Overview of Strategies for Making Connections Between Transportation, Land Use and Air Quality

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SUMMARY OF PROCEEDINGS

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Symposium Summary: The Transportation, Land Use, Air Quality Connection

Forward

Recent changes in transportation and air quality policy at the federal, state and regional levels have focused increased attention on the critical interrelationships between transportation, air quality, as well as land use, and on the development of strategies that enhance the linkages among these policy areas.

This report is a summary of proceedings from a major symposium convened by the Public Policy Program of UCLA Extension in November 1991 which examined the connections among transportation, land use and air quality. The purpose of the program was to share the findings of recent research relating to these three areas with policy leaders and practitioners.

Major topics addressed by the symposium included:

— How far can we go with transportation technology in improving air quality?
— How does transportation infrastructure investment relate to air quality and urban form?
— How do changes in urban form impact on transportation and air quality?
— What improvements are gained through congestion pricing and other market-based strategies?

To help insure that the information and issues addressed in the program were keyed to the needs of policymakers, the program was developed with a team of researchers, and with representatives of the cosponsoring and cooperating organizations, which included government, business and public interest groups.

This symposium was the first in an annual series being held on the connections among transportation, land use and air quality. While this particular program addressed broad themes, subsequent programs will focus in greater detail on related subtopics.

It is the hope of the symposium organizers that this and the other programs that follow will contribute to the continuing dialogue, and to the search for the most efficacious strategies.

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Symposium Summary: The Transportation, Land Use, Air Quality Connection

I. OVERVIEW

Traffic congestion, metropolitan growth, and air pollution are three of the most important issues facing urban policy makers in the 1990s. Often considered separately in the past, these issues are increasingly linked as regions such as Los Angeles and San Francisco grapple with the effects of growth. To explore the transportation, land use, and air quality connection, the UCLA Extension Public Policy Program conducted a research symposium under the guidance and support of a cross-section of public and private sponsors.

The symposium, held at Lake Arrowhead, California on November 6-8, 1991, brought together over 125 transportation, air quality, environmental, land use, and development leaders from California and around the U.S. to examine the policy implications of recent research on transportation, air quality, and land use. The specific goals of the symposium were to:

1. Cross disciplinary boundaries in air quality, land use, and transportation research to establish communication channels among professionals, academics, and state and local officials;

2. Mutually identify the wide array of transportation, air quality, and land use goals as a basis for more coordinated public policy;

3. Critically examine the effectiveness of each of the many transportation and land use policies proposed to improve air quality; and

4. Discuss the content and implications of current and future plans to preserve mobility and improve air quality.

The symposium sessions were organized to generate discussion by presenting a range of views on each topic. Each of the topical sessions had two presentations followed by a panel discussion of experts and professionals in related fields. The symposium ended with Harvard Professor Alan Altshuler's interpretation of the proceedings followed by a panel discussion of elected officials.

This report, which summarizes the key discussions, debates, and findings of the symposium, is organized into four parts. The first is this overview and introduction. The second part presents the key points discussed in each of five related topical sessions. The third presents a synthesis of the issues, themes, and questions raised during the symposium. And the final part is a series of appendices which includes the symposium program, a listing of the presenters and panelists, the roster of participants, and identification of the symposium's co-sponsoring organizations.
II. SUMMARY OF THE KEY TOPICS AND DISCUSSIONS

The conference was carefully designed to provide an array of perspectives on five related topics, each of which is presented in turn on the following pages:

A. Transportation, Air Pollution, and Urban Form in California: An Overview.

B. How Far Can We Go With Technology?

C. Investing in Transportation Infrastructure and Managing Congestion for Air Quality Improvements.

D. Urban Forms and Density Patterns: What Do We Know About These Relationships to Transportation and Air Quality?

E. Regulatory Approaches to Making the Connections.

A. Transportation, Air Pollution, and Urban Form in California: An Overview

Professor Martin Wachs of the UCLA School of Architecture & Urban Planning opened the symposium by outlining some of the policy and research connections in transportation, air quality, and land use. Professor Wachs believes that our knowledge of these connections is incomplete and that Americans, in general, have a naive view of the relationship between research and policy-making. Scientific research is extremely powerful because it is believed by most Americans to be objective and well-informed. These views of science do not hold for research in transportation, land use, and air quality, in part, contends Wachs, because the line between knowledge and advocacy is unclear. Academics view their transportation and air quality research through the lenses of their disciplines, while policy makers view these questions through the lenses of the various positions already taken by their agencies. The "truth" gradually emerges from the lively interchange among facts, ideas, and perspectives.

Michael Scheible of the California Air Resources Board (ARB) outlined the four components of his agency's clean air efforts: cleaner new cars, clean up the cars in use, cleaner fuels, and the implementation of transportation control measures (TCMs).

While technical improvements in vehicles during the last fifteen years have lowered emissions by 70%, nearly half of these emissions improvements have been lost to the significant growth in vehicle travel (particularly vehicle trips) during the same period. This, according to Scheible, makes the implementation of Transportation Control Measures (TCMs, such as carpooling programs) and indirect source regulations (ISRs, such as land use planning) key elements in mitigating air quality degradation due to continued growth of both population and per capita automobile use.

The discussants were representatives from federal (Environmental Protection Agency and Highways Administration), state (Caltrans), and regional (Sacramento...
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Metropolitan Air Quality Management District) agencies. The speakers from the transportation agencies stressed the importance of congestion relief and were somewhat wary of ISRs as an air quality strategy. Further, the following points were made by the discussants in response to the opening presentations:

- Only 25% of all metropolitan vehicle trips are made to and from work, yet most transportation policies aimed at improving air quality concern work trips only; such policies should also focus on other factors — such as non-work trips, dirty cars, and traffic congestion;
- Telecommuting and formalized work at home programs will play a big role in improving air quality and mobility in the 90s;
- There is a lack of conclusive research and data establishing linkages between air quality, transportation, and land use, as well as on the cost-effectiveness of TCMs and ISRs;
- Air quality policies should shift from TCMs to market-based incentives and/or develop a balance between command-and-control strategies and market-based incentives;
- Our knowledge of TCMs and their effects is limited; at this stage TCMs are more of an art than a science;
- Transportation policies aimed at improving air quality should not be made in a vacuum; economic goals and costs are important as well and should be considered more often in air quality planning; and
- Air quality has been the driving force in most recent transportation planning; all other considerations have been given a back seat.

B. How Far Can We Go With Technology?

Professor Daniel Sperling of UC Davis discussed the air quality impacts of new vehicle technologies and alternative fuels, and concluded that policy makers have two choices to reduce mobile emissions and energy usage: (1) modify travel behavior through ridesharing, land use changes and increased public transit, or (2) develop and maintain technological fixes to the problem. Professor Sperling believes that technological changes require little social change and are politically and institutionally easier to implement than efforts to modify travel behavior. Given the better track record and political palatability of technological improvements, technological fixes are a better path to clean air than the land use and demand management policies currently proposed.
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Current air quality standards, according to Professor Sperling, ignore energy policies and requirements. Methanol and compressed natural gas are likely the preferred fuels for the first half of the twenty-first century, but these, and all other new fuels, need to be examined for their greenhouse effects as well. Vehicles designed for methanol (which is more expensive than gasoline) provide modest ozone reductions and small energy security benefits, but no greenhouse effect improvements. Further down the road, electric vehicles are the most promising new technology, despite the fact that research and development on electric vehicles by the major auto makers has languished. Finally, Professor Sperling believes that uniform emissions standards make little sense; emissions standards should be targeted to specific problems in specific regions.

University of Denver Professor Donald Stedman then presented his controversial research on remote sensing of vehicle emissions. This research shows that most mobile source emissions come from a small minority of the vehicle fleet. Small improvements in the emission standards of new cars and biennial vehicle inspection and maintenance programs, states Professor Stedman, are far less effective strategies than finding and correcting the small minority of "gross polluters." Professor Stedman bases his conclusions on data gathered using a remote sensing device that measures vehicle emissions produced by cars driving by the detection equipment. This device, developed by University of Denver researchers, has tested the emissions of over 300,000 vehicles in the US, Canada, Mexico, and Europe.

Professor Stedman contends that tighter new car emission standards will increase air pollution because the higher cost of new, marginally cleaner cars will discourage the junking of older, dirtier cars and keep gross polluters on the road longer. Contrary to popular perception, however, the gross polluters are not simply the oldest cars; rather, they are vehicles of any age that are out of tune or have malfunctioning or altered emission control equipment. According to Professor Stedman, finding these cars, tuning them up, and fixing their existing emission control equipment is the most cost-effective strategy to improve air quality.

The panel discussants were Larry Caretto of California State University, Northridge and Tim Yau of the Electric Power Research Institute. The future of electric vehicles was discussed and several audience members questioned both the accuracy of the Professor Stedman's remote detection equipment and the administrative ease of locating and correcting the gross polluters. Others warned against focusing exclusively on air quality as the only transportation problem; they believe that energy use, mobility, and economic development are other valid goals of transportation policy.
C. Investing in Transportation Infrastructure and Managing Congestion for Air Quality Improvements

Greig Harvey, of Deakin, Harvey, and Skabordonis, Inc. transportation consultants, presented material on modeling the effects of transportation investments on land use and air quality. Using modeling data gathered as part of a Sierra Club lawsuit of the Metropolitan Transportation Commission, Harvey outlined the different views of the air quality impacts of highway infrastructure improvements. The pro-highway investment viewpoint is that:

- New capacity at bottle-neck locations increases average speed, thereby reducing emissions of carbon monoxide and hydrocarbons.
- New capacity reduces transportation costs, thereby improving productivity and the regional economy.
- Most new development will occur with or without additional highway investment.
- Given the theory that most people have relatively inelastic time budgets, marginal highway investments are not likely to alter the total vehicle hours of travel.

In contrast to this pro-highway investment perspective are the views of environmentalists; they argue that investments in new highway infrastructure degrade, rather than improve, air quality because:

- New capacity at bottleneck locations stimulates enough additional vehicular travel to outweigh at least some of the beneficial effects of higher speed, and perhaps to produce comparable levels of congestion at higher volumes.
- Congestion relief discourages the infill development and densification that are necessary to support mass transit.
- New capacity promotes population growth and sprawl by opening up new land for development on the metropolitan fringe.
- Highway investment decisions are primarily political and there is little technical support for most decisions. Highway investment decisions are not, in any formal way, tested against different, possibly more beneficial, uses of the same money.

Harvey’s research on the air quality impacts of highway investments indicates that the speed related emission reductions between the "build" scenarios and the "no-build" scenarios were not as large as expected by pro-highway investment proponents, though small net reductions in hydrocarbon emissions resulted from bottleneck improvements.
These air quality improvements could, however, be reversed if additional increments of suburban growth are induced by the new highway capacity. The reason the highway investments to reduce traffic congestion result in only modest air quality improvements is because the new investments are relatively small and incremental changes in comparison to the size of regional highway systems.

USC Planning Professor Genevieve Giuliano then discussed the potential air quality impacts of congestion pricing. The theory of congestion pricing, according to Professor Giuliano, is based on two beliefs: (1) that there exist markets based on supply and demand that can be equilibrated by price, and (2) that time has a value such that people are willing to trade money for time.

Potential short-term responses to pricing would likely be a reduction in total travel and shifts in travel behavior away from peak period and single occupant vehicle travel. Long-term responses to pricing might include more compact development patterns as well. While congestion pricing would likely improve air quality through congestion reduction, these improvements would be mitigated by the fact that much of congestion reduction would come from trip time shifts rather than a reduction of trips and vehicle travel. Additionally, for congestion pricing to work, there is a need for alternative transportation modes and subsidy programs to be in place.

Professor Giuliano thinks that the most likely applications of pricing will be: higher tolls on existing toll roads, higher gas taxes, higher parking charges, time of day tolls, some travel-based pollution fees, freeway fees in air quality non-attainment areas, and regional taxes for owning and operating automobiles in non-attainment areas. Professor Giuliano concludes that the equity concerns are significant, and unless carefully designed the poor could be priced off the roads and the rich could benefit the most from pricing. She believes that pricing programs should be structured to mitigate the disproportionate impacts on low-income people.

In the discussion, labor strategist Eric Mann cautioned against assuming that social questions such as transportation, land use, and air quality could examined in a value-free way. He encouraged the participants to consider the differential impacts of air quality and transportation strategies on people of color, women, and working people. Joseph Brecher of the Sierra Club Legal Defense Fund was skeptical of the effectiveness of current air quality planning, citing the history of implementation delays and postponements in clean air planning since the early 1970s. The only recourse for clean air advocates, according to Brecher, is litigation against government for non-compliance. He also stated that we need to try all strategies regardless of the imperfect knowledge regarding their actual effectiveness.

Richard Sommerville of the San Diego Air Pollution Control District was very optimistic about TCMs, which he thinks are the policies with the fewest risks and the broadest array of benefits in addition to air quality.
D. Urban Forms and Density Patterns: What Do We Know About These Relationships to Transportation and Air Quality?

Professor Peter Newman of Murdoch University in Perth, Western Australia and USC Planning Professor Peter Gordon presented very different views on the effects of urban density, travel, and air quality. Professor Newman presented data on cities around the world showing that population density is positively correlated with public transit use and negatively correlated with auto travel and gasoline consumption:

- Where good transit is provided, land uses are concentrated and travel distances are shorter, favoring non-automobile modes. In low-density settings, where automobile use is the primary goal in infrastructure provision and planning, travel distances are longer and non-automobile modes are less viable.

- Density increases are necessary for making a city less auto dependent. In particular, high-density development needs to be focused on transit systems and transit stations to have an effect on travel behavior.

- Changes in the urban transport system are best reached through comprehensive planning and not through laissez-faire auto-based development. Transportation policies on pricing, demand management, and land use planning need to be conceived and executed in concert to create livable, transit-centered cities.

- Current transportation models are generally static and do not consider the long-term relationship between increasing auto speeds and increases in vehicle travel and dependency. If this relationship was considered in modeling, the negative air pollution and energy consumption impacts of new highway investments would be revealed.

Examining a somewhat different question, Professor Gordon presented U.S. data showing that travel times and commute lengths are decreasing with metropolitan dispersion. As the market rationalizes development patterns through dispersal, he argues, travel patterns are rationalized as well:

- Although some models of urban development predict that longer work trips result from increased urban size, this has not been the experience in the U.S. Gordon's research shows that auto work trip travel times between 1980 and 1985 decreased in most large metropolitan areas.

- Contrary to the predictions of most models, employers are adjusting intra-metropolitan locations over time to accommodate the dispersion of housing.
The failure of rail transit is no surprise given that proportionally fewer trips are made to central business districts (CBDs) over time and the continuing increase in suburb to suburb trips.

Policies should use market forces to facilitate decentralization, impose congestion charges and emission taxes, price parking, and deregulate transit.

Jane Blumenfeld from the Los Angeles Mayor's Office and Veronica Kun of the Natural Resources Defense Council were generally supportive of Professor Newman's position on land use and travel; both called for more central-city, transit-oriented development. On the other hand, Hugh Fitzpatrick from the Irvine Company discussed the planning experience in Irvine and concluded that, even in the best of circumstances, changes in urban form do not have a positive impact on transportation or air quality.

E. Regulatory Approaches to Making the Connections

UCLA Urban Planning Professor Donald Shoup presented research undertaken with Professor Richard Wilson of California State Polytechnic University, Pomona which uses an international data set to estimate the impacts of subsidized employee parking on travel, congestion, and air pollution. When employers have eliminated parking subsidies, the proportion of employees driving to work alone has declined by between 18 and 81 percent; the reduction in the number of cars driven to the work site ranges between 15 and 38 percent. Because most employers subsidize employee parking costs, even in CBDs, solo commuting is subsidized and encouraged. Additionally the federal government encourages this behavior by considering the provision of free parking by the employer as non-taxable, while other transportation subsidies (except public transit subsidies of $15.00 or less) are part of one's taxable income.

Professor Shoup proposes that employers should cash out free parking by offering a transportation stipend to employees in lieu of subsidized parking; employees could then use the stipend as they see fit, either by purchasing parking or by pocketing the money and commuting by some other mode. He estimates that in downtown Los Angeles, employer paid parking stimulates an additional $25 million per year in congestion costs and an additional $5 million per year in air pollution costs.

Professor Shoup also added that we need to look closely at the parking requirements cities place on new developments which, he believes, are frequently excessive. In some areas, city regulations require more than half of new developments be devoted to parking. This excessive parking encourages solo driving by reducing the user parking costs, thus subsidizing driving alone.
City and Regional Planning Professor Elizabeth Deakin of the University of
California, Berkeley discussed local government traffic mitigation ordinances and
congestion management programs (CMPs) which have, in most cases, been used to fend
off more radical, citizen-initiated growth controls. Trip mitigation ordinances and CMPs
are different implementation mechanisms for TCMs. Trip mitigation ordinances have
generally focused on the work trips of large employers and their effectiveness has been
dependent on the implementation requirements and the availability and quality of
transportation alternatives, while CMPs are more likely to be based on level of service
criteria for all trips and are supply management oriented. CMPs’ efficiency vary from
location to location and they mainly address with undesirable land use impacts.

Most programs have resulted in about a five percent reduction of trips, though this
figure varies significantly from city to city. Many issues, such as non-work trips, linked
work-trips, employer/job types, and the special needs of women, are ignored by these
plans. The programs have proven difficult to monitor, enforce, and maintain over time.
A better approach to mandatory trip reduction programs like Regulation XV, according
to Professor Deakin, would be to allow employers more flexibility; for example, employers
could be exempted from preparing a trip reduction plan if they adopt parking pricing.

Discussants John Stevens, a principal consultant to the State Assembly, and Norm
Emerson of Emerson and Associates, discussed the following issues:

- The importance of developing growth management policies at the state and
  local levels;
- That elected officials need to balance development goals and policies with the
  views of constituencies that tend toward slow growth and no growth;
- The need for further research on the effects of TDM incentives and on the
  impacts of TDM on mitigation fee collections;
- That work trips, the focus of most TDM programs, account for only 1/4 of
  all trips;
- Although congestion pricing is an ideal strategy for trip reduction, parking
  pricing, the second best alternative, is easier to implement; and
- That consideration should be given to the lowering of development fees for
  projects with TDM programs.
III. TYING IT ALL TOGETHER: MAJOR ISSUES, COMMON THEMES

When San Francisco Supervisor Harry Britt took to the podium at the close of the conference, he advised the assembled academics and analysts against ambiguity. "Elected officials don't want ambivalence from their advisors," he warned, "we want certainty." Supervisor Britt's address at the closing session was part of a panel of elected officials responding to the one and a half days of presentations and discussion that had preceded them.

The sentiment of this closing panel -- comprised of Britt, Greg Cox from the California Governor's Office of Planning and Research for Local Government, Judy Hathaway-Francis of the Los Angeles County Transportation Commission, and Norton Younglove of the South Coast Air Quality Management District* -- was that more consensus was needed on the connections between transportation, land use, and air quality. These calls for consensus were a response to the differences of opinion in the symposium presentations and discussions. These differences posed a particular challenge for Harvard Professor Alan Altshuler who, in the penultimate session, was to fit all of the conference presentations into a coherent framework.

A. Fitting the Research Findings into a Policy Framework: Professor Alan Altshuler

Rather than simply summarize the conference presentations, Professor Altshuler focused on exploring the paradigms, values, and beliefs expressed by symposium presenters and participants. The symposium, Altshuler judged, had confirmed Martin Wachs' opening observations that the line between analysis and advocacy is often blurred in this field. This is not because the analyses are flawed, but rather because the advocates of contending positions highlight different aspects of a very complex set of problems; these differences, of course, are largely driven by values and beliefs.

*Each of these speakers is or has been a locally elected official serving on a regional planning body. Locally elected officials serving on regional bodies face a special challenge in balancing regional planning needs—such as reduced traffic congestion and improved air quality—with the desires of their local constituents for economic development, convenient parking, local land use control, etc.
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Policy Approaches to Cleaner Air

The discussions, Altshuler observed, had revolved around four main categories of mitigation action:

1. **Technical fixes.** These include new car emission standards, low emission fuel standards, and Professor Stedman’s proposal to carry out in-use vehicle inspections on the road (in the same manner, roughly, as governments now detect speed violations) rather than at inspection stations. Such measures are potentially very powerful, but debates revolve around the feasibility and costs of achieving specific performance standards by specific target dates.

2. **Transportation investments,** most notably for new highways and transit systems. Though such investments are commonly justified (at least in part) on air quality grounds, virtually no one at the symposium thought that such investments could have significant air quality impacts over the next several decades.

3. **Command-and-control regulations.** These include transportation control (demand management) regulations and indirect source (land use) regulations. The immediate targets of such regulations are usually firms and local governments rather than individuals. A serious question is whether these institutions have the will and ability to bring about desired changes in travel and real estate development behavior.

4. **Market-based regulations.** These include Professor Shoup’s proposal to offer employees the option of “cashing out” their parking fringe benefits as well as more familiar measures such as gasoline tax increases, parking taxes and surcharges, highway congestion tolls, and marketable emission permits (as a means both of controlling aggregate emissions and of encouraging innovation by all regulated enterprises to reduce their emissions). Such regulations are typically aimed at individuals and firms, who experience them in the form of income and price incentives rather than commands. However, several participants question the political feasibility of such measures such as Professor Shoup’s parking pricing proposals and the idea of marketable emissions permits.

Values, Beliefs, and Paradigms

Altshuler identified three approaches to transportation planning for air quality improvement that were in evidence at the conference:

1. The **Least Cost, Least Inconvenience** approach seeks the most parsimonious path to clean air. Advocates believe that the preferred path to cleaner air should, insofar as possible, be that which imposes minimal cost, in money or time, on consumers and firms and which intrudes least on their behavioral choices.
2. The **Comprehensive Behavior Alternative** approach views air pollution as just one among many social problems to be addressed. Advocates of this approach believe that each mitigation alternative should be evaluated in terms of all its effects, not just its effect on air quality. And the decision about whether to adopt it should hinge on this comprehensive evaluation.

3. The **Limited Behavior Alternative** approach views air quality improvement as one of several critical aims that should guide transportation policy making. Other values voiced most prominently at the conference included congestion relief, greater urban compactness, economic development, and equity in the distribution of both mobility and financial responsibility.

For obvious reasons the supporters of these several approaches emphasize very different questions and arrive at widely divergent policy conclusions. Consider, for example, orientations toward transportation control measures (TCMs) (intended to reduce vehicle miles of travel), and indirect source regulation measures (intended to generate land use patterns requiring less travel) in the South Coast Air Quality Plan.

- Many transportation specialists favor such measures primarily for their congestion relief potential. Allan Hendrix of Caltrans, for example, judges that technological improvements will solve the air quality problem over the next 20 years or so, but not the congestion problem. He considers it essential, therefore, to pursue air quality improvement at least in part by means that also offer congestion relief.

- Advocates of technical fix options tend generally to be in the least cost, least inconvenience camp. However, they are often willing to impose significant costs if necessary to hasten the pace of change. Professor Sperling, for example, favors the current California emphasis on creating a market for zero-pollution (i.e. electric) vehicles even though it is far from clear that they represent a least cost path to meeting the Clean Air Act standards. He views this strategy as the only viable path, however, toward a long term "reactive organic carbon free future," which he believes as essential to reversing global warming.

- Some of the most passionate advocates of clean air believe that any measure with potential benefits should be adopted, regardless of cost and inconvenience, since some measures are likely to fail and the goal of clean air is so vital.

- Finally, some believe that TCMs and indirect source reductions are absolutely necessary if clean air goals are to be met on schedule. They emphasize that rapid growth has wiped out half the air quality gains that technology has produced over the past two decades, and that predominant sentiment in the region favors comparable growth over the next two decades. In this scenario, they believe, technology alone will not do the job.
Given these differing viewpoints, Professor Altshuler asks, what do we know and what is uncertain about the effects of transportation control measures (TCMs) and indirect source regulations (ISRs)?

1. What do those who claim such measures are needed mean by the term "need"? Do they mean that the health benefits, relative to the cost of implementing these measures, will be greater than measures aimed at other health problems? Or do they mean merely that these measures are needed to achieve Clean Air Act standards by a specified date? In the latter case, what are the health consequences of modest shortfalls by the target date, particularly if technology will solve the remaining problem over the subsequent few years? The South Coast Plan indicates that one fifth of the emission reduction expected over the next two decades will be attributable to TCMs and ISRs. However, several participants at the conference expressed doubt that the contribution would be this great.

2. Could a technological improvement, such as Professor Stedman's device for detecting gross polluters render TCMs and ISRs wholly superfluous in terms of achieving the Clean Air Act targets? If so, should this idea be greeted with relief or, alternatively, with dismay -- since it would undermine the capacity of those with collateral agendas to append them to clean air programs?

3. What are the estimated costs of the proposed TCM and ISR measures? Are they likely to render the region more attractive to job-creating investors (by reducing congestion and smog) or less attractive (by increasing regulatory uncertainty and inconvenience)? Will they improve the quality of life as perceived by South Coast residents (by reducing congestion and smog) or just the reverse (by increasing the time required for commute trips, by forcing employees into more rigid travel patterns, by requiring people to live at higher densities than they prefer)? Little is known at present about the answers to these questions.

4. Could "leakage" cause these policies to be undermined in unanticipated ways? As Professor Shoup commented, for example, those most amenable to carpool incentives are those who now use transit rather than those who now drive. As Professor Deakin noted, carpooling tends to make linked work/non-work trips very difficult (e.g. shopping on the way home from work). This may be largely offset, however, as workers get into their cars at home, after arriving by carpool, to make their non-work trips. The Bay Area Rapid Transit (BART) impact studies of the 1970s revealed, moreover, that congestion relief gains may be very short-lived. BART attracted most of its patrons from buses, carpool passengers, and those who were making new trips; but it did attract
some drivers. Within several months, however, these were largely replaced on parallel routes by new drivers -- who had presumably foregone the trips in question before the opening of BART for fear of encountering too much congestion. Finally, environmentalists have long proclaimed that commuters have travel time budgets; if they can travel faster, they will travel farther, and they are willing to incur longer trips infrequently that they may consider unacceptable every day. It follows that a successful telecommuting strategy might result in employees coming to work less often, but commuting from greater distances.

5. How feasible, administratively and politically, are TCMs and ISRs? During the 1970s politicians gradually took away from EPA the most powerful measures they had potentially available to reduce motor vehicle travel such as gasoline rationing, tax increases, and parking surcharges. Politicians, in general, cannot vote against the idea of clean air; it is also true, however, that they cannot vote for tough enforcement measures. Thus, the California Clean Air Act is essentially toothless when it comes to TCMs and ISRs. Its premise is that localities and firms will put the muscle on employees and developers. But localities and firms have little zeal to carry out this mandate.

6. How equitable are TCMs, ISRs, and technology forcing measures like the electric vehicle program? Regulation XV is more likely to put low-paid secretaries and factory workers into carpools than their bosses. Growth controls may drive up housing costs, providing windfalls to those who now own their homes but imposing heavy burdens on those who currently rent and those who will establish households in the future (future immigrants, children living in current households). The electric vehicle program may require cross-subsidies by the auto manufacturers, driving up the cost of new cars. One result would be to increase the cost of used cars. Current owners of relatively new cars in this scenario will have the option of hanging onto them longer than they might have otherwise, or of selling them for a higher price than they could otherwise have obtained. Those in the market for used cars, however, who are generally less affluent, will bear the burden of a transition to electric vehicles.

7. What do we know about the air quality effects of higher urban densities? Not a great deal. People travel less in dense cities like New York, but air pollution heaviest in the largest dense cities; so the residents of the most densely developed cities breathe the heaviest concentrations of air pollution. There is little evidence, moreover, that scattered high density development in a large sprawling region like Los Angeles produces major travel reductions. Finally, half or more of the pollution associated with a typical trip of 10 miles is a product of the engine warming up and cooling off, independent of mileage. There are very modest gains, therefore, from shortening average trip lengths if the number of vehicle trips remains relatively constant.
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Command-and-Control Versus Market-Based Regulation

Various conference participants expressed disagreement about the merits of command-and-control versus market-based regulatory approaches. Professor Altshuler questioned whether these approaches are really so incompatible. Market-based incentives, he noted, are generally deployed in the service of standards established by command. For example, a system of marketable emission permits generally involves a command-and-control determination of the number of permits to be issued.

The most common criticism of market-based approaches is that they are inequitable. This is a legitimate concern but the advocates of market-based regulation have long had the answer to it. One can structure market-based systems to be progressive or neutral — by providing low income users with subsidies or discounts, or by utilizing the revenues to finance programs of special benefit to the poor.

Another common criticism is that market-based regulation is politically unfeasible. In some cases — for example, congestion tolling, or gasoline taxation as method of transportation control — this does seem to be true. In other cases, however, market-based regulation seems likely to be more feasible than most or all of the alternatives. Marketable permits for businesses are in this category. Professor Shoup's parking scheme also is almost certainly more feasible than striving to eliminate the tax deduction for parking as a fringe benefit for imposing surcharges on employee parking.

Finally, some argue that market-based regulations are too difficult to implement. One must ask, however: compared to what? Is it more difficult to implement market-based regulations than it is to force the development of electric vehicles, or to get commuters en masse to change their ways, or to get local governments to pursue high densities? The same, incidentally, may be said with respect to Professor Stedman's proposal for on-the-road motor vehicle inspections. Critics question whether the technology has yet been fully perfected. Doubtless it can still be improved, but it certainly seems closer to readiness for general use than other strategies that have already been adopted such as the electric car.

Implications for Air Quality Management Planning

Professor Altshuler recounted the many comments on current air quality plans made by speakers and participants during the symposium. He noted that nearly all comments were in some way critical of current plans; only Richard Sommerville of the San Diego Air Pollution Control District expressed the belief that current air quality plans will be fully and effectively implemented. In particular, presenters and other participants seemed particularly skeptical that the TDM and ISR components of the current South Coast Air Quality Plan would be fully implemented. This, he believes, raises an interesting question; is the current plan intended as a literal blueprint for the future, or as a statement of aspirations and fervent hopes? The answer at this point, he concluded, is anything but clear.
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B. Major Issues, Common Themes, and Further Work

Several important debates framed the conference: The importance of air quality vis-a-vis other social problems; the need for transportation control measures and indirect source regulations; command-and-control versus market-based approaches; and the role of new technologies, such as electric vehicles, in maintaining air quality in the long term.

These alternative views revealed different sets of values, different perceptions of the problem, different approaches to planning, different sets of proposals, and different visions of the future. Thus, despite the elected officials calls for consensus, the connections between transportation, land use, and air quality will likely remain debated for some time to come.

At the close of the symposium, participants were asked about the key areas for further research on the transportation, land use, air quality connection. Five areas were mentioned most frequently by presenters, discussants, and attendees:

1. Evaluations of the effectiveness of transportation control measures (such as Regulation XV) and indirect source regulations (such as regional jobs-housing balance programs);
2. Empirical studies of congestion pricing and market-based pricing, based on actual practice;
3. Examinations of the effect of future demographic and economic changes on land use, transportation, and air quality;
4. Evaluations of the economic impacts of transportation and land use policies to improve air quality; and
5. More research on remote emissions detection and "gross polluters."

With this agenda, then, the search for the transportation, air quality, and land use connection will continue.
APPENDIX A

SYMPOSIUM PROGRAM

Wednesday Evening, November 6

5:30–6:30 p.m.  Reception
6:30–7:30 p.m.  Dinner
7:30 p.m.  Informal Dialogue and Socializing

Thursday, November 7

7:30–9:00 a.m.  Check-in and Registration for Thursday Arrivals
7:45–8:30 a.m.  Breakfast
9:00 a.m.  Overview of Symposium Goals, Program, and Logistics
LeRoy Graymer, Director, Public Policy Program, UCLA Extension
Joanne Freilich, Assistant Director, Public Policy Program, UCLA Extension

9:15–11:00 a.m.  I.  **Transportation, Air Pollution, and Urban Form in California:**

A. The Policy and Research Connections
Martin Wachs, Professor, Graduate School of Architecture & Urban Planning, UCLA

B. Technical and Policy Aspects of Motor Vehicle Contributions to Air Pollution in California
Michael Scheible, Assistant Executive Officer, California Air Resources Board

C. Understanding Linkages from the Perspective of the:
   - U.S. Environmental Protection Agency —
     David Calkins, Chief, Air Programs Branch, Air and Toxics Division, Region IX
   - Federal Highway Administration —
     Stephen Lockwood, Associate Administrator for Policy, Washington, D.C.
   - California Department Transportation —
     Allan H. Hendrix, Deputy Director, Transportation Planning
   - Sacramento Metropolitan Air Quality Management District —
     Normal Covell, Air Pollution Control Officer

D. General Discussion

11:00–11:15 a.m.  Break
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11:15–12:45 p.m. II. **How Far Can We Go With Technology?**

A. Prospects for Vehicle Technology and Alternative Fuels
   *Daniel Sperling*, Professor, Department of Civil Engineering, University of California, Davis

B. Mobile Source Pollution: Monitoring and Intervention Strategies
   *Donald Stedman*, Professor, Department of Chemistry, University of Denver

C. Panel Discussion
   *Larry Caretto*, Associate Dean, School of Engineering & Computer Science, California State University, Northridge
   *Tim Yau*, Manager, Strategic Planning, Electric Power Research Institute, Palo Alto

D. General Discussion

12:45–1:45 p.m. Lunch

2:00–4:00 p.m. III. **Investing in Transportation Infrastructure and Managing Congestion for Air Quality Improvements**

A. Impacts of Highways and Transit Investments on Land Use Patterns and Air Quality
   *Greig Harvey*, Vice President, Deakin, Harvey, Skarbardoni, Inc., Berkeley

B. Potential Contributions of Congestion Pricing to Air Quality, Transportation, and Land Use
   *Genevieve Giuliano*, Professor, School of Urban & Regional Planning, University of Southern California

C. Panel Discussion
   *Eric Mann*, Director, Labor Community Strategy Center, Los Angeles
   *Richard J. Sommerville*, Air Pollution Control Officer, San Diego Air Pollution Control District
   *Joseph Brescher*, Attorney, Sierra Club Legal Defense Fund

D. General Discussion

4:15–5:45 p.m. Free Time

5:45–6:30 p.m. Reception/Social

6:30–7:45 p.m. Dinner
IV. **Urban Forms and Density Patterns: What Do We Know About These Relationships to Transportation and Air Quality?**

A. *Peter W. G. Newman*, Professor, Institute for Science and Technology Policy, Murdoch University, Perth, Western Australia

B. *Peter Gordon*, Associate Dean, Urban and Regional Planning; Professor, Department Economics, University of Southern California

C. Panel Discussion
   *Jane Blumenfeld*, Planning Advisor, Los Angeles City Mayor’s Office
   *Hugh Fitzpatrick*, Vice President, Regional Infrastructure Policy and Planning, The Irvine Company, Newport Beach
   *Veronica Kun*, Staff Scientist, Natural Resources Defense Council, Los Angeles

D. General Discussion

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Friday, November 8

7:45–8:30 a.m.  Breakfast

9:00–10:45 a.m.  V. **Regulatory Approaches to Making the Connections**

A. Parking Requirements in Land Use Regulation: Designing Parking Policies to Reduce Automotive Pollution
   *Donald Shoup*, Professor, Graduate School of Architecture & Urban Planning, ULCA

B. Traffic Mitigation Ordinances and Congestion Management: Evaluating the Effectiveness of These Approaches
   *Elizabeth Deakin*, Assistant Professor, City & Regional Planning Program University of California, Berkeley

C. Panel Discussion
   *Norman Emerson*, President, Emerson & Associates, Glendale
   *John Stevens*, Principal Consultant, Assembly Transportation Committee, California State Legislature

D. General Discussion

10:45–11:00 a.m.  Break
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11:00–12:00 noon VI. **Fitting the Research Findings into a Policy Framework**

*Alan Altshuler*, Director, Taubman Center for State and Local Government, Kennedy School of Government, Harvard University

12:00 noon–1:15 p.m. Lunch

1:15–2:45 p.m. VII. **Where Do We Go From Here?: Leveraging Policy Investments in Transportation/Land Use/Air Quality**

*Harry Brit*, Board Director, Bay Area Air Quality Management District and Commissioner, Metropolitan Transportation Commission  
*Gregory Cox*, Deputy Director for Local Government, Governor's Office of Planning & Research  
*Judy Hathaway-Francis*, Commissioner, Los Angeles County Transportation Commission  
*Norton Younglove*, Chair, South Coast Air Quality Management District

3:00 p.m. Adjournment
APPENDIX B

PRESENTERS & COORDINATORS

The Transportation/Land Use/Air Quality Connection:
Overview of Strategies for Making Connections

Alan A. Altshuler is the Ruth and Frank Stanton Professor in Urban Policy and Planning at the John F. Kennedy School of Public Policy at Harvard University, where he is also Director of the Taubman Center for State and Local Government. He was formerly Dean of the Graduate School of Public Administration at New York University, and prior to that he served as the Chair of the Political Science Department at MIT. He was the first Secretary of Transportation and Construction of the state of Massachusetts, a position which he held between 1971 and 1975. He is the author of several widely read books on the city planning process, urban transportation policy, and the automobile industry. His current research includes work on the relationship between transportation and air quality.

Elizabeth Deakin is Assistant Professor of City and Regional Planning at the University of California, Berkeley, where she is also Assistant Research Engineer with the Institute of Transportation Studies. She holds degrees in Political Science, Law, and Civil Engineering. Her major areas of scholarly interest have been transportation policy, planning and analysis, land use policy and planning, energy and environmental planning, and legal and regulatory issues in transportation and land use. She has recently reviewed proposed legislation on land use planning, growth management, and air quality planning for the California Legislature.

Joanne Freilich is Assistant Director of the Public Policy Program at UCLA Extension where she develops and implements conferences, seminars, and courses for policy leaders and professionals in areas such as land use, governance, transportation, environmental quality, and public finance. She previously served as a regional planner with the Southern California Association of Governments from 1973 through 1989 where she specialized in air and water quality, transportation and land use planning.

Genevieve Giuliano is Associate Professor of Urban and Regional Planning at the University of Southern California where she specializes in transportation planning and land use issues. She has recently published research papers on staggered work hours, congestion pricing, and the role of transportation demand management in growth management. Her research documenting the effectiveness of transportation planning for the 1984 Los Angeles Olympics is very well known, and she is currently working with Martin Wachs on an evaluation of Regulation XV of the South Coast Air Quality Management District.

Peter Gordon is Associate Dean of the School of Urban and Regional Planning at the University of Southern California, where he is also Professor of Economics. He specializes in transportation, regional development and regional science, and has recently conducted research on urban travel patterns with an emphasis on gender, time of day,
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and urban-suburban differences. Professor Gordon is well-known in Los Angeles as a critic of the regional rail transit construction program.

LeRoy Graymer established the Public Policy Program at UCLA Extension in 1979 and continues to serve as its Director. The Program addresses public policy issues of regional, state, and national importance through numerous conferences, seminars, workshops, and other activities. He was formerly Associate Dean of the Graduate School of Public Policy at the University of California, Berkeley, and Vice President and Professor of Political Science at California State University, Dominguez Hills.

Greig W. Harvey is Vice President of the consulting firm of Deakin, Harvey, Skabardonis, Inc. of Berkeley. He is a nationally recognized expert on travel demand modeling and recently his research has focused on the relationships between transportation, land use, and air quality. He has conducted applied research on these topics for local, state, and federal agencies.

Peter W. G. Newman is Associate Professor in Environmental Science at Murdoch University in Perth, Western Australia. He holds degrees in Chemistry and Environmental Science, and has become familiar with American transportation and air quality policy while a visitor at Stanford University and while serving with The Urban Institute. Professor Newman is the senior author (with Jeffrey R. Kenworthy) of the controversial book entitled: Cities and Automobile Dependency: A Sourcebook which has been receiving international attention since its publication a few years ago.

Michael Scheible is Assistant Executive Officer for the California Air Resources Board. He manages the Office of Strategic Planning, and oversees the implementation of the California Clean Air Act and analysis of the new federal Clean Air Act. He has been with the Air Resources Board since 1973; prior to that time he served as an Air Pollution Control Engineer in the Peace Corps, and was assigned to Rio de Janeiro, Brazil.

Donald Shoup is Professor of Urban Planning at UCLA where he teaches and conducts research on urban economics, public finance, and the evaluation of public programs. In recent years his research on parking policies and their implications for mode choice and traffic congestion has received national attention, and he developed a technique for "deferred tax assessments" which has been enacted into law by the California Legislature.

Daniel Sperling is Professor of Civil Engineering and Environmental Studies and Director of the Institute of Transportation Studies at the University of California, Davis. He is the author of two major books on transportation fuels and over 70 technical papers on transportation fuels and transportation technology planning. He chairs the Alternative Transportation Fuels Committee of the Transportation Research Board.

Donald Stedman is Professor of Chemistry at the University of Denver. His work on air pollution, conducted for the California Air Resources Board among other sponsors, has come to national prominence in recent years, and is extremely controversial. His work
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deals with the mobile monitoring of pollution created by motor vehicles and the relationship between vehicle fleet characteristics and concentrations of critical air pollutants.

**Martin Wachs** is Professor of Urban Planning at UCLA, where he served three terms as Head of the Urban Planning Program. He has written three books and over eighty articles on transportation planning, transportation problems of the elderly, transit finance, transportation demand management, and ethics in planning. With Genevieve Giuliano, he is currently conducting research evaluating Regulation XV of the South Coast Air Quality Management District.

**PANELISTS**

**Jane Blumenfeld** is the Planning Advisor to Mayor Bradley where she is responsible for tracking major development projects and developing land use policy for the City of Los Angeles. Previously she spent eleven years as a planner in various capacities within the Los Angeles City Planning Department. Ms. Blumenfeld is particularly interested in formulating city policy to effectively channel growth, such as the development of mixed use projects and the integration of land use, transportation and environmental planning.

**Joseph Brescher** is a private attorney based in Oakland, California, specializing in environmental, resource, toxics and land use problems. He is on retainer with the Sierra Club Legal Defense Fund and the Port of Oakland. Since 1972, Mr. Brescher has been involved in several major court cases and litigation involving the Clean Air Act, representing environmental and citizen groups in strict upholding of provisions in that Act.

**Supervisor Harry G. Britt** was first elected to the San Francisco Board of Supervisors in 1979, and served as President of the Board from 1988 to 1990. He is a member of the Board of Directors of the Bay Area Air Quality Management District, the Metropolitan Transportation Commission, and also serves as President of the San Francisco County Transportation Authority.

**David L. Calkins** has been with the Federal Government for 27 years, 19 of which have been with the EPA. In Region IX, he has served as Chief, Air and Water Planning Branch; Director, Office of External Relations; Chief, Air Program Branch; and Acting Deputy Director, Institutional Analysis Division. In 1981, he was on special assignment to the Bay Area Air Quality Management District.

**Laurence S. Caretto** is Associate Dean of the School of Engineering and Computer Science, and a Professor of Engineering at California State University, Northridge. His teaching and research interests include a special interest in combustion, vehicle emission, and air pollution. Mr. Caretto was a member of the California Air Resources Board from 1978 to 1983, and Vice-Chair of that Board from 1979 to 1982, where he was involved in new regulations for fuel composition, diesel vehicles, emission equipment warranties, and working with local air pollution control districts for improved state/local interaction.
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From 1983 to 1987 Mr. Caretto was an alternate board member, representing the Los Angeles City Council on the South Coast Air Quality Management District Board, where he served as the Board's representative to the statewide committee to oversee the Vehicle Inspection ("Smog Check") Program.

Norman Covell is the Air Pollution Control Officer for the Sacramento Metropolitan Air Quality Management District. Mr. Covell is also the Director of the Environmental Management Department for the County of Sacramento. This department was created by the County Board of Supervisors in 1988, and includes the Air Pollution Control, Environmental Health and Hazardous Materials Programs.

Gregory Cox is Deputy Director for Local Government in the Governor's Office of Planning and Research in Sacramento, serving as principle liaison with cities, counties and special districts. He also heads the Wilson Administration's Council on Growth Management. Mr. Cox served on the Chula Vista City Council from 1976-1990, and in that capacity also served as mayor from 1981-1990. As mayor, he was active in growth management activities in San Diego County. In 1988, Mr. Cox was President of the League of California Cities.

Norman H. Emerson is principal in the consulting firm of Emerson & Associates which specializes in public policy analysis, strategic planning, public affairs management, and transportation policy and planning. Recently, he was appointed to the Los Angeles Community Redevelopment Agency Board by Mayor Bradley, focusing on transportation issues, and to LACTC's Policy Committee on Congestion Management Planning. Prior to establishing Emerson & Associates, Mr. Emerson was Director of Public Affairs for the Voit Companies, a Los Angeles based commercial real estate development and management company, and developers of Warner Center. Mr. Emerson previously was Regional Representative and Special Assistant to the Secretary of Transportation, U.S. Department of Transportation, and an Executive Assistant to the Mayor as Director of Research and Policy.

Hugh Fitzpatrick is Vice President of Regional Infrastructure Policy and Planning for The Irvine Company, which is developing the nation's largest master planned urban environment on 64,000 acres of land it owns in Orange County, California. He is responsible for coordinating the company's participation in the planning, funding and implementation of the regional and local transportation network in south and central Orange County. Mr. Fitzpatrick came to The Irvine Company in 1985 from the California State Transportation Commission, where he served as Assistant Director for Mass Transportation, and then as deputy director for Finance.

Judith Hathaway-Francis is a member of La Habra Heights City Council. Since 1990, she has been a Commissioner with the Los Angeles Transportation Commission, and chairs the Commission's Transportation Development Act, Article 8 Hearing Board and the Mobile Source Air Reduction Review Committee. Ms. Hathaway-Francis was also appointed the President of the California Contract Cities Association in 1990.
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Allan H. Hendrix has served as the Deputy Director for Transportation Planning since June 1990 for the California Department of Transportation (Caltrans). His previous position was Chief of the Division of Highways and Programming for Caltrans, where he was responsible for capital outlay programming, toll facilities, and liaison with the California Transportation Commission.

Veronica Kun is a Senior Scientist with the Natural Resources Defense Council specializing in air, energy and transportation issues. She has wide experience in policy analysis, economics, and environmental management having worked in both the public and private sectors concentrating on environmental assessment, land use planning and analysis, and environmental design. Ms. Kun previously served on the staff of the Energy and Natural Resources Committee of the U.S. Senate, providing support and guidance on energy issues, particularly on policy issues concerning renewable energy resources.

Stephen C. Lockwood was appointed to the Federal Highway Administration as Associate Administrator for Policy in 1990, and is responsible for development of policy evaluation and new legislation. He has led the FHWA Task Force developing the 1991 Surface Transportation legislation. Previously, Mr. Lockwood served as Director of the Transportation 2020 Alternatives Group (TAG), and as a private consultant for 15 years where he was responsible for directing a broad range of major transportation projects.


Richard J. Sommerville has been the Air Pollution Control Officer at San Diego County Air Pollution Control District since 1978, and has recently served as the Chair for the California Inspection and Maintenance Review Committee. The committee’s analysis and recommendations led to state legislation improving the “smog check” program.

John R. Stevens is Principal Consultant on the Assembly Transportation Committee chaired by Assemblyman Richard Katz. The committee is responsible to hear and act on all Assembly and Senate bills related to transportation, and to provide technical resources to all members of the Assembly. Mr. Stevens graduated from California State University, Pomona, with a Bachelor’s degree in the Biological Sciences, and worked in the south-central area of Los Angeles as a professional director of a nationwide community service agency. In 1979, he became Director of Community Affairs for AVCO community developers, a subsidiary of AVCO Corporation, which developed Rancho Bernardo in San Diego and much of Laguna Niguel in southern Orange County, and in 1982 he became Executive Assistant to Orange County Supervisor Tom Riley, specializing in transportation and land use issues.
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**Timothy S. Yau** is Manager of Strategic Planning at the Electric Power Research Institute (EPRI) in Palo Alto. He is currently developing a three year plan on new demand-side planning approaches, as well as positions and policies on major energy issues. Previously, Mr. Yau’s responsibilities at EPRI included directing research projects to advance the state-of-the-art in power system planning and operations through computerization.

**Hon. Norton Younglove**, Supervisor, representing the Fifth District since 1971, also serves as Chair of the Board of Supervisors of Riverside County. He has been a member of the South Coast Air Quality Management District Board since 1982, and served as its Chair from 1987 through 1990. Mr. Younglove continues to regularly represent the district before the State Legislature and congressional committees. Supervisor Younglove has twenty years of public service with Riverside as an elected official, and has been a member of more than 40 local, state and national organizations, as well as being a past president of SCAG.
APPENDIX C

PARTICIPANT ROSTER

ALAN A. ALTSHULER (Speaker)
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Ruth and Frank Stanton Professor
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THOMAS C. AUSTIN (Panelist)
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Planning Engineer
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San Francisco, CA

PAUL BENSON
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WILLIAM BLACKMER
Chief
Office of Environmental Analysis
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DAVID CALKINS (Panelist)
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EDWARD CAMPBELL
Member, Board of Directors
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LARRY CARETTO (Panelist)
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Symposium Summary: The Transportation, Land Use, Air Quality Connection

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GREG COX (Panelist)
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ROGER EMBREY
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NORMAN H. EMERSON (Panelist)
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GREIG W. HARVEY (Speaker)
Vice President
Deakin, Harvey, Skabardonis, Inc.
Berkeley, CA

HON. JUDY HATHAWAY-FRANCIS (Panelist)
Commissioner
Los Angeles County Transportation Commission
Los Angeles, CA

PETER HATHAWAY
Chief Deputy Director
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WILLIAM HEIN
Deputy Executive Director
Metro, Transportation Commission (MTC)
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ALLAN HENDIX (Panelist)
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MICHAEL HOFFACKER
Executive Director
Sacramento Area Council of Govts.
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BONNIE HOLMES
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Chief Planning Analyst  
Federal Highway Administration  
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STEPHEN LOCKWOOD (Panelist)  
Associate Administrator for Policy  
Federal Highway Administration  
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VICTOR MAGISTRALE  
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ERIC MANN (Panelist)  
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VERONICA KUN (Panelist)  
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APPENDIX D

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