travel Census shows a gradual decline in transit and carpooling for commuting from 1990 to 2000, consistently all over the U.S.

Carpool Lanes

- Urban freeway expansion today almost always involves carpool lanes, and carpool lanes are never created by converting existing lanes to carpools-only
  - Federal highway and environmental regulations essentially require any new freeway lanes in urban nonattainment areas to include carpool lanes
  - Urban sales tax programs add carpool lanes when widening freeways not because they must but because carpool lanes move people more effectively
  - Only one major urban freeway widening has been built without carpool lanes since 1980 in California: on Route 101 Ventura Freeway in Los Angeles in the mid-1980s, done with no federal participation
  - Caltrans once converted an existing mixed-flow lane to a carpool-only lane, on Route 10 Santa Monica Freeway in Los Angeles in the mid-1970s, and it was so unpopular with the public that no agency has dared to try it again since
- Carpool lanes do work, both to increase capacity and yield more carpooling
  - Carpool lanes typically change behavior gradually over 3-5 years, as drivers switch into carpools to take advantage of shorter travel time
  - Caltrans reports that one carpool lane on Route 99 in Sacramento carries more people daily in the peak hour than the three adjacent mixed-flow lanes
  - Carpools offer wider choices than transit: during the peak hour in Sacramento, there are at most a few thousand empty seats in transit (serving about 200 trip patterns) versus more than 1 million empty seats in autos (serving hundreds of thousands of trip patterns)

- Carpool lane corridors in a wide range of cities - Houston, Washington DC, Seattle, Minneapolis - run counter to the general trend around the country since 1990 that shows declining percentage of carpooling to work and a decline in direct home-to-work trips in favor of stops for errands
- Most carpool lanes in the Bay Area – on the Bay Bridge, on Route 101 in Marin and San Mateo Counties, even on arterials in San Jose - are so heavily used that 3+ people are required in the car to use the lane
- Caltrans has begun to examine how to shift carpool lanes requiring 2+ people to 3+, since after 10-15 years 2+ carpool lanes prevalent in Southern California are becoming too congested
- The Legislature required Caltrans to test opening up the Route 10 El Monte carpool lanes east of Los Angeles (which required 3+ carpools) to 2+ carpools in 2002; the resulting congestion was so chaotic in both the carpool lanes and mixed-flow lanes that public pressure terminated the test after five months

- Express bus an important factor in getting maximum productivity out of carpool lanes
  - AC Transit buses carry more than 20% of passengers riding in the carpool lane across the Bay Bridge
  - Carpool lanes in Houston, with extensive express bus service, carry 118,000 people each weekday in 36,000 vehicles; if all drove alone, Houston would need 24 lanes of additional capacity on its freeway network
  - The I-66 corridor between Virginia and Washington DC carries more daily riders on express buses in carpool lanes than on the Washington Metro rail line running in the median
- HOT (High Occupancy Toll) lanes, which allow free access to carpools and use by single drivers who pay a toll, can be another option in certain cases
  - The Route 91 toll road in Orange County has proven popular, with a broad range of drivers owning a toll pass and using the toll lanes on days when fast and reliable travel time is worth a toll of up to $5
  - The I-15 managed lanes in San Diego have also proven popular, with variable toll rates used to optimize traffic flow and toll revenues used to improve transit service in the corridor

<u>Approaches and Funding for Road Capacity</u>

- A spectrum of options, with a wide range of costs, is available to expand or open up road capacity, from adding lanes to making operational improvements to shifting travel away from driving alone to changing travel patterns
  - Adding lanes to a roadway – on the main line, through freeway interchanges, at local interchanges, or across barriers such as rivers or railroads - comes with the highest cost: $4 million or more per mile on arterials and $15 million per mile or higher on freeways

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- Operational improvements – such as ramp meters, weave lanes, auxiliary lanes, motorist information on freeways and signal timing, turn lanes, intersection widening, bus turnouts, fewer driveways, smart corridors on arterials – typically cost an order of magnitude less, in the range $500,000 to $3 million per mile
- Programs to shift travel away from drive-alone may affect travel over a wide area at modest cost; for example SACOG's 5-1-1 and rideshare programs cost less than $1 million per year regionwide to foster carpooling, transit ridership, and bicycling in all corridors and areas
- Programs that lead to travel pattern changes - for example the Blueprint's compact development which shifts longer trips to local trips, or demand management to foster telecommuting and alternative work schedules – can take traffic off the road at peak hours for very little direct cost

- Road programs are so underfunded today that funding for road expansion must compete against funding for road maintenance, rehabilitation, and operations
  - Cost effective investments become more critical
  - Strategically targeted investments, such as widening at interchanges or coordinated signals that allow free flow along the length of an arterial street, often provide larger benefit at smaller cost than general road expansion
  - Targeted improvements at specific bottleneck points (found at the head of the line of congested traffic, even though drivers perceive congested traffic from the back of the line) can sometimes open up capacity all along corridor

- System capacity built in 1950s and 60s was backed by a robust gas tax, now sales taxes and development-based funds have become the main sources to pay for road expansion
  - ½% sales tax revenues exceed the STIP in all urban counties
  - Funding for road expansion increasingly comes from development-based sources, which provided 8% in 1985, 14% in 1995, and now 25% in 2005
  - Caltrans actively pursues developer funding for state highway improvements, since it can use only 10% of STIP funding for state highways in urban areas; this should intensify now that the State uses 100% of its shares of gas taxes and federal funds for highway maintenance and rehabilitation

- Toll roads may be the only option for very large projects in today's funding climate
  - The public has not shown willingness to tax itself at 1960s levels, when fuel taxes comprised 30% of the cost of gasoline, so private funding and financing must be brought to bear if very high cost projects are to be built
  - Tax increment bonds, developer bonds, toll bonds, and other revenue-backed borrowing can advance private funds that get repaid over the life of a project

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SACOG ISSUE PAPER ON HIGHWAY LANE PRICING AND TOLLS

The paper introduces three highway pricing concepts: tollways, high occupancy toll (HOT) lanes, and fast and intertwined regular (FAIR) lanes. Definitions, objectives and issues to consider from case studies are offered to assess the opportunities and challenges for highway pricing in the Sacramento region.

DEFINITIONS

Toll Facilities (Tollways)[1]: A toll road or turnpike is a highway that requires toll collections from all drivers (usually with the exception of emergency vehicles). Typically, those tolls are used to support operations and maintenance, as well as to pay debt service on the bonds issued to finance the toll facility. Tolls may be collected at a flat rate at toll plazas, or based on distance traveled using tickets, electronic transponders, or video recording of license plates. Many existing, traditional toll roads are converting to some form of electronic toll collection, and most new toll projects incorporate the option to pay electronically.

High-Occupancy Toll (HOT) Lanes[2]: HOT lanes refer to special use lanes on an otherwise free highway facility. On HOT lanes, low occupancy vehicles are charged a toll, while High-Occupancy Vehicles (HOVs) are allowed to use the lanes free or at a discounted toll rate. Vehicles not meeting HOV occupancy requirements buy the right to use the HOV lanes. HOT lanes have been facilitated by the emergence of electronic toll collection technology.

FAIR Lanes[3]: "Fast and Intertwined Regular Lanes" or "FAIR lanes" involves separating freeway lanes, typically using plastic pylons and striping, into two sections: "fast" lanes and "regular" lanes. Drivers who pay to participate receive a transponder for their vehicles. The transponders communicate with the electronic toll collection system to record if the driver is using a “fast” or “regular” lane during congested peak-travel periods. The “fast” lanes charge tolls that vary by the time of day and level of congestion. In the “regular” lanes, drivers in the program would be compensated with credits and constricted flow would continue. The credits can then be used as toll payments for use later in the “fast lanes,” or as payment for transit, paratransit or parking at commuter park-and-ride lots along the corridor.

Value Pricing[4]: Value pricing, also known as congestion pricing and peak-period pricing, entails fees or tolls for road use which vary with the level of congestion. Fees are typically assessed electronically to eliminate delays associated with manual toll collection facilities.

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1 **Washington State Comprehensive Tolling Study Initial Assessment; Working Paper #2: National Perspective: Uses of Tolling and Related Issues**, Cambridge Systematics, Inc., November 2005.

2 Source: University of Minnesota, Hubert H. Humphrey Institute of Public Affairs Website at http://www.hhh.umn.edu/centers/slp/projects/conpric/index.htm, November 28, 2005.

3 Source: Federal Highway Administration, Office of Transportation Policy Studies Website at http://www.fhwa.dot.gov/policy/otps/valuepricing.htm, November 28, 2005.

4 Source: Federal Highway Administration Website on Value Pricing Pilot Program at http://www.fhwa.dot.gov/policy/vppp.htm, November 28, 2005.

Assessing relatively higher prices for travel during peak periods is the same as that used in many other sectors of the economy to respond to peak-use demands. For example, airlines offer off-peak discounts and hotel rooms cost more during peak tourist seasons.

- For existing tollways, toll rates typically do not vary by time of day or day of week. Many planned tollways, however, do incorporate value pricing.
- For HOT and FAIR lane projects, value pricing is used.

Introduction to Case Studies: Examples of highway pricing for the entire facility (toll roads) vs. only select lanes (HOT or FAIR lanes) are described separately in the following sections because of key institutional, design and financial differences. Project goals vary considerably, ranging from profit motive in a toll road example to subsidizing transit services in a highway lane pricing example. Despite the different goals, successful cases are those with adequate demand for a highway pricing application; the willingness to pay is highest on corridors with limited free alternative highway options or high levels of congestion that last for more than just the peak commute periods.

For each case study, relevant information for policy makers is highlighted. By beginning with a discussion of early toll facilities and then expanding to the broad range of active efforts, the paper demonstrates that interest in highway pricing continues to grow. The national and state case studies suggest that the Sacramento region may also see more highway pricing proposals as the region further urbanizes and connections to nearby regions strengthen. In assessing proposals for the Sacramento region, policy makers must consider both the clarity of vision for a candidate corridor and whether or not the highway pricing strategy can be successfully implemented. Moreover, successful case studies demonstrate the need for a clear vision, good design, strong operations and a realistic financial plan so that the benefits outweigh any concerns of equity or fairness.

TOLL FACILITIES

States in the Midwest and East have a long, well-established history of toll roads and toll bridges, dating back to the construction of turnpikes in the 1940s and 1950s before Congress undertook the interstate highway program in 1956.

Most of the early toll turnpikes still operate, typically collecting tolls based on distance. All were built on heavily-traveled corridors of 50 years ago, and all remain heavily used, despite the fact that free interstates have been built elsewhere in those states in the last 50 years. Toll revenues of the early toll roads were originally used to pay off original construction bonds. Later revenues went towards bonds for highway widenings and extensions, and to pay for maintenance and operations. Today, some toll authorities hold substantial reserves and some states, such as Massachusetts, have passed legislation allowing diversion of some revenues to support other roadways.

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Toll Bridges in California

California built ten toll bridges during the years from the 1930s to the 1980s. The bridges include the Golden Gate Bridge plus seven in the Bay Area and two in southern California on state highways.

- Institutional management – The Golden Gate Bridge is owned and operated by a public authority, while the other eight state highway toll bridges in the Bay Area and San Diego have been turned over to regional toll agencies.
- Revenues towards a range of transportation services – Toll revenues pay for bridge operations, maintenance (including seismic retrofit or replacement), bridge improvements and transit service to relieve traffic demand on congested bridges and, in some cases, to fund highway improvements as far as ten miles away in corridors that lead to the bridge.
- Integration with new toll payment technologies – All of the remaining toll bridges in California allow electronic toll collection for drivers possessing a FastPass. Peak pricing was studied and considered for the San Francisco-Oakland Bay Bridge in the late 1990s but not implemented for complex local political reasons.
- Reversion to a free facility – The state paid off bonds in 1998 to revert to free use the Vincent Thomas Bridge in Long Beach.

Automobile Toll Roads in California

California's experience in toll roads is presently limited to the two public toll authorities in Orange County that built four state highway routes (51 miles total) during the 1990s as toll roads with a flat toll rate set by the bond covenants.

- Increased mobility. Collectively, the toll roads reduce congestion by an estimated 20% along I-5 in the county; I-5 is free and runs roughly parallel to the tollways through the southern portion of Orange County. The four toll routes presently carry approximately 200,000 vehicles per day.
- Revenues short of projections. Both Orange County toll authorities have had to refinance debt and are now considering consolidation to allow further debt restructuring. This is because traffic volumes, and thus toll revenues, are lower than projections. It is suggested that the lower traffic volumes are because development immediately beside the corridors has proceeded more slowly than anticipated due to a saturated high-end housing market in Orange County.
- New proposals for toll roads. Following the success of toll roads in the East and Midwest, many fast growing cities in the western US are adding toll roads to their highway networks. The most active efforts are in Dallas, Houston and Denver. For the Sacramento region, the Placer Parkway Preservation Project[5] represents a preliminary feasibility study investigating whether tolls could be used as a potential revenue source

[5] **Conceptual Plan; Placer Parkway Interconnect Study**, DKS Associates, January 2000.

on this proposed regional facility. It is being conducted by consultants to the Placer County Transportation Planning Agency.

Truck Lanes and Toll Roads in California

Currently there are no truck toll lanes in California and very few miles of truck-only lanes. The high level of freight traffic in Southern California has led to active proposals for new free and priced truck-only toll lanes, as well as a proposed tollway for exclusively truck traffic.

- **Truck-only Lanes (free)[6].** The purpose of truck-only lanes is to separate trucks from other mixed-flow traffic to enhance safety and/or stabilize traffic flow.
    - ► **An emerging concept.** Very few truck-only lanes exist nationally. California has two truck-only lanes along Interstate 5 north of Los Angeles and others are being planned.
    - ► **Metrics for success.** A feasibility study report by the Southern California Council of Governments (SCAG) concludes that exclusive truck lanes were most plausible for congested highways where three factors exist: truck volumes exceed 30% of the vehicles, peak-hour volumes exceed 1,800 vehicles per lane-hour, and when off-peak volumes exceed 1,200 vehicles per lane-hour.
- **Truck-only Toll Lanes (priced):** Truck toll lanes have the same purpose as the free truck-only lanes, but are proposed where the truck traffic is highest. Caltrans proposes a $5.5 billion overhaul of an 18-mile stretch of Interstate 710 in Los Angeles County that will link the Ports of Los Angeles and Long Beach to the Pomona Freeway.
    - ► Revenue Generation. Studies suggest that container fees and tolls could produce up to $1.4 billion in capital funding for the I-710 improvements.
    - ► Design. The Locally Preferred Strategy calls for widening the freeway to 14 lanes from the existing 6 to 10 lanes, adding a four-lane truck facility.
- **Truck-Only Tollway:** SCAG's long-range transportation plan proposes a 140+ mile $16 billion truck-only tollway from the ports of Los Angeles and Long Beach out I-710 to Route 60 to I-15 to Barstow. The facility would be financed and paid for with tolls of $60 per truck trip.

HIGHWAY LANE PRICING

In contrast to toll roads, two new highway pricing concepts (HOT and FAIR lanes) involve variable pricing for only select lanes of an otherwise free highway. The following sections describe typical objectives for implementing these projects, relevant case studies, and issues to consider.

There are a variety of objectives for implementing highway lane pricing strategies. Objectives are described as primary or secondary.

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[6] **Caltrans Truck-Only Lanes Fact Sheet**, Caltrans Traffic Operations Program-Office of Truck Services, May 2004.

Primary Objectives

- **Enhance corridor mobility**. Value pricing by the level of congestion provides incentives to shift some trips to off-peak times, less congested routes, or alternative modes. Mobility is further advanced by causing some lower-valued trips to be combined with other trips, or to be eliminated. A shift in a relatively small proportion of peak-period trips can lead to substantial reductions in overall congestion.
  - **Reduce travel-times/vehicle hours of travel.** A key benefit from enhanced mobility is the time savings to travelers.
  - **Improve travel-time reliability**. Variability of travel times due to congestion (peak-periods especially) also may result from enhanced corridor mobility.
- **Generate revenue.** Revenue received can go towards various purposes, including the construction of the highway facility, ongoing highway operations and maintenance, or subsidies towards transit and ridesharing.

Secondary Objectives

- **Provide equity.** Because highway lane pricing creates the opportunity for paying drivers to avoid congestion, some critics have charged that the facilities are elitist and serve primarily affluent users at the expense of middle and low-income motorists. In response to this concern, a common objective is to make sure that any highway pricing benefits are equitably distributed, not disproportionately enjoyed by only users that can afford to pay. Highway pricing can be structured to provide transit subsidies and/or no-pay or discount options
- **Improve under-utilized HOV facilities.** One form of highway lane pricing, HOT lanes, may enhance efficiency of HOV lanes and respond to negative public opinion about underutilized HOV lanes.
- **Promote transit and ridesharing**. Highway lane pricing is often implemented with strategies to use the revenue generated to provide transit subsidies and to stimulate carpool formation to increase average vehicle occupancy.
- **Reduce mobile source air pollution emissions**. A marginal reduction in air pollution emissions may result to the extent that vehicles will drive at steady speeds versus stop-and-go in congestion.

Existing and Planned Highway Lane Pricing Examples

Highway lane pricing case studies from other regions are only generally applicable to candidate corridors in the Sacramento region. Lessons learned regarding geometric design standards, signing, and toll collection technologies have relevance, but capital costs and revenues generated are less applicable.

(1) State Route 91 (SR-91) Express Lanes – Orange County, California grew out of a desire to increase capacity in a heavily congested corridor. SR-91 Express Lanes is a 10-mile, four-lane, HOT controlled access facility located in the median of an existing highway. The project was privately constructed but is now operated by a public agency.

- **Construction and Ongoing Operations:** The SR-91 Express Lane project was awarded on a concession basis to a private consortium, which financed, built, and operated the new lanes, using project revenues to repay its debt and derive profit. The facility has been sold to the Orange County Transportation Authority (OCTA) who now operates it.
- **Pricing:** Toll rates on the Express Lanes vary from $0.75 to $4.75 by time of day and day of week. Customers must have a prepaid account and transponder to use the Express Lanes. Tolls for HOV/2+ vehicles are reduced by 50 percent.
- **Use Patterns:** The HOT lanes are being used differently than expected. The private interests that built and initially operated the facility expected a modest number of higher income drivers to buy passes and then to use the lanes regularly. In contrast, four times as many drivers as expected have passes, but they don't use them regularly; most drivers with passes only use the HOT lanes 1-2 days per week when timely or fast travel is imperative or an accident congests the main lanes.
- **Socio-economic Equity**[7]**:** As described in the objectives section, critics often suggest that highway lane pricing primarily serves affluent users at the expense of middle and low-income motorists. Actual data on SR-91 HOT lane use largely dispel this charge. Studies of the SR-91 Express Lanes indicate a statistically significant correlation between income and frequency of toll lane use, but also reveal that three-quarters of the users at any one time are from households with incomes below $100,000/annually.[8]

(2) I-15 FasTrak in San Diego grew out of a desire to utilize spare capacity on the HOV lanes as well as the desire to cross-subsidize transit service in the corridor. The I-15 FasTrak involved the conversion of an under-utilized pre-existing 8-mile, two-lane HOV facility to a peak-period reversible HOT lane facility.

- **Pricing:** The I-15 FasTrak program allows single occupancy vehicles to pay a toll ranging from $0.50 to $4.00 to use the HOT lanes normally reserved for vehicles with two or more occupants. Customers must have a FasTrak account and transponder to use the HOT lanes. HOV2+ vehicles may use the facility at no cost.
- **Construction and Ongoing Operations:** The project was completed and continues to be operated by the San Diego Association of Governments (SANDAG) which has earmarked a significant portion of the revenues derived from the HOT-lane fund transit improvements in the I-15 corridor.

(3) Katy Freeway HOT Lanes (QuickRide Program) in Houston seeks to obtain more productivity out of underutilized HOV lanes. The Katy Freeway is an existing 13-mile, six-lane freeway with a one-lane reversible HOV lane in the median which was recently

converted to HOV/3 to reduce HOV-lane congestion. Excess capacity of the HOV/3 facility led to the introduction of a HOT lane (QuickRide) program.

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[7] **A Guide for HOT Lane Development**, Parsons Brinkerhoff, Texas Transportation Institute, and U.S. Department of Transportation Federal Highway Administration, March 2003, Page #28.

[8] **Continuation Study to Evaluate the Impacts of the SR-91 Value-Priced Express Lanes: Final Report**, State of California, Department of Transportation, December 2000.

- **Pricing:** HOV/2 vehicles pay $2.00 per trip to use the facility during peak periods, while HOV/3+ vehicles continued to use the facility at no cost. Customers must have a QuickRide account, transponder and windshield tag to use the facility.

(4) I-680 Smart Carpool Lane Project – Alameda County, California will be the Bay Area's first HOT-Lane study of value-pricing HOV lanes. It is a four-year demonstration project on a 14-mile stretch of Interstate 680 between Pleasanton and Milpitas, commonly referred to as the Sunol Grade.

- **Institutional issues:** The Sunol Grade portion of Interstate 680 is, by voter-approved ordinance, required to operate new value-priced HOV lanes. The project is a joint effort of the Metropolitan Transportation Commission (MTC), Alameda County's Congestion Management Agency, Caltrans, and the Federal Highway Administration (FHWA).
- **Design:** The HOV/HOT lane will be delineated from the three other lanes with striping, which is less expensive and more flexible than physical barriers.
- **Pricing:** The highest peak-hour tolls will likely range from $0.22 to $0.38 per mile and the tolls will be collected through the FasTrak system – an electronic reader identifies the vehicle from an in-vehicle transponder and deducts the toll amount from a prepaid account. The tolls can be adjusted to keep pace with traffic conditions.
- **Projected Revenues:** The cumulative net income over 20 years for HOT lanes in both southbound and northbound directions is estimated to be between $83 and $142 million under the current HOV-2 (two-person carpool) policy.

(5) US-50 High Occupancy Toll (HOT) Lane Strategy Evaluation[9]: A feasibility study on the cost-effectiveness of converting HOV lanes into HOT-lanes between Sunrise Boulevard and downtown Sacramento was completed in September 2005 by consultants for Caltrans, District 3. It concludes that the HOT-lanes are not currently cost-effective for two primary reasons: projected congestion levels were not high enough and increased time costs from limiting access to the HOT lanes.

- **Projected congestion levels not high enough**. The forecasted levels of congestion in the US 50 study did not produce enough congestion to make the HOT lane attractive to potential users at the toll prices assumed.
- **Increased time costs.** The study assumes a limited number of access points that in the model scenarios force a number of HOVs to use the general-purpose lanes; these HOVs experience increased time costs, which leads to more congestion in the general-purpose lanes that result in increased time costs to other travelers.
- **New Technologies may result in lower costs and higher benefits.** The study authors note that the cost-effectiveness of HOT lanes along US 50 could improve significantly with emerging technologies. GPS-based HOT lane technologies that are being studied in Seattle may allow vehicles to freely enter and leave the HOT lanes, thereby reducing the time cost problems from limited access points in the US 50 study assumptions.

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[9] **US 50 High Occupancy Toll (HOT) Lane (Sunrise Blvd. to Downtown Sacramento) Strategy Evaluation**, Dowling Associates, September 2005.

(6) I-580 / I-680 FAIR Lanes Study – Alameda County, California[10] investigates the potential for implementing the new Fast and Intertwined Regular (FAIR) lanes concept along two East Bay corridors and will be coordinated with the concurrent "I-680 Smart Carpool Lane Project" study.

FACTORS TO CONSIDER FOR HIGHWAY LANE PRICING

The case studies demonstrate that there are a number of issues that should be considered when considering highway lane pricing applications.

Policy and Institutional Issues

- **Overall system philosophy – why highway pricing?** A successful highway pricing application must determine if there is adequate demand. Considerations include:
  - **Determine levels of congestion.** Does corridor demand (today and during the planning period) exceed capacity by moderate or high levels?
  - **Determine duration of congestion**. How many hours of the day is the free corridor (today and during the planning period) congested?
  - **Determine level of HOV use.** Will there be spare capacity in the HOV lanes not used by HOVs today or in the future? This analysis is specific to possible HOT lane applications.
- **Initial agency considerations**. Critical efforts include defining agency roles and types of participation in the development of a highway pricing project.
  - **Define the vision.** Will highway pricing be implemented as a corridor management tool? Is the facility an isolated corridor improvement, or will it be connected to other toll or HOT lane facilities?
  - **Establish project goals.** Clear and decisive goal setting may include relieving congestion or promoting transit use and ridesharing.
  - **Public or Private?** Determine the optimal public/private balance between the construction and ongoing management of the facility.
  - **Address equity and fairness concerns.** This is particularly an issue with HOT lanes were it is important that benefits are equitably distributed, not disproportionately enjoyed by only users that can afford to pay.
  - **Establish criteria for success.** Develop monitoring and evaluation plans that may include system performance measures.
  - **Encourage public involvement.** A public outreach/awareness campaign and active public involvement throughout the evaluation and design process can help address concerns and generate public acceptance of a highway pricing concept.

[10] **Managed Lanes: Strategies Related to HOV/HOT**, White Paper prepared by the TRB HOV Systems Committee (A3A06), September 2003.

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Design, Operational and Safety Issues

- **Design considerations**
  - **Will the highway HOV/HOT lanes monitor access through "buffers"?** HOV/HOT lanes on highways with inadequate rights-of-way (ROW) typically have contiguous/buffer-separated access (cones, striping, etc.) between the free and priced lanes, though GPS-based technologies promise the opportunity for vehicles to freely enter and leave the HOT lane without any "buffers".
  - **Will the highway HOV/HOT lanes control access with a "barrier"?** Highways with HOV/HOT lanes that have physical barriers limiting access points are the easiest to monitor. One key design issue is whether the lanes will be dynamic reversible-flow lanes or static two-way lanes. A second design challenge is the terminal treatments at ingress and egress locations. These are the diverge areas at the beginning of HOV/HOT lanes and merge areas, lane-drops, at end of HOV/HOT
- **Operations**
  - **Select the best toll collection technology.** The most common approach to electronic toll collection is via in-vehicle transponders and readers at HOT-lane entry and exit locations.
  - **Enforce payment for access to the fast lanes.** Considerations include the amount of on-going enforcement and the number/location of enforcement areas. Enforcement of contiguous/buffer-separated HOT-lanes may prove more difficult that enforcement of barrier separated HOT-lanes.
- **Safety**
  - **Design for safety.** Optimally, the HOT lane has a cross-section design with adequate shoulder widths to accommodate disabled vehicles and accident clearance.
  - **Establish appropriate policies.** The Caltrans Freeway Service Program is an example of a coordinated policy with provisions for the timely clearance of disabled vehicles.

Economic and Financing Issues

- **Construction/Financing Issues**
  - **Estimate Capital costs**. This analysis involves reviewing the difference between retrofit and new construction, any additional right-of-way costs, and the need for grade separations, etc.
  - **Select the optimal financing mechanism.** Capital financing options may involve bonds, supplemental sales taxes, etc.
  - **Define ownership and governance for the facility.** The financing and ongoing operation costs vary greatly between a publicly owned and a public/private venture.

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- **Revenue Issues**
  - **Determine who will pay.** Primary considerations involve determining if the two person HOVs will be free. Will there be variable pricing for SOVs? Will trucks allowed and charged?
  - **Establish a toll pricing strategy.** Distance based tolls or flat rates independent of distance traveled toll lanes? Tolls varied by vehicle type and occupancy (e.g. trucks, SOVs, HOV 2 or 3 person? It is also important to determine if the tolls are constant over time or tolls that increase over time (e.g., tied to inflation index or to construction cost index).
  - **Consider issues that seriously limit revenue generation.** Is the projected congestion high enough to attract enough use? For HOT lanes, the length of facility is also important to consider. A short facility may have little revenue generating capability unless it is a critical bottleneck (i.e., bridge, tunnel, pass, etc.).
  - **Determine how the revenue will be used.** Will the revenue go towards operations and improvements to the facility, or will a portion of the revenues go towards subsidizing other transportation investments or programs? (e.g., transit subsidies, rideshare programs, etc.).

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SACOG ISSUE PAPER FOR 2007 MTP
TRANSIT EXPANSION ISSUES

This paper explores the issues and choices that underlie the expansion of transit services through the life of the Metropolitan Transportation Plan (MTP) 2030. Who will demand transit services? Should transit's primary role be to serve the transit dependent, or should it be to provide another choice to those who currently choose to drive? What mix of transit services and connections would make transit effective enough to attract more ridership? How should the expansion of transit service relate to urban density and growth? How much will a significant expansion of transit cost, and how will we pay for it?

Transit Capacity and Use

- Transit service in the region is currently provided by 13 public transit operators and two private non-profit Consolidated Transportation Services agencies offering varied size and types of service
  - Sacramento Regional Transit District (RT) operates peak service with 250 buses in local service and 40 rail cars on 40 miles of track, comprising about two-thirds of the region's service
  - The other systems range in size from Yolo County, Roseville, and Yuba-Sutter Transit, operating about 30 buses each in peak service, down to City of Auburn with a fleet of only three vehicles
  - ParaTransit Inc. operates a fleet of 125 lift-equipped vans serving primarily riders needing assistance in greater Sacramento, and four operators offer the same service in the other counties
- Transit in this region is primarily a lifeline service for the transit-dependent, with frequency lower than the 15 minutes considered the minimum to attract those who can choose between auto and transit
  - Of about 160 transit routes run by all the region's operators, fewer than 10% run as often as 15-minute frequency, even in the peak period
  - No bus routes or light rail lines run lower than 30-minute frequency in the evenings
- Transit currently carries less than 1% of all daily trips in the region, about 4% of commute trips, and 20% of commute trips into downtown Sacramento
- At least half of transit ridership in the Sacramento region today comes from transit-dependent passengers: youth, elderly, disabled, low income, or those who do not have access to an automobile
  - Surveys show that at least 25% of transit riders do not own an automobile, and almost 20% have incomes below the federal poverty line

  - The transit dependent female disproportionately include female heads of households and immigrants
  - Older Americans, particularly those over 75 (who drive less or not at all), are more likely to rely on transit, typically with a reduced fare; among non-drivers age 75 or older, 14% use transit as their primary mode of travel and nearly 20% say they use transit on a monthly basis
  - An increasing number of school students use transit, and in Sacramento ride at a discounted fare, as tight school district budgets force cuts in school bus transportation
- The remaining riders are choice riders, who choose transit over other available transportation options, mainly for commuting to work
  - Most choice riders tend to be commuters with higher incomes; 54% of transit trips in U.S. cities, and a somewhat smaller share in Sacramento, are commute trips
  - Persons with incomes over $50,000 per year comprise 17% of the nation's transit users
- Anecdotal evidence indicates that the region's transit system has perhaps 30% unused peak capacity, little of it found on routes attractive to choice commute riders, and plenty of off-peak capacity
  - The transit system carries more than 30,000 riders in a two-hour peak period in both morning and afternoon, with a bus and rail fleet with at most 20,000 seats per hour in peak hour service
  - Many peak hour runs operate full, some with standees, particularly those oriented to commuting to and from downtown Sacramento, but some others run less than half full at all times
- A comparison of Sacramento with ten urban areas of most similar population shows Sacramento with a relatively small fleet (8th out of 11 cities) that proportionally carries more passengers overall (6th out of 11) but fewer commuters (10th out of 11)
  - The study done in 2003 compared Sacramento (28th largest urban area in U.S.) with the next five larger metropolitan areas (Portland, San Jose, Riverside, Cincinnati, and Norfolk) and the next five smaller areas (Kansas City, San Antonio, Las Vegas, Milwaukee, and Indianapolis) for vehicles in peak service and daily and commuter ridership in relation to population and density
  - Portland provides a model of superior transit service, ranking 1st in all the performance measures, carrying more than three times the ridership on a peak fleet nearly three times larger than in Sacramento, in a service area with 40% lower population density but a fifteen-year history of transit-supportive development policies
  - San Jose and Riverside provide interesting contrasts in service approach in suburban settings in California of comparable size and population density: San Jose favors effectiveness over efficiency, ranking 3rd in peak vehicles and ridership and 6th in commuter ridership but with the lowest farebox return (12%) of any large operator in the state, while Riverside favors efficiency over effectiveness, ranking 11th (lowest) in peak vehicles and overall and commuter ridership but with one of the higher farebox returns (29%) statewide

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- Overall and commuter ridership are generally proportional to peak vehicle fleet size, with Las Vegas and Sacramento showing larger than average overall ridership per vehicle in service and Cincinnati and Kansas City showing larger than average commuter ridership

- Strategic transit expansion will be necessary to increase peak period choice ridership, and becomes increasingly critical to complement and serve more compact Blueprint development patterns

<u>Transit Expansion and Land Use</u>

- Land use density matters a lot for efficient transit service
  - Traditional fixed route transit is inherently either ineffective or inefficient in low-density suburban residential and employment settings; the performance of San Jose and Riverside systems noted above illustrates this point
  - Comparing downtown Sacramento and Rancho Cordova, one a dense and the other a sprawling employment center of comparable size, Sacramento RT's bus and rail lines carry an average of about 450 riders per line in the peak periods to and from downtown Sacramento versus about 300 riders per line to and from Rancho Cordova
  - San Francisco Muni, operating in the densest residential and employment environment in California, carries 720,000 riders daily on a fleet of 900 buses and 160 rail cars (680/vehicle)
  - Los Angeles MTA, operating in a relatively high density urban/suburban metropolitan area, carries 1,375,000 riders daily on a fleet of 2550 buses and 180 rail cars (500/vehicle)
  - Sacramento RT, operating primarily in a low density suburban environment, carries 100,000 riders daily on a fleet of 250 buses and 40 rail cars (350/vehicle)
  - Riverside Transit, operating in a medium-density suburban area, carries 25,000 riders daily on a small fleet of 85 buses (300/vehicle), nearly as high as Sacramento despite minimal service
  - Residential and employment density, as well as the presence of major trip attractions, such as educational facilities, are significant factors in cost efficiency of new transit services
  - Transit cannot efficiently serve typical low suburban residential or employment densities at reasonable cost, but must be brought into play as more compact infill redevelopment takes place
- Close proximity to transit, close enough to walk, dramatically increases transit use
  - Research in suburban Maryland found that those with walk access to high quality transit service were 10% to 45% more likely to use transit than those who had to drive for access
  - San Jose built about 4,500 housing units and 9 million square feet of commercial-office space within walking distance of the Tasman West light rail line between 1997 and 1999, and saw daily ridership on its 2-line light rail system increase from 20,000 in 1996 to more than 25,000 by 2000

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    - Base Case land development would yield only 5% of jobs and 2% of housing within ¼ mile of high level of transit service, whereas the Blueprint would place 41% of jobs and 38% of housing within the same closeness to high level of transit service

- Urban form and transit service must be interrelated at a fundamental level: as urban area population grows beyond 2 million transit and walking become more suitable, highway congestion becomes the expected norm, driving costs increase (delay and parking), and accessibility patterns change

    - More compact urban design and mixed land uses favor more travel choices, including transit, as the cost in dollars and congestion make driving alone less attractive and affordable

    - In larger and more compact urban areas, the roadway and parking space needed for autos becomes a limiting factor for auto use, for because of congested conditions and cost

    - A workplace parking space is 20% larger than the typical office workspace, so free parking cannot be an option at higher employment densities

    - A garage comprises about 10% of the cost of a typical suburban house, in the denser setting of downtown Chicago a common garage space adds about 20% to the cost of a condominium, and in Manhattan garage rents amount to as much as 50% of apartment rents

- With Blueprint as a key regional goal, transit expansion policy and investments can become tools to shape land use objectives, rather than simply to increase service in an attempt to lure more riders

    - The lion's share of growth in transit ridership must come from more choice riders, and must include both commute trips and some local travel for other purposes

    - Modeling of the Preferred Blueprint Scenario compared to Base Case for 2050 showed an increase from 135,000 transit trips to 550,000 transit trips daily, an increased share of all commute trips from 2.3% to 7.8%, and an increased share of commute trips to downtown Sacramento from 20% to 44%

    - As existing services in Sacramento illustrate, local transit service aimed for the transit-dependent does not attract choice riders in large numbers, so new transit service aimed for choice riders must include additional kinds of services tailored to provide travel competitive with the auto

    - Commuters value service with reasonable travel speed compared to congested roadways, minimal stops, good frequency over an extended peak period, and minimal waiting at transfer points

    - Communities with strong activity centers and jobs/housing balance need transit services tailored to new more localized travel patterns, for choice riders and trips other than commuting

    - Employment centers, both downtown Sacramento and suburban areas, need to cultivate high office density, buildings close to sidewalks, and appropriate parking prices to enable efficient transit access

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- The transition from lifeline transit service for the transit-dependent to transit as a mode of choice is a challenging one, because infill and compact development at some point require high level transit service but that level of service does not operate efficiently until compact development is in place
  - Compact infill development needs good transit service, which requires more funding, but infill development becomes less feasible with higher fees
  - Development fees to some extent can be used more creatively for transit-supportive features or directly for transit equipment and facilities, with an eye to the impact on transit operating cost

Transit Expansion and Travel

- Transit fares are a key factor for most transit-dependent riders, who tend to have lower incomes
  - The poorest fifth of American households spend 36% of their budgets on transportation, while the richest fifth spend only 14%
- For the choice rider, transit must compete with auto on travel time, convenience, out-of-pocket cost, and perceived comfort
  - Travel time, often two to three times longer than by auto, tends to be the key consideration for many choice riders
  - Transit service frequency competes with the auto, which offers the ability to travel at any time; choice riders typically regard transit frequencies greater than 15 minutes as inconvenient or unacceptable
  - Sacramento RT's pass at $80/month or $960/year compares with the $960/year cost of fuel (at $2.75 per gallon) for the average commuter; parking costs that vary from zero to $8 per day ($2400/year) can provide a real economic advantage for transit
  - In certain areas, such as downtown Sacramento and the UC Davis campus, limited availability (which translates to high cost) of parking is also an important consideration
  - Transit's true economic advantage comes when transit service becomes good enough that a household can dispense with an auto, saving the $8000 annual cost of auto ownership
  - Many choice riders are able and willing to pay premium fares for premium service, such as express commute service or amenities such as wireless access or airline-type seats
- Without express service that is competitive on travel time with driving, few drivers are willing to park and switch to slower transit services once they get behind the wheel
  - Walk or bicycle access to transit can increase share of choice riders
  - Bus service that can bypass or avoid traffic congestion gains attractiveness for choice riders
  - Express bus running in carpool lanes, with signal control on arterials, or with transit-only lanes at congested points can attract more suburban park-and-ride transit users

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- Wait time deters ridership more than slow run time, due to anxiety and the perception of no progress, so routes with reliable timed transfers or no transfers are more attractive for commuters

- Significant growth in the senior population, as the baby boom generation ages, points to increased transit services for seniors as well as a restructuring of the way these services are provided
    - The population over age 65, most of whom no longer commute to work daily, is expected to grow from 11% of the population today (225,000) to 21% by 2030 (625,000)
    - The population over age 75, with travel patterns amenable to community transit service, is expected to nearly triple in 25 years, from 100,000 today to 275,000 in 2030 (11% of population)
    - The population over age 85, of whom many are likely to be transit users, is expected to more than triple in 25 years, from 20,000 today to 75,000 in 2030
    - Universal design features, including low-floor vehicles, automatic doorways, flatter walkways, curb ramps, and handrails become increasingly important for an aging population of riders

Service Expansion

- For a given amount of dollars, bus service allows broader area coverage, whereas rail transit provides high capacity in limited areas along corridors
    - Rail costs about four times as much as bus to operate, which means buses could operate more frequently or to a wider area, but if density right along a corridor is high enough the ridership potential of rail may be high enough to justify a rail investment
    - Good bus transit service with heavy established ridership makes sense as a precursor to investment in a rail line along a corridor
    - The high capital cost of rail transit requires strong justification to support that choice: 20% of the rock bottom cost for ten miles of rail line could buy and replace 80 buses for 30 years of service, at the same annual operating cost
- Two primary considerations in provision of transit service – service coverage and service frequency – often directly conflict when assessing how to spend the limited dollars available to expand service
    - Service coverage provides the ability to get more people to their desired location, as long as the trip does not include an inordinate amount of out-of-direction travel or transfers
    - Service frequency meets traveler preferences for reliability, shorter waiting times, and comfort, particularly in peak periods when higher frequencies reduce overcrowding
    - Wider service coverage does reach more potential choice riders, but if service frequency is too low those customers will rarely use transit
- Both increased service frequency and increased service coverage will be necessary to reach Blueprint objectives for 4% transit mode share, with service improvements tailored to attract choice riders

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- Suburban operators have shown effectiveness with limited-stop express service between high population and high employment areas, with minimal or no transfers
- Minimal transfers.
- Reducing out-of-direction travel, particularly in lower density areas, shortens overall travel time
- Improved transit transfer facilities in downtown Sacramento, with common stops serving different operators and routes, shelter and good information for those who must transfer, and parking for bus layovers, will offer more connection choices and convenience for commuters and better efficiency for the operators

- Modeling of the Preferred Blueprint Scenario shows peak transit demand of 140,000 morning and afternoon in 2030, four times larger than today
  - Just to keep pace with the growth in population, the current level of transit service would have to increase 50% over the next 25 years, to about 450 buses in peak service
  - At same efficiency the transit system has today, the region would need a fleet of about 1400 vehicles to carry 140,000 peak hour trips
  - With very high efficiency - most buses deployed on commuter routes, nearly all buses running full, and 50% turnover of passenger load along the route - a transit fleet of about 1000 buses and the current light rail system with 7½ minute headways could handle 140,000 peak hour trips
- Public funds from local sources to support operations is the most critical component of service expansion, and presently limits the amount of transit service that can be deployed in the region
  - Every bus that Sacramento RT puts in service on average costs about $300,000 annually, which requires $240,000 from public funding to supplement fare revenues; some of the smaller operators can operate buses for one-third less
  - The Metropolitan Transportation Plan (MTP) for 2025 assumed 15% greater efficiency, which meant more riders per vehicle and thus more fare revenues, but that enabled only a 50% increase in service level, far from enough to support the fleet of 1000 or 1400 buses needed to serve Blueprint travel objectives
  - Sacramento's Measure A sales tax extension provides funding to operate light rail including the South Line extension plus expand the current 250 buses in peak service gradually to about 300 by 2025, but not enough to operate the DNA Line or significantly greater bus service

Environmental Effects of Transit

- Public transportation, while a large user of energy, can contribute strongly to energy conservation, since multiple-occupancy vehicles use less energy than driving alone in an auto

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- Diesel buses get about 3 miles per gallon, versus an average of 20 miles per gallon for automobiles, so a bus carrying seven or more riders becomes more efficient than driving alone
- Sacramento RT's light rail uses only 22% as much fuel per passenger mile as autos at current ridership

- Electric rail transit vehicles and trolleybuses emit little or no pollution at the point of operation; diesel buses, with innovations such as clean diesel fuel, are becoming less polluting
- Many newer buses are being fueled by alternate fuels such as compressed natural gas (CNG) to improve air quality and comply with federal and state pollution-reduction requirements
  - 100% of the bus fleets operated by Sacramento RT and Yolobus are powered by CNG
  - About 90% of the service provided by Davis Unitrans is fueled by CNG, and it operates one even-cleaner prototype Hydrogen-Natural Gas blend bus
  - City of Elk Grove operates a fleet of 21 gasoline-electric hybrid very low emission buses

Transit Service Options

- Transit encompasses a wide spectrum of services, each best suited to particular travel markets, only some of which are currently offered in Sacramento, including (but perhaps not limited to) urban rail/light rail, commuter rail, streetcar, express bus, Bus Rapid Transit, local service bus, neighborhood shuttle bus, dial-a-ride, assisted paratransit for the disabled, subscription bus, and jitney
  - Different services come with a wide range of costs, both for equipment and operations, and with cost such a critical factor the various services must be considered carefully for each situation
  - Various service options must be considered in comparison to auto travel, since that is where most choice riders must come from
  - Streetcars, express bus, and Bus Rapid Transit merit particular attention in Sacramento, since all offer service well-suited to the compact development that Blueprint is trying to foster
  - Mixes of services, such as express bus, light rail, and local shuttles working together in the same corridor, can build overall ridership
- More service is not necessarily the only ingredient
  - Better intermodal connections, such as on-board bike racks, park and ride locations, safe and pleasant walk access routes, and improved transit transfers, can enhance the appeal of transit
  - Other conditions can attract choice riders, including fewer stops, faster boarding times, automated or proof-of-payment fare collections, enhanced personal security at stops and on board, and accessibility for the disabled

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Funding for Transit Expansion

- Transit, like other transportation modes, cannot operate in a funding vacuum, and fares typically provide only 20-30% of the revenues needed to fund transit service
  - Sacramento RT gets about 20% of its operating cost from fares, while smaller operators range from about 7% to 30%, to a high of 60% for Davis Unitrans which receives a transit fee approved from UC Davis students that permits unlimited use
- There is limited financial capacity within the Sacramento region for transit operators to expand service without additional financial support, much of which must come from local sources
  - The MTP for 2025 directs $1.5 billion in federal and state funds that flow through the region to transit over 23 years, an average of $50 million per year for capital improvements and expansion (40% of total capital investment) and $25 million per year to support operations (10% of total 23-year operating costs)
  - Funding usable for operations becomes a premium, because, unlike for roads where only 30% of the public life cycle cost goes to maintenance and operations, for buses 90% of life cycle cost goes into operations, and for light rail the operations component exceeds 50%
  - Given state and federal reluctance to fund transit operations, it is likely that local transportation funding must be found to meet the financial needs of an expanded transit system for the region
  - With 75-85% of operating costs going to labor, the region and its operators must seek services and service arrangements that can minimize labor cost
  - More riders mean more fares to defray operating costs, so higher ridership becomes a critical part of the service expansion equation, but realistically no operator statewide except BART with its all-rail system covers as much as 40% of operating cost from fares
  - An efficiently-used 1000-bus fleet carrying six times today's daily ridership might cover 40% of operating costs from fares, but would still require 2.25 times today's total funding from public sources (an additional $100 million per year)
- Capital and operating costs vary widely, and matter considerably for choice of transit service
  - New light rail vehicles cost $3 million apiece with a 30-year service life, a full-size bus coach costs $380,000 with an average 12-year service life, and a shuttle bus costs about $80,000 with an average 5-year service life
  - The typical bus in the Sacramento RT system costs about $300,000 per year to operate and light rail vehicles cost $1.3 million per year to operate, while smaller operators can run buses for as little as $200,000 per year

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