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Learning from Los Angeles: transport, urban form, and air quality

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Abstract. Los Angeles is well known around the world as an automobile-oriented low density community, yet recent transportation policies have emphasized greater capital investment in rail transportation than in highways, and recent policies have attempted to discourage automobile usage through transportation demand management. While these policies have accomplished small shifts toward public transport and somewhat lower dependence upon singly occupied automobilies for work commuting, the financial costs of these policy changes has been very large in relation to their benefits. Proper pricing of transportation alternatives, more creative use of new and emerging transportation technologies, and the provision of many more opportunities for simpler private sector transport services, would all appear to be more promising as cost-effective approaches to coping with congestion in Los Angeles than the current regional transportation policies.

Introduction: Transport in Los Angeles

Just as the Eiffel tower comes to mind as the symbol of Paris, and the Statue of Liberty symbolizes New York, the internationally recognized symbol of Los Angeles is the freeway. Los Angeles is known the world over as the prototype city of the late twentieth century by both its critics and detractors, and its very essence is to be found in its transport system as well as its far flung mix of low and moderate density communities connected by thousands of miles of high capacity freeways. Those of us who live there realize that the dispersed form of the region was to a great extent the product of the Pacific Electric Red Cars, and of decisions about capital investments in water distribution systems, while the freeways were historically more a response to the form of Los Angeles that they were its cause. Nevertheless, it is obvious that transport systems have been a central object of policy makers throughout the evolution of Los Angeles. They remain today among the most important objects

of policy making and political controversy, and are likely to be equally critical in determining the future of the metropolitan area.

Los Angeles is in the midst of its third major transport crisis of the twentieth century. By that I mean that it is experiencing the third period during which transport issues have risen to the top of the region's agenda, with extremely high levels of public awareness and concern, and a continuing sense of urgency among regional officials. And, while the causes of the current traffic crisis are similar to those in the past, the recent responses of public policy makers have differed from those of the past in that congestion is now being addressed by means other than major expansions in highway capacity. It remains to be seen whether the current approach will prove more or less successful than those pursued in response to the earlier transportation crises. The two previous transportation crises were precipitated by rates of growth in population and economic activity which far exceeded the rate of growth in public investment in highway capacity, and the policies adopted to address each of these crises involved major commitments to highway capacity expansion.

Earlier transportation Crises in Los Angeles

The first of these crises came in the nineteen twenties, when rapid growth of automobile ownership and an inadequate local street system led to very serious traffic congestion, and pressure from businesses and politicians to do something about it. In 1924, a Major Street and Highway Plan was adopted by the City Council, and the voters approved a proposition to tax themselves for the purpose of implementing the plan. Discontinuities in the street network were eliminated, broad boulevards were mapped, and real estate developers were required to cede to the city the land necessary to extend streets and boulevards into newly developing areas. At the same time, voters and elected officials rejected several initiatives for the expansion and improvement of the regional rail network, in part because they were fed up with the service provided by the privately owned Pacific Electric and Los Angeles Railway systems, and in part because they did not wish to pay higher taxes and higher fares to support a crumbling transit system just as they were acquiring automobiles for the very first time.

The second major traffic crisis in Los Angeles occurred after World War II, when suburban population growth and homebuilding resulted in increased traffic volumes which swamped the surface street system and again raised traffic congestion to the top of the public agenda. The highway network which had been planned in the twenties had been only partially implemented because of the depression and the war, and growth in transportation demand

far outstripped the existing system's capacity. The vigorous freeway construction program of the California Division of Highways responded to the second traffic crisis, and hundreds of miles of grade separated freeways were added to the highway network of Southern California between the end of the war and the early seventies, with the peak of freeway construction occurring in the early sixties. Major rail transit initiatives were defeated as a decentralizing population saw little value in the construction of subways to benefit primarily the central city business community (Wachs 1984; Wachs 1992; Adler 1987).

The current transportation crisis

Since the early seventies, the rate of traffic growth has again exceeded the rate of population growth. While the spurt of growth in traffic in the twenties was attributable to the initial acquisition of automobiles by a rapidly growing population, and the spurt of growth in the fifties was fueled by pent up demand for automobiles and suburban growth which had been artificially depressed by two decades of depression and war, growth of traffic in the seventies and eighties had somewhat different sources. Automobile ownership has recently swelled to the point that there is now more than one registered vehicle per licensed driver in Los Angeles County. As a large proportion of women have entered the work force and household incomes have risen, per capita driving – especially in the peak congestion periods – has grown at a much faster rate than highway capacity.

At the same time freeway building has come to a virtual halt. Revenues available for financing new highways dropped in real terms as improved energy efficiency reduced gasoline consumption and thus reduced gasoline tax revenues. Because taxes on gasoline are charged on a per gallon basis, a doubling of the miles-per-gallon rating of the vehicle fleet meant that revenue to build and maintain highways was halved in proportion to the increases which were occurring in vehicle miles of travel (Taylor 1992). Citizens' objections to the social and environmental disruption of highway building led to further delays and costly law suits, so that the few remaining highway construction projects, like the Century (or Glen Anderson) Freeway, are extremely expensive and seem to take forever to complete.

The recent change in direction in transportation policy is one of historic proportions, which attempts to reverse a trend which has been powerful for over sixty years, and it remains to be seen whether the current approach will be successful. While the two earlier traffic crises in Los Angeles' history resulted in concerted effort to increase the capacity of the highway system, the response to the traffic crisis of the eighties has, quite self consciously, been

very different. Reflecting concerns about air quality, energy, and the quality of life in the region, policy makers have in recent years rejected the strategy of increasing highway capacity. Instead, they have developed an elaborate and expensive program of providing alternatives to the automobile rather than accommodating growth in its use. Investments in new transit capacity are now being made in the form of hundreds of miles of light and heavy rail lines, and the initiation of "Metrolink" rail passenger service on several existing rights-of-way connecting the outlying suburban areas to downtown. In addition to rail transit construction, current transportation policy increasingly emphasizes transportation demand management (TDM), which includes a wide range of approaches to increasing the efficiency with which the existing transportation system is utilized by encouraging carpooling, vanpooling, and transit use. Many jurisdictions have, for example, adopted "trip reduction ordinances" which promote densities of development and mixed land uses in order to reduce trip generation and which require developers to incorporate ridesharing, bicycle facilities, and transit connections into their projects. Perhaps the best known TDM measure is Regulation XV of the South Coast Air Quality Management District, which requires all employment sites having 100 or more workers to prepare and implement ridesharing programs (Giuliano & Wachs 1992).

The state-mandated "Congestion Management Program" for Los Angeles County, recently published by the Los Angeles County Transportation Commission (1992) includes a draft TDM Ordinance which is recommended for adoption by all cities within the county. Reflecting the recent emphasis on TDM, almost all recent expansions of highway capacity in Southern California have come in the form of High Occupancy Vehicle (HOV) Lanes, which complement TDM ordinances and regulations by providing a travel time advantage for those traveling in carpools, vanpools, and buses. And the Federal Clean Air Act Amendments of 1990 require areas not yet meeting federal clean air standards to implement "Transportation Control Measures" (TCMs) which also reinforce the trend toward TDM. Transportation Control Measures are programs intended to change travel behavior through such devices as increased tolls, parking charges and auto-free zones. While these requirements are based upon scant evidence that such measures can significantly improve air quality, they represent an important step in the accelerating trend toward limiting rather than accommodating the use of the automobile in increasingly congested and polluted urban areas.

Taken together, the recent emphasis on rail construction and transportation demand management constitute a major departure from the sixty-year trend toward accommodating growth in automobile ownership and use, and providing automobile travel opportunities at low cost. The Los Angeles County Metropolitan Transportation Authority (formerly known as the Los Angeles County Transportation Commission) has embarked on a thirty year program,

having a price tag of over 180 billion dollars, which reflects this new philosophy. In other words, the region plans to spend about $600 per capita per year for thirty years on implementing this new approach, a rate of spending which in real dollars substantially exceeds annual spending on freeways at the height of the freeway building program. While the plan includes some technical improvements to existing highways and some closures of critical gaps in the freeway network, it gives far greater emphasis to rail system expansion, HOV lane expansion, and more modest but significant expansions of conventional bus transit services.

This change of direction in transport policy attempts to reverse a trend which has been powerful for over sixty years. It does so because of a confluence of many political forces, including a commitment to cleaner air, an anti-highway and anti-growth attitude on the part of many increasingly important community groups and environmental interests, and the increased availability of federal funding for public transit. It is reasonable to ask whether this change in direction has any prospect for success in taming the automobile in this region over the coming twenty years, and whether there might be alternative approaches which could be more fruitful.

Recent trends in traffic, urban form, and air quality in Los Angeles

In order to evaluate the potential success of LA's emerging transportation strategy, it is useful to examine recent trends in travel patterns, and also to look at the evolution of urban form which is the source of the changes in travel. We must also take into account trends in air quality, since air quality is one of the main motivations behind transport policy in Los Angeles.

Using an aggregate index of traffic congestion based on daily vehicle miles of traffic per lane mile of freeways and arterial streets, the Texas Transportation Institute's national data on traffic congestion shows Los Angeles to be the city with the heaviest traffic congestion of any in the United States, and to be continuing to worsen in that regard during the late 1980s. To place these facts about worsening congestion into context, however, other data show that reported travel times between home and work are actually growing slightly shorter over the years in Los Angeles as they are doing in 19 of the 20 largest American cities (Gordon, Richardson & Jun 1991). And other data from travel surveys begin to tell us that the proportion of journeys being made on the Los Angeles transport system for work-related purposes is slowly but steadily decreasing, while non-work trips are steadily increasing even as a proportion of peak hour traffic. How is it possible that journey lengths are becoming shorter even as measured congestion is getting worse? Wouldn't worsening traffic congestion lead to a general lengthening of journey times?

What I believe is happening is that as traffic congestion worsens, we are experiencing a kind of adaptive behavior which is giving rise to shorter journey times. Some people, especially among poorer people, those who rent their homes, and younger childless adults, are adjusting to the increase in traffic congestion by choosing to live nearer to where they work. They are doing this either by changing their residences or changing their jobs, or perhaps both. Other people, mostly among middle and upper income people, professional and technical workers, those who are of child-rearing ages, and those who own their homes, are continuing the trend which has lasted over many decades of moving out from the city center to lower density outlying residential communities. These people are both working and living in the outlying suburbs, accepting longer distances between home and work, but traveling those distances on relatively less congested roads in outlying areas. Los Angeles is one of the most decentralized large cities on earth, having approximately six percent of the region's employment in the central business district. Thus, travel times between home and work are decreasing even as congestion is increasing because some are traveling shorter distances on congested urban roads, while others are traveling at higher speeds over longer distances on less congested outlying roads.

In large part because of the decentralization of employment throughout the region, and the low density of development, Los Angeles continues to rely much more heavily than most regions on the singly occupied automobile for journeys to work. A recent survey showed that today about 77% of the workers drive to work alone, while only five percent use transit and some 15% carpool or vanpool. The remaining few walk, jog, or cycle to work (Collier & Christiansen 1992). Of course, among automobile trips which are for non-work related purposes, vehicle occupancies are much higher than for work-related trips, yet overall weekday peak hour vehicle occupancies throughout the region remain clearly below 1.2 and have not changed significantly since they rose measurably during the two middle east oil embargoes of the early and late seventies.

In the United States, transport policy is more and more frequently being determined by the national commitment to improved air quality, and it is surely widely known that because of its unique topography, prevailing winds, and sunlight, Los Angeles has one of the most severe air quality problems among the great metropolises of the world. In the United States, in our pursuit of good health, we keep lowering by law the amount of pollution which we will allow our citizens to breath and those programs are having a noticeable effect. Thus, while air quality has improved dramatically in Los Angeles over the past twenty years, the fact that the standards are now more demanding also leads to the need to do even more despite the fact that the cost of doing more is very high.

In 1958 there were 219 days on which air quality was so bad that "stage one among alerts" were announced in Los Angeles, whereas by 1990 there were only 41 such days and in 1991 there were 47. And, while more serious Stage 2 Smog Alerts, which lead to warnings for elderly people and children to stay indoors, occurred between thirty and forty times a year in the sixties, there has not been a single Stage Two smog day since 1988. Although federal air quality standards are deemed to be exceeded if they are exceeded at any place within the region, increasingly on days when federal standards are violated, they are violated at only one or two of the 30 or more monitoring stations which are operated in the region. It is clear, therefore, that air quality has improved dramatically, although Los Angeles still has the worst air quality of any major American city. The improvement which has occurred thus far has come as automobile travel has more than doubled and traffic congestion has increased substantially, and this makes the accomplishment very impressive. The improvements have resulted almost exclusively from new car standards which are very demanding – some pollutants are reduced by 98% in new cars when compared with new cars twenty years ago. And today, after more and more new cars having pollution controls have gradually replaced older uncontrolled cars, it appears that 80% of the air pollution is produced by 10% of the vehicles – those which are badly out of tune, which have been tampered with, and which are very old. We also know that a new car which is fully warmed up produces so little pollution that removing vehicle miles of travel is simply ineffective at reducing pollution very much – about 75% of the daily pollution produced by a modern, controlled auto is produced in the first few miles of driving after a cold start because the catalytic converter is least efficient when it is cold. These facts are important for transport planners. They tell us to eliminate auto trips entirely if we can rather than reducing their length. They tell us to focus on inspection and maintenance of the existing fleet rather than pushing for more stringent new car standards. And, they tell us that further technological improvements in automobiles – such as the addition of pre-heated catalytic converters and the introduction of electric vehicles – promise more air quality improvement than efforts to change the travel behavior of large numbers of citizens.

When faced with these trends, does it make sense to develop a regional policy around the provision of alternatives to the automobile? Clearly, there is a strong consensus among political leaders in Los Angeles that the domination of the automobile can be reversed, and that alternative modes can be made more attractive to commuters. I believe that the policies being pursued in my region thus far are well meaning but likely to have only marginal impacts on traffic congestion and environmental quality. On the other hand, the dilemma faced by transportation professionals is that approaches which hold more

promise for improving congestion and air quality are likely to be extremely difficult to implement in the regional political arena.

Critique of current regional transportation program

A regional transportation planning policy which emphasizes the construction of a costly rail network, HOV lanes on highways, and the reduction of peak-hour work trips through TDM will surely result in the reduction of some trips which would otherwise be made by singly-occupied automobiles. But as long as these approaches remain at the center of Los Angeles' regional policy, they will cumulatively have small effects and large costs. Traffic congestion will not increase as much as it would without these measures, but it will not improve nearly as much as it could under alternative policies. More people will use transit, carpools and vanpools as a result of these programs, but at very high financial costs, and each year the increase in single- occupant auto trips will be far greater than the number of trips captured by these alternative modes. In other words, as these programs increase the numbers of transit riders and ridesharers in absolute numbers, they will still continue to lose ground to the automobile in relative terms. Unfortunately the small absolute gains for transit and ridesharing come with an enormous price tag of public subsidy, and it is clear that those programs cannot be cost effective within the current policy environment.

Critique of the regional rail program

Three new rail projects are already in operation, all having initiated service since 1990: The Blue Line, a light rail line from downtown Los Angeles to Long Beach; a small portion of the Red Line, a true metro in the central core of Los Angeles; and Metrolink – a commuter railroad service connecting outlying suburbs to downtown Los Angeles. Under construction are another light rail line, the Green Line, and more of the Red Line, while additional rail transit investments are being planned. The Blue Line and the Metrolink are far enough along that we can actually study some data; the Red Line is still too partial and too new to yield any reliable data.

The Blue Line cost nearly a billion dollars of capital investment, and even when the amortization of those capital costs is excluded, the fares paid by its riders cover only eleven percent of the operating costs. This facility now serves slightly more than 35,000 riders per day, and surveys indicate that about half of those riders previously made the same trip using the bus. For the former bus users, their prior mode required smaller public subsidies and in many cases accommodated their trips in shorter travel times. Overall, local buses in Los

Angeles cover close to 40% of the costs from fare paid, and some crowded, inner city routes manage to cover nearly 90% of their operating costs through their revenues. Presumably, the purpose of building the rail line was not to attract people from buses, but rather to draw them out of automobiles. Thus, the 20,000 or so daily riders who previously made their trips by automobile are the real measure of the contribution of the Blue Line. This is a tiny fraction of the 40 million daily trips made in the Los Angeles Basin, and the total annual subsidy per new rail rider is in excess of $20,000 per daily rider. Putting it another way, each time a citizen of Los Angeles boards a bus and pays a fare of $1.10, the taxpayers contribute another $1.50 toward covering the costs of their trip; each time a citizen boards the Blue Line, the tax payers contribute nearly twelve dollars in subsidy.

The new Metrolink is even more dramatic and photogenic, but extremely expensive in relation to the benefits it is providing. During the opening week, when rides were completely free and when some travelers were being further encouraged to use the train by free (public subsidized) taxi rides from the stations to their offices in the San Fernando Valley, the daily ridership reached as high as 7,500, or about as many people as are carried by one freeway lane in three hours at a tiny fraction of the public cost. When the "fare free week" was over, however, ridership quickly dropped off to about 3,000 daily boardings, a few more than the number of people served by one freeway lane in ninety minutes. Of course, the "steady state" ridership remains to be seen. To achieve this level of ridership taxpayers spent money on refurbishing three railroad rights-of-way, acquiring dozens of attractive bi-level rail cars and locomotives, and building or renovating 18 rail stations despite the fact that there are roughly 200 daily boardings per station in the system. Each time a suburban commuter pays approximately $4.50 for a one-way journey on Metrolink, the taxpayers subsidize that ride by another $26.50. In other words, it costs about as much as if we were paying for each traveler on Metrolink to make the same journey at public expense in a taxicab. And those receiving the subsidy to ride on Metrolink are among the richest citizens of the region – a recent survey showed that the median family income of the suburban rail system commuters is over $63,000 per year (Commuter Transportation Services 1993).

There is no doubt that as the Red Line and Green Line are added to the rail system, ridership will increase. But the most optimistic outcome will result in annual ridership of the combined system of rail lines of something less than one-year's increase in the number of automobile commuters in this region, though it will have taken over a decade and more than ten billion dollars of public money to build.

There are several reasons for this result. First, in a region as extensive as Southern California and characterized by low and moderate population

densities, even hundreds of miles of rail right-of-way can provide stations within reasonably comfortable distances (on foot, by car, bus, or cycle) of only a tiny fraction of he homes of the region's residents, and within comfortable distance of the work places of only a tiny fraction of the region's employed work force. For example, the Blue Line, Red Line, and Metrolink all were planned to provide improved access to the Los Angeles Central Business District despite the fact that, as stated earlier, downtown jobs represent less than six percent of regional employment and that share is steadily decreasing as suburban "edge cities" capture more and more of the employment in the region. In addition, because of the low density development pattern of the region, many users of the new rail system must drive to the stations. This discourages rail system usage: as long as one is in the car and driving, the marginal effort and cost of continuing to the destination are small in comparison with the effort of using a park-and-ride lot and paying to board the train. Driving to the station also results in the rail line improving air quality very little, since, as indicated above, the cold start is the source of most automobile air pollution.

Secondly, the rail rights-of-way in many cases including the Blue Line and Metrolink, have been chosen because of their availability and not because they are located in corridors of heavy travel volume. Since they do not all serve the established corridors of traffic flow in the region, they can appeal to only a small segment of the travel market.

Thirdly, it is difficult for those services to compete with the cost of the automobile, even at subsidized prices, in a region in which more than 90% of workers are provided with free parking at work. For example, the monthly fare on Metrolink between outlying Simi Valley and downtown Union Station, though subsidized, is $176. This is surely significantly less than the total monthly cost of driving between Simi Valley and downtown, but among inner city workers more than half of the cost of the auto trip is attributable to the monthly cost of parking. Where employers provide for free parking spaces having a market value in excess of $120, few commuters will forego that benefit in exchange for the opportunity to pay for their own monthly rail ticket. Fortunately, under municipal and state legislation, employers are increasingly being required to offer their employees contributions to transit commuting in lieu of free parking spaces, and for some commuters this might begin to make a difference.

Fourthly, many people forego the train because they need to make use of their automobiles in the course of their daily work, others couple trips for child care, education, and recreation with their daily work trips.

An unfortunate aspect of the high cost of rail services in relation to the low patronage is the fact that other transit alternatives are being foregone which could be more cost effective in this region. While costs for both rail routes

and busways very considerably depending upon local conditions, one recent study estimated that the cost of a single mile of heavy rail construction was approximately equal to the cost of 3.2 miles of light rail line, or 13.3 miles of elevated busway (Driver 1992). In a region of low density, it would certainly provide far more public benefit per dollar of expenditure to provide thirteen miles of busway rather than one mile of underground subway. The opportunity to expend funds on busways, however, is limited by the extent of our commitments to the rail network.

Similarly, the financial resources expended on the rail network are providing dramatic improvements in expensive transit service for a relatively small number of suburban middle and upper income commuters. Alternative uses of the funds, however, could provide a much larger quantity of less expensive service for lower income inner city dwellers who are far more dependent upon public transit and who use the service regularly. While uncrowded and heavily subsidized suburban trains are being expanded, crowded inner city buses which require far less subsidy are passing up waiting passengers at inner city bus stops. In an effort to prove that rail transit can be safe, regional transit authorities are expending more per year on the security of the Blue Line and Metrolink than they are on security for the entire regional bus system, despite the fact that ridership surveys indicate that fear of crime is the single most important factor deterring bus ridership.

I am concerned that the current policy incorporates many inequities, and is over time making the poor increasingly worse off in relation to the rich. The sales tax which is used to finance a major portion of the program falls disproportionately upon the poor. The emphasis on suburban rail service transfers benefit to rich suburbanites, results in higher fares on the basic inner-city bus services upon which the poor depend, and results in fewer inner city local bus service expansions which might provide greater benefits for the transit dependent population.

Critique of regional transportation demand management program

The second dimension of transportation policy which has become prevalent in the region is Transportation Demand Management (TDM). Southern California is today engaged in a far-reaching experiment in TDM aimed at reducing commuters' reliance on the single-occupant automobile for the journey to work. The emerging Congestion Management Program (CMP) of the Los Angeles County Metropolitan Transportation Authority is one example of this commitment, but so far the most tangible impacts upon commuters of a commitment to TDM has occurred through actions of the South Coast Air Quality Management District (SCAQMD). The severe air quality problem in the Los Angeles area has given rise to the District's Regulation XV. An

important element of the region's air quality management plan, it requires employers to take responsibility for encouraging workers to consider alternatives to driving to work alone, including public transit, carpooling, vanpooling, walking, telecommuting, and cycling. Regulation XV was adopted by the Board of the SCAQMD in October of 1987, and its implementation began on July 1, 1988. It requires that public and private employers (firms, government agencies, schools, hospitals, etc.) having 100 or more workers at any work site complete and file a plan for that site by which they intend to increase the Average Vehicle Ridership (AVR) to a specified level within one year of the SCAQMD's approval of its plan. AVR is determined by surveying the work force, and is defined roughly as the quotient of: the number of employees reporting to work between 6:00 and 10:00 a.m., divided by the number of motor vehicles driven by these employees. Employment sites in the central area of Los Angeles are assigned a target AVR of 1.75, and employers in low density, outlying areas are expected to aim for a target AVR of 1.3. Intermediate areas, which constitute most of the area and most of the sites covered by the regulation, have AVR targets of 1.5. The SCAQMD anticipates that a regional average AVR of 1.5 will be reached by the mid-nineties.

The regulation also requires every covered work site to have a trained "employee transportation coordinator" (ETC), and it requires the employer to implement the plan once it has been approved. The South Coast Air Quality Management District estimates that there are more than 6,200 firms, agencies, and institutions which employ 100 or more workers at individual sites and are subject to this regulation. Together they employ approximately 3.8 million workers.

Professor Genevieve Giuliano and I have been conducting an ongoing evaluation of the effectiveness of Regulation XV because of its national significance. Our study includes monitoring the effects of the regulation on a panel of employment sites over several years, interviewing ETCs at a sample of employment sites drawn from that panel, and conducting in-depth case studies of a few of the work sites which are part of the panel (Giuliano, Hwang & Wachs 1993; Wachs & Giuliano 1992).

The results of the investigation so far indicate that the regulation is having a measurable impact on the travel patterns of the affected work sites. For our panel of 1,110 work sites which have completed one full year of implementation, overall average vehicle ridership, as defined by the SCAQMD, increased from 1.22 to 1.25, a statistically significant increase with an average increase among all the work sites of 3.4%. For a smaller sample of 243 work sites at which the regulation has been implemented for two full years, the AVR continued to rise in the second year to 1.30. Of the 1,100 employment sites included in our full panel, about 69% experienced increases in AVR during the

first year, with just about twenty percent of the employment sites experiencing increases of more than ten percent in their AVRs, and half of the sample having increases of up to 10%. At another 31% of the work sites AVR decreased during the first year of program implementation.

Among the 1,110 employment sites in our full sample, the proportion of workers driving to work alone decreased from 75.7% in the first survey to 70.9% in the second. Among our smaller sample of 243 work sites for which data are available for two years, the proportion of workers driving alone declined by the end of the second year to 65.4%. The largest shift in mode was toward carpooling, while vanpooling also increased significantly. The public transit share and proportion of workers walking and cycling, however, did not increase significantly. There was great variation in the extent to which employment sites are meeting the goals of Regulation XV, and many firms have done much more poorly than others. In general, the greatest improvement in AVR was found among employers whose initial AVR values were among the lowest, and interestingly the size of the work force at a given site was not statistically associated with the extent of improvement in its AVR (Giuliano, Hwang & Wachs 1993).

The purpose of Regulation XV is to reduce auto emissions by reducing peak period travel, which is usually measured in terms of total vehicle miles of travel (VMT). Accurate calculation of VMT reduction would require identification of the employees who change mode and the mode to which each changed. Employee information is not available, and we therefore estimated VMT reduction based on the overall number of trips reduced in our data set. We expanded this calculation to the population of companies subject to Regulation XV to generate the regional VMT impact: 1.3 million daily VMT, or a reduction of 0.4% of annual VMT. This estimate is optimistic, because we are not making any allowance for latent demand. Given the level and extent of congestion in the region, it seems reasonable to expect that any reduction in peak period work trips would be offset by increases in other types of trips. And, furthermore, since work trips constitute roughly a quarter of all trips, and only half of all work trips in the region are taken by employees of work sites having 100 or more employees, it is not surprising that even the successful outcome of the regulation noted so far has resulted in an extremely small shift away from singly occupied automobiles when viewed in the context of all of the travel taking place in the region.

Under Regulation XV individual employers may design programs consisting of mixes of incentives and disincentives which seem most appropriate to their particular circumstances, and the incentives chosen vary considerably from one organization to another. So far, employers have chosen overwhelmingly to offer incentives to rideshare rather than disincentives to driving alone. More than two-thirds of the work sites in our sample included some

form of preferential parking arrangements for carpools and vanpools, for example, while only three percent of the work sites introduced parking pricing as a strategy to encourage ridesharing. In addition to preferential parking locations, the most widely adopted incentives included financial incentives to users of public transit (46% of employers) a guaranteed ride home program (45% of employers), promotional prize drawings for ridesharers (45% of employers) and the installation of showers and lockers for cyclists (43% of employers).

Very important to the evaluation of Regulation XV is an estimation of the costs which it imposes upon the regulated work sites. Many critics of expensive regional capital investment programs in rail networks cite transportation demand management as a much more cost efficient alternative, so cost is an important dimension on which to evaluate the Regulation XV program to date, Unfortunately, it is extremely difficult to arrive at authoritative cost estimates. In a survey of 182 ETCs who were asked to estimate how much their employers were spending on Regulation XV programs, an extremely wide variation in estimates was obtained, probably reflecting the difficulty of properly accounting for costs. However, the mean estimated annual expenditure on implementing Regulation XV was $31 per employee, and the median was $20 per year per employe. The maximum value was $250 per employee per annum and the standard deviation was $39.

Professor Giuliano and I also conducted case studies of five companies as part of our research. The case studies included a detailed examination of Regulation XV costs. These ranged from $12 to $263 per peak employee per year, and excluded the costs of any ridesharing activities that preceded the Regulation XV plan. And finally, the accounting firm of Earnst and Young conducted a detailed survey of employment sites subject to the regulation for the purpose of estimating the cost of trip reduction through TDM. Their survey of 5,763 regulated sites concluded that the average reported annual cost of Regulation XV was $105 per regulated employee; and that the cost to the regulated community of removing one vehicle trip per day has been around $3,000 per year, or $11.76 per daily trip removed from the road (Earnst & Young, 1992).

On the basis of the best available evidence in Southern California, then, it would appear that efforts to remove automobile trips from the road and to replace them by either rail transit or, through TDM, to entice the drivers into carpools, vanpools or buses as well as trains, can produce results which involve modest shifts away from singly occupied automobiles and toward alternative modes. On the other hand, both of these approaches produce a modest number of changes in trips, and they result in costs to private employers and public agencies which are disappointingly high per trip shifted. It would seem on the basis of results summarized here that by themselves the strategies

of increased investment in rail transportation and transportation demand management cannot provide large shifts in travel patterns at acceptable costs. It is not in the public interest to expand programs which have such high public and private costs per unit of benefit. I believe that if the costs of these programs were widely understood by the public, political support for these policies would quickly erode. Approaches must be sought to either increase the cost-effectiveness of these approaches or to find other ways of accommodating growth in travel in the region which are more cost effective than the policies which are currently being pursued.

Alternative transportation policies for southern California

Since the two major strategies for controlling traffic congestion and reducing the environmental consequences of widespread automobile dependency are likely to produce only modest successes at high social costs, transportation policymakers should consider alternative strategies which could produce more satisfying results in a more cost-effective manner. In the following sections, I consider policies which discourage growth in the use of the automobile by levying higher charges against it in an effort to come closer to recouping its full social costs through charges paid by drivers. In addition, I consider policies which attempt to reshape urban form so that land use patterns and the spatial distribution of activities will be more compatible with greater reliance on alternative modes of transportation. Finally, I consider the encouragement of entry into the transportation market of a wide range of alternative forms of transit service, including jitneys and cars for hire.

Pricing the automobile appropriately

One major reason for the modest shift of travel from the automobile to alternative modes, despite extensive investments in rail systems and despite expanding requirements for transportation demand management, is the fact that the automobile is so heavily subsidized through direct and indirect policies of the national, state, and local governments. The long list of subsidies to the automobile surely includes the exclusion of roads and highways from the local tax rolls, the support of traffic police and medical emergency services by property and sales taxes, and the setting of gasoline taxes and vehicle use fees which do not recoup the economic value of the "externalities" created by the automobile in the form of air pollution, energy resource depletion, and time losses due to congestion. Many workers are provided with additional direct subsidies for the use of automobiles in the form of free or highly subsidized parking spaces at their work places, reimbursement of

automobile operating expenses when cars are used in the course of work, and the use of employer-owned or leased automobiles for work- related purposes and personal benefit. With the automobile priced so far below its full social cost, we are all encouraged to make greater use of it than we would if its price reflected its true costs to society. And, it is extremely difficult to encourage people to use rail transit, buses, carpools, vanpools, bicycles or to walk as long as the direct and indirect subsidies to the automobile are so high. Transportation policy incorporates enormous inefficiencies by on one hand encouraging profligate use of the automobile through numerous subsidies, and on the other enacting regulation to require use of alternative modes or by attempting to encourage travelers to abandon their automobiles by providing even heavier subsidies to alternative modes. Undoubtedly, if the automobile were charged something closer to its full social cost, greater use of transit and ridesharing modes would occur, and those modes would require lower levels of direct public subsidy in order to survive.

There are several ways in which public policy could levy more realistic charges against the automobile, but all would be difficult to enact under current political circumstances. Perhaps most obvious would be substantial increases in gasoline taxes. It is well known that European gasoline taxes are much higher than those in the United States, and that Europeans continue to drive more fuel efficient cars and to use transit for a larger share of their trips than do Americans, even though the use of the automobile in Europe is now actually rising at a faster rate than it is in the US (Pucher, 1988). In some countries, gasoline prices exceed four dollars per gallon, with the largest share of the selling price being the fuel tax. Many have advocated higher fuel taxes in the United States for the purpose of both recouping more of the social costs of automobile use and simultaneously encouraging the use of alternative modes. Major objections, of course are from large users of fuels, and from advocates for the poor, who believe that automobile fuel taxes would be regressive. Gasoline consumption is, however, clearly income related, and the regressiveness of higher gasoline taxes must be judged in relation to the very large recent increases in sales taxes (which are also regressive) to support transportation programs.

One of the most intriguing proposals involving gasoline prices would be to shift the burden for paying for part of our automobile insurance to the form of a per gallon charge at the pump. While allowing automobile users to carry additional insurance beyond this minimum, such a plan would have several benefits. First, it would respond to the problem of uninsured motorists in Southern California, where it has been estimated that approximately 25% of automobiles on the road are in violation of the law requiring them to be insured. Secondly, such a program would add an element of equity to the system of charging for insurance which is now based largely on geographic

location of residence rather than use of the vehicle. Finally, the insurance premium in the form of a gasoline surcharge, by raising the unit cost of driving rather than treating insurance as a fixed cost, would contribute to the increased attractiveness of alternative modes in relation to the singly-occupied automobile.

Other policy options by which the social costs of the automobile might be more fully charged to those who benefit from automobile use include revisions to the annual vehicle registration fee structure. Present vehicle taxes are structured to be roughly proportional to the value of the vehicle. As an alternative it has been proposed, for example, that we rebase annual automobile registration fees so that they would be inversely proportional to their fuel efficiency. Registration charges would be lower for fuel efficient vehicles and higher for gas guzzlers. Such a fee structure would encourage the purchase of fuel efficient vehicles, and would thus use pricing mechanisms to encourage more socially responsive patterns of ownership and use.

A final policy option involving the cost of motor vehicle use would be the adoption of a system of congestion pricing, sometimes called road user charges. Proposed in one form or another for decades, congestion pricing might provide a way of aligning the charge for automobile use with the social cost of travel. Congestion pricing involves charging drivers more to travel at times and at locations at which congestion is heavy, and less to travel at times and locations which are uncrowded. The goal of such charges is to encourage people to avoid traveling at the most congested times and places by using alternative modes (including carpooling), by shifting to less crowded routes, or by deferring travel to a time period at which the roads are less crowded. In theory, the charge for travel can be continually readjusted to eliminate congestion. While the total cost of owning and operating an automobile would appear to increase under a system of congestion pricing, substantial reductions in delay and improvements in travel times certainly have value to individual travelers, and would result in far more efficient use of the existing transportation network. In principle, congestion pricing is similar to the form of pricing used by telephone companies to encourage calling in the evenings and on weekends, and the pricing used by airlines to encourage weekend flying.

Congestion pricing has two basic forms: area charges and facility charges. Area charges are today in use in Singapore and Trondheim, and are being planned in detail for an increasing number of European and Asian cities to control traffic and increase revenue for transportation programs. A cordon line or border is set up around a congested area, and during defined periods of heavy congestion admittance to the area is granted only to vehicles paying an entry fee. Facility charges are tolls, more like traditional bridge or highway tolls, which are levied when a traveler uses a particular roadway segment during congested periods. The charges may be levied on a per trip basis,

or recorded electronically in an account for which a bill is sent weekly or monthly.

Some objections to congestion pricing arise over the administrative complexity of collecting the fees and over the potential invasion of privacy which comes with certain systems of billing travelers for their charges. These problems have recently been substantially minimized by new communications technology. Automatic vehicle identification systems and debit card systems have been combined to provide convenient and efficient charging without violating the privacy of the driver.

More serious objections to congestion pricing deal with the impacts of such charges on the poor. Under normal circumstances richer people will have a larger number of options available to them, and richer people will generally be less sensitive to tolls than poorer people. While this is true, there are approaches to congestion pricing which can mitigate potential negative impacts of congestion pricing on the poor. Congestion tolls would generate large amounts of revenue (a recent Southern California case study suggests annual fee revenue of $3 billion) that could be used in part to offset losses to the poor. For example, if the revenues from the congestion tolls were used to fund improvements in public transit, the poor, who use transit in much larger numbers than the rich, would benefit directly from such a policy. In addition, it is possible to structure the congestion prices so that there is a "lifeline rate" available, just as there is for telephone service. Finally, income tax credits could be granted to poor people for their payments of congestion fees.

There is also concern that if the major response to congestion pricing should be the rerouting of traffic to other areas or facilities, congestion could worsen in those areas even as it is lessened in the areas subject to the charges. In addition, some worry that the levying of a congestion charge in some areas may put them at an economic disadvantage in competition for tenants and customers, while others argue that the alleviation of congestion might well counter-balance the charge in the minds of potential customers and tenants.

Despite the fact the congestion pricing is receiving a growing amount of attention internationally, a great deal of political opposition will have to be overcome before the concept is adopted on a significant scale in California. Citizens will naturally be unsupportive of a system requiring them to pay for the use of roads which were in the first place built using the proceeds of taxes – it would be akin to charging twice for the same service. In addition, citizens do not trust planners who assure them that in exchange for the charges travelers will obtain the benefit of less congested highways. After all, planners promised substantial reductions in traffic congestion as a consequence of the construction of new rail lines, and those promises have been unfulfilled.

Because of widespread skepticism regarding congestion pricing, several

demonstration projects which do involve congestion fees will constitute important proving grounds for the concept in Southern California. On Route 91 in Orange County, for example, two lanes are being added to the median by a private corporation. Costs of construction and of operating the facility will be covered by tolls. Current plans call for varying the toll with traffic conditions and vehicle occupancy. Vehicles with three or more occupants will be exempt from the tolls. This will provide an important initial test of commuter acceptance of highway pricing in Southern California. Other demonstration projects are being planned, funded both by Caltrans and by the federal government under the Intermodal Surface Transportation Efficiency Act (ISTEA).

Influencing transportation by policies affecting urban form and land use

The urban form of Southern California, consisting of large expanses of low and medium density residential and commercial activities punctuated by moderate to high density activity centers or "edge cities" is considered by many to be the major cause of steadily increasing travel volumes, and the ultimate source of traffic congestion, automotive air pollution, and inefficient energy consumption patterns. It is argued, therefore, by many urbanists and environmentalists, that policies should be pursued which will lead to the "densification" of the metropolitan area, especially at transportation nodes such as rail transit stations. Higher density areas, especially of mixed land uses, provide opportunities for people to satisfy their needs by traveling shorter distances, and thus result in fewer trips per capita. Quite a few architects and urban designers are attempting to incorporate this principle into plans for new developments, such as the massive Playa Vista project near Los Angeles Airport. This development is one of several which incorporate the concept of "neotraditional town planning," including higher densities, more diverse mixes of residential and commercial land uses in close proximity to one another, and the provision of higher than typical levels of transit service within the developed areas.

These proposals are extremely interesting, yet their prospect for alleviating traffic congestion remains largely unproven. Among the important reasons for skepticism is the fact that built form changes very slowly over time, so this approach can yield only marginal results in the short term. At least two thirds of the existing built environment was in place fifty years ago, and even if a strategy were to be adopted promoting higher densities and mixed uses in many new developments over the coming decades, the effect of these policies would be phased in over fifty years or more. In addition, land use is regulated by local governments which jealously resist the centralization of control over land use at the regional level and which treasure the low density

patterns of their own communities. For this approach to have a noticeable impact on urban form and travel behavior, hundreds of local jurisdictions would have to change their land use development regulations, and the existing population would in many instances resist such change because they would perceive these approaches as threatening to the lifestyles which they have consciously chosen when they made their residential location decisions.

It is clear that most advocates of "densification" are located disproportionately in Los Angeles County, which, of course, is already developed to a greater extent than the rest of the region. Some cynics and some realists point out that advocating densification is merely a strategy to insure that Los Angeles County will capture an increasing share of future growth in comparison with the recent trend of suburban expansion, and that the strategy may be motivated by a desire for the fiscal returns from growth rather than from the reduction of traffic congestion. In outlying areas there is no evidence whatsoever that residents or commercial investors prefer moderate or higher density development patterns in comparison with those which have recently prevailed.

It is very important to note that while traffic reduction by density increases has become increasingly popular among environmentalists and urban reformers, many scholars have demonstrated that low density development patterns do not necessarily result in heavier traffic congestion, and there is little empirical evidence which persuades me that this approach is fundamentally sound. While authors like Newman and Kenworthy (1989) demonstrate that higher density cities generate fewer trips and lower energy consumption per capita than lower density cities, they accomplish this by comparing different cities at one point in time rather than by tracking particular cities over many decades. Thus, Los Angeles is compared with Hong Kong or New York in order to reach the conclusion that density can make the intended difference, but there is no guarantee that the adoption of Hong Kong or New York style densities in Los Angeles would result in the intended outcome. In fact, most of the high density cities which are cited as examples were major metropolises long before the coming of the automobile, and over time they are becoming less dense as lower density suburbs are added at their peripheries and as higher rates of automobile ownership occur in those cities in response to rising incomes. Traffic congestion in New York, Hong Kong and other high density cities is, if anything, increasing more rapidly than congestion in Los Angeles. And, in contrast, scholars who have studied metropolitan areas like Los Angeles over time, note that development at the fringe is not increasing trip volumes or trip lengths substantially in lower density metropolises (Gordon, Richardson & Jun 1991). It is possible to reconcile these views which might seem on the surface to be in disagreement. While it is true that higher density areas do generate fewer automobile trips per capita or per dwelling unit because their

residents can walk, cycle, or use transit to accomplish more of their travel needs, it is obvious that higher density areas are by definition also characterized by higher populations and large numbers of dwelling units per unit of area than are lower density communities. While they may be more "efficient" by generating fewer auto trips and vehicle miles of travel per capita, their higher densities result in a larger number of total trips. Thus, while New York has higher population densities than Los Angeles and a greater jobs-housing balance than Los Angeles, and New Yorkers consequently make higher proportions of their trips by walking and using public transit than do Angelinos, the fact that there are more New Yorkers per square mile still yields very high levels of traffic congestion on the streets of that city. Anyone who has visited New York or Hong Kong must be skeptical of proposals to reduce congestion in Los Angeles by increasing densities, because congestion levels in those cities are at least as great as congestion levels here despite the fact that more trips are made there by transit and on foot.

Would it be good policy to adopt a program to make Los Angeles more like Hong Kong or New York in the face of congestion levels in those cities and evidence that over time those cities are becoming more like Los Angeles? And, would the citizens of Los Angeles support policies to encourage much high densities there? I believe that the answer to these questions is not obvious, but should be left to the land market and to policy choices which are based upon more complex sets of issues than traffic congestion alone. It may well be true that many more citizens of the region would prefer to live at higher densities in "neo-traditional neighborhoods" than do so presently, and this may be the result of land use policies which have restricted higher densities in regions like Los Angeles. For that reason I would encourage more diversity in our built form, and more experiments like Playa Vista which would provide a wider range of choices among a greater variety of built environments, and which might produce more efficient travel patterns even while increasing traffic volumes beyond their current levels.

In addition, it may be rational and appropriate to encourage higher densities and greater mixes of land uses at locations which are well served by public transit. In fact, as noted above, the ongoing commitment to increasing the extent of the rail network in Los Angeles constitutes a commitment to an extremely high cost form of urban transportation, which will in all likelihood garner very little patronage in relationship to its capacity and cost. Thus, it would seem essential to encourage higher densities at the station sites in order to produce greater patronage and thereby to avoid a financial disaster which could flow from the need for ever increasing subsidies if we are determined to keep the rail system operating over the coming decades. Rather than needing rail to alleviate traffic congestion due to growth, the region may actually need higher densities at the station sites in order to minimize

the costs of the adopted transportation system. But, even substantial commitments to increased variety of land uses and higher density at station sites will only make a marginal change in the overall travel patterns of the Los Angeles region for decades to come, and it is difficult to accept policies jointly advocating rail construction and higher density as "the solution" to growing traffic congestion over time. The BART impact studies in the San Francisco Bay area and several studies of the Washington D.C. Metro have demonstrated that mixed use land developments in the vicinity of the station sites have resulted in increased traffic congestion in those areas. We must be careful to acknowledge, therefore, that whatever benefits may flow from increased density, reductions in traffic congestion – especially local reductions – are not likely to be among the primary justifications for aggressive mixed-use development at the station sites.

A wider range of mass transportation choices

If we accept the notion that mass transit consists of a wide range of transportation modes which can function as alternatives to the singly-occupied automobile, we can envision many opportunities to increase the efficiency of the local transportation system which are far more cost effective than the policies presently in place. For example, if we consider carpooling, vanpooling, shared ride taxies, jitney services, local buses and employer operated buspools as examples of mass transportation modes, I believe that in combination these modes can improve mobility substantially within a future transportation system that remains dominated by the automobile.

The most successful transit options will be those which compete most closely with the automobile, and that means that they should be able to connect many low density communities, provide relatively immediate response times, and overall door-to-door costs and travel times which approximate those of the automobile. As automobile subsidies are reduced, a larger range of such alternative services become economically feasible. In many parts of the world, the private sector is providing a wide range of such options, and I believe that they have a significant role to play in the future of Los Angeles. In Queens, New York, Caribbean immigrants have started operating vans which take commuters from residential communities to Manhattan work places at fares slightly higher than those charged by the urban transit system, and they are doing a booming business. The success in Los Angeles of the airport shuttle vans provide another example of a system which moves large numbers of people and reduces congestion in comparison with the automobile. Rather than requiring heavy capital investments like rail systems, these alternatives require very little public investment. In combination with modern communications technology and the availability of increasing numbers of High Occupancy

Vehicle (HOV) lanes, such services can offer quick response, lower cost travel options for the citizens of the region. Furthermore, if barriers to entry into businesses of this type were lowered, and if the automobile were priced at levels close to its true social costs, such options would occur without major public expenditures and would provide jobs for many more workers in the transportation sector. But, when heavy capital investments are made in centralized transportation networks, there is a tendency to retain regulations which eliminate private van services and jitneys from competition with the public system and thereby to protect the integrity of the public system by guaranteeing it monopoly status.

In addition, if heavy investments of capital in rail transit were reduced, it would also make funding more readily available to increase local bus services which are today overcrowded and which are given too little attention by public authorities. Transit deficits would be reduced by increasing bus services on heavily traveled inner city local routes which are the backbone of the transit system, which require the lowest subsidies per passenger served, and which provide essential services for the poor, carless, elderly and disabled populations. If these improvements were coupled with adaptive improvements to the street network, such as the provision of exclusive bus lanes on more city streets, traffic signal priority for buses, and bus turnouts and off-street loading facilities, higher volumes of bus traffic could be accommodated without a worsening of street traffic congestion. Finally, if employers were to take some of the money which they now invest in employee subsidies for single occupant automobiles and were to redirect it into subsidies for vanpools and company-operated buses, a wider range of transit options would be available for the work force to choose from.

A role for technological improvements

Many look to technological breakthroughs to enhance the future transportation network, and the technological progress which gets the most attention is extremely dramatic, large-scale innovation. Magnetic levitation vehicles and high-speed trains capture the imagination of the press and the citizens, though they hold open the prospect for benefiting a relatively small number of people. Almost unacknowledged are other technological improvements which have actually contributed much more to the progress of the transportation system. Recent improvements in automobile fuel economy and decreases in automobile emissions have actually been very dramatic and have substantially improved well-being. There is reason to expect technological progress in the coming decade which will continue to improve access and increase the efficiency of the transportation system.

Communications technology is advancing very rapidly and we can soon

expect travelers to be able to receive a great deal more information on their travel options than is presently available. For example, within a very few years, using telephones or computer terminals, travelers will be able to be informed of the location of the next bus on a certain route, and its expected arrival time at a certain point. This technology is already in use in a few test locations in Europe, and it is functioning quite well. In addition, we are very close to having available what transportation officials refer to as a "universal fare medium," a transportation "smart card" which employs microchip technology to allow its holder to pay different fares – depending upon mode, trip length, and time of day – using a single device very similar to a credit card.

While not likely to see application in the immediate future, automated vehicle control systems are actively being developed which will enable higher volumes of travel on existing roadways by permitting vehicles to move at higher speeds and at closer spacing than is now possible. I believe that such technologies are not likely to be applied to general automobile traffic during the coming decade, but that they will be initially applied to bus transportation and possibly to HOV lanes before being applied to automobile traffic in general. Technological contributions of these sorts are likely to make marginal but significant contributions to transportation system efficiency and effectiveness in the coming decades.

Conclusion

Increased mobility by citizens of Los Angeles is not a social, environmental, or economic problem. Indeed, people should have the opportunity to travel more than they do now, rather than less. Mobility means access to opportunities for employment, health care, recreation, and social interaction, and the goal of transportation policy should continue to be to increase those opportunities rather than to restrict them (Webber 1992). The challenge before us is to find ways of increasing mobility while avoiding the negative consequences of doing so in the form of congestion, air pollution, and the inefficient use of energy. The complexity of the urban area, of individual decisionmaking about residential and work location and travel, and of American politics, makes it difficult to conceive of a single policy or technology that can promise an immediate increase in mobility while decreasing the negative impacts of the transportation system. In this paper I have outlined what I believe is a sound multifaceted program to help Los Angeles move toward these goals in the coming decade.

I believe that automobile users must be assessed the social costs which they are imposing upon the urban system, and that doing so will have a positive effect upon the local economy and quality of life. In the presence of appro-

priate accounting for the social costs of the automobile, a wide variety of transportation alternatives are both feasible and efficient, while in the absence of that policy the construction of high capacity systems having high capital costs is inadequate to counter the effects of deep and varied subsidies supporting ever-increasing automobile ownership and use.

I am skeptical that any one policy aimed at recasting urban form in service of transportation policies can have a salient effect on the future of the Los Angeles region, but am confident that a wider variety of urban forms can respond to appropriate social pricing of the automobile to increase future choices of living environments as well as of travel modes.

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