

Symposium summary: The Future of Cities and Travel

**UCLA Extension Public Policy Program
Annual Symposium Series on
THE TRANSPORTATION, LAND USE, ENVIRONMENT CONNECTION**

The Future of Cities and Travel

**October 19-21, 2008
UCLA Lake Arrowhead Conference Center
Lake Arrowhead, California**

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Foreword

This report is a summary of proceedings from a prominent policy and research symposium on **The Future of Cities and Travel** held October 2008 at the UCLA Conference Center in Lake Arrowhead, California.

UCLA Extension Public Policy Program convened the symposium, which was the eighteenth in an annual series created to address the importance of ***The Transportation, Land Use, and Environment Connection***. This year's topic focused on developments and trends that will affect travel, land development, and environmental quality in the years ahead. Economic, social, environmental, and technological trends that may significantly alter the planning landscape in the next 5, 10, or 20 years were identified. The intent was to examine what planners, forecasters, and policymakers today know about such possible change agents that will help better prepare for an uncertain future.

The core of the program focused on the following topics:

- ◆ Incorporating forecasts into policies and plans
- ◆ Demographic and development trends
- ◆ Transformative effects of telecommunications on economic and social life
- ◆ How intelligent technologies may help solve urban and transportation problems
- ◆ The next generation of motor vehicle systems in a resource-constrained world
- ◆ The future of alternatives to private vehicle travel: transit, carsharing, paratransit
- ◆ Successful efforts in other countries to increase walking, biking, and transit use
- ◆ Sustainable urbanism: linking research, policy, and practice
- ◆ Linking long-range forecasts with short-term decision-making

Special recognition goes to the numerous governmental, business, environmental, and public interest groups (Appendix D) who offered considerable help and underwriting as sponsoring and cooperating agencies, and served as part of the Steering Committee.

I gratefully acknowledge the collaborative partnership between UCLA Extension and the UCLA Institute of Transportation Studies. Co-chair Brian Taylor, Professor and Chair of Urban Planning, UCLA School of Public Affairs, and Director, UCLA Institute of Transportation Studies offered research-grounded and provocative insights that enhanced the program and raised the level of discourse during the symposium.

Thanks are also due to two individuals who prepared this comprehensive proceedings report: Alex Demisch and John Gahbauer, both affiliated as graduate students with the UCLA Institute of Transportation Studies.

It is the hope of the symposium organizers that this forum will contribute to ongoing policy dialogue and lead to the introduction of solutions through research and practice.

Catherine Showalter
Director, UCLA Extension Public Policy Program

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1. Introduction

The Future of Cities and Travel, the 2008 UCLA Lake Arrowhead ***Transportation, Land Use & Environment Connection*** Symposium, brought together scholars, researchers, planning practitioners, nonprofit advocates, and policy makers to discuss the state of transportation against a backdrop of great uncertainty about the global economy and the then-forthcoming outcome of the presidential election.

The Symposium was, therefore, well situated for taking stock of where we are in the transportation sector—of what we know, what we do not know, and how we can plan intelligently for the future not only in the midst of great uncertainty but also when our resources of time and energy are so often focused on near-term crises. Many of the crises of 2008 – fiscal shortfalls, deepening concern over climate change, skyrocketing fuel prices, and the mortgage meltdown – demonstrated the critical need for the rational and calm planning that could have foreseen these issues.

Will the volatility in gas prices and energy costs more generally prompt a lasting change in people's travel habits and residential preferences, or will citizens hedge their bets on the promise of increased vehicle fuel efficiency and other improvements that enable a more or less unchanged existence?

More conventional bellwethers of change in transportation also remained ambiguous: a significant increase in elderly drivers is forecast, for example, but the specific impact of this demographic change on travel behavior is unclear.

Despite an inauspicious economic setting, 2008 was also a year in which technology continued to make enormous advances, enabling constant connectivity and communication as never before. It is becoming clear that technology will affect our transportation networks and vehicles dramatically, both in the way they are designed and in how they are used. But the specific ways in which it may do so remain difficult to foresee.

As in the past, the Symposium focused on creating linkages between research and practice, ideas and action, public and private, markets and regulation, local and global, development and conservation related to transportation, land use, and the environment.

Conference presenters discussed these trends, emphasizing the need to be cautious in forecasting trends with any certainty. But a common theme throughout the forum was the importance of making decisions with less-than-perfect information. In the face of worrisome economic and environmental issues, many sounded the need for greater flexibility, imagination, and risk-taking in how we plan for the future, despite the current uncertain political and economic uncertainty.

II. Symposium Proceedings

WELCOME

Catherine Showalter, Director, UCLA Extension, Public Policy Program; Director, Osher Lifelong Learning Institute at UCLA

David Menninger, Associate Dean, UCLA Extension and Continuing Education

Frank Gilliam, Dean, UCLA School of Public Affairs

Showalter briefly welcomed the participants and introduced **David Menninger**. **Menninger** noted that this symposium, now in its 18th year, is the result of an ongoing collaboration between UCLA Extension, the School of Public Affairs, the Department of Urban Planning, and the UCLA Institute of Transportation Studies. **Menninger** thanked the steering committee for their guidance and financial support of this multi-disciplinary effort. **Menninger** also acknowledged **LeRoy Gramer**, Founding Director of the UCLA Extension Public Policy Program, **Catherine Showalter**, and **Brian Taylor**. **Menninger** then introduced **Frank Gilliam**.

Gilliam was impressed by the long history of this program. This symposium is what a university is about – collaboration between scholars, public sector officials, and private sector practitioners. **Gilliam** stressed the importance of bringing the two worlds of theory and practice together.

Showalter recognized the elected officials present at the symposium, many of whom are speakers this year. **Showalter** also acknowledged the steering committee, the symposium's sponsors, co-sponsors, and cooperating organizations. **Showalter** ended by quickly polling the audience to see how many participants were here for the first time – about two-thirds of the people in the room raised their hands.

SYMPOSIUM OVERVIEW

Brian Taylor, Professor and Chair of Urban Planning; Director, UCLA Institute of Transportation Studies

Taylor thanked everyone for coming and provided an overview of this year's program. The topic is concerned with one primary challenge – how can we plan intelligently for tomorrow when so much of our time and attention is so often focused on coping with near term crises?

Taylor pointed to a number of factors affecting public policy in 2008. Traffic congestion, fiscal shortfalls, climate change, skyrocketing fuel prices, the mortgage crisis, deepening recession, a growing partisan rift over taxing and spending, and anxiety over a possible depression have all been potent drivers of public policy both in California and at the federal level. Indeed, each of these external factors seemed to creep up on us one after another, and the focus of public policy has been a moving target over the past year. Yet all of these pressing crises were foreseeable, and may have been anticipated if we approached the issues calmly. And had we been thinking more carefully, we would have been better prepared to deal with these issues. However, the challenge now will be to cope with these crises while anticipating future issues.

Taylor gave a brief description of the sessions to come. The symposium has an explicit focus on fostering a number of linkages – between research and practice, ideas and action, public and private, markets and regulation, local and global, development and conservation as related to transportation, land use, and the environment.

SESSION 1: INCORPORATING FORECASTS INTO POLICIES AND PLANS: PREPARING FOR ECONOMIC AND POLITICAL DRIVERS OF URBANIZATION IN THE YEARS AHEAD

Hasan Ikhata (Moderator), Executive Director, Southern California Association of Governments

Forecasting is a widely promulgated practice in planning, but many question the accuracy and uses of forecasts. What if we're wrong? What if we're right? Should we even base policy decisions on one number? Might we just be able to talk about goals and objectives? These are all questions that we must face. **Ikhata** criticized public sector officials for rarely looking back to confirm whether or not their forecasts were accurate, even though this could assist the development of better tools for the future. In addition, forecasts only yield one number, and this oversimplifies the complexity of the process. **Ikhata** suggested that we must make a more concerted effort to show decision makers what exactly is important.

Linking Forecasts to Action: The Roles, Uses, and Misuses of Forecasts in Transportation, Land Use, and Environmental Decision Making

Martin Wachs, Director, Transportation, Space & Technology Program, RAND Corporation

Why do we plan for the future? **Wachs** posed that we plan to alleviate uncertainty, much like using a map in an unfamiliar area. Yet we do not really know why we forecast; forecasts are not integral to the planning process, and we could instead base our plans on goals such as clean air or zero growth in greenhouse gas emissions. Indeed, ancient civilizations created plans hundreds of years ago, but forecasting has only emerged as a planning tool in the last century.

Forecasting is rooted in the mid-century notion of the rational. If plans were to be taken seriously by the public, planning methods had to become systematic and analytical. Forecasting offered this kind of instrument. But **Wachs** argues that forecasting is not inherently technical, and that it is more useful as a political tool. For instance, developers and environmentalists may disagree on fundamental principles, but they can both agree on a forecast that might predict population growth or worsening congestion. Forecasts offer a starting point and a middle ground from which to move forward. Furthermore, political action is possible because we agree to argue about particular forecasts rather than to attack one another's fundamental values. We can eventually agree with one another about forecasts without having to agree about fundamental values.

If we view forecasts primarily as a political tool, then we can see why public officials tend to not look back and see if their forecasts were right or wrong. In fact, forecasts are almost always

wrong, but they serve their purpose by facilitating agreements that eventually led to action. **Wachs** offered a few illustrations.

The Boston Big Dig ran \$15 billion over budget and took ten years longer to complete than the forecasts initially predicted. Similarly, the Miami subway was forecast to cost \$1 billion and to carry about 200,000 passengers per day, but the actual cost was closer to \$1.3 billion and daily ridership is only about 37,000 (leading to a much higher public subsidy per rider). In New York City, the famous power broker Robert Moses boasted about misleading public officials with falsified forecasts to get a number of large infrastructure projects built.

Had anyone argued at the outset that the forecasts for these projects were inaccurate, then it is possible that they never would have been built. But accuracy was clearly not a primary goal. Rather, the forecasts served as a key mechanism to reach a political agreement that these projects should be built.

All forecasts are based on three elements: (1) a method or model, (2) data, and (3) assumptions that are necessary to use the data in the context of a model. **Wachs** stresses that the *assumptions* are the most critical element of any forecast, yet they are rarely debated. One can simply extrapolate current trends to reach a projection of what might happen, but this is not the same as a forecast. The assumptions of what will happen to, say immigration rates or energy prices in the future, are the key factors in creating a forecast.

In some instances, realistic assumptions can be made because they are based on regularity. For example, we can accurately predict the school enrollments for the next year because we can safely assume that all students will progress to the next level. But in the realm of planning, we do not have the luxury of this stability, and our forecasts often do not work well. Interactions between transportation, land use, and the environment are highly complex and each is simultaneously both cause and effect. In addition we have inadequate behavioral data, outdated models, and wildly varying and value-laden assumptions.

Wachs notes that the most widely used model today, the four-step model, was developed in the 1950s to determine the size and location of major facilities like freeways. By the 1960s, these models were already regarded as outdated, but planners simply retrofitted them to other uses throughout the rest of the 20th century. But a recent national committee (on which **Wachs** served) deemed the four-step model as inaccurate and inadequate for the applications (such as modeling the effects of pricing or land use policies) for which it is widely used.

Our models are linear; we make assumptions that are necessary for us to arrive at a single prediction of a future value, even though those assumptions are characterized by deep uncertainty. Thus the models simply cannot be correct.

But rather than seeking a single optimal course of action, **Wachs** proposes a new type of tool that would lead to a satisfactory plan for many possible futures. RAND is currently developing a Robust Decision Making (RDM) method of analysis that allows us to still use existing data sets and technical expertise in a way that does not limit us to making a single point estimate of what the future will be like in 30 years. Using computer modeling, they can test thousands of

forecasts, and reach conclusions about which assumptions are most critical to determining outcomes, and pay close attention to those in particular. RDM combines the best of scenario planning with quantitative rigor in ways that decision makers will find credible and contributes to contentious debates.

RAND has not yet used RDM within the context of transportation, but they have used it to effectively address many types of decisions characterized by deep uncertainty regarding the energy sector, climate change policies, national security programs, and commercial-sector applications. If planners want to continue to use forecasting in the coming years, we need to examine our current methods and acknowledge that forecasting has played an important political role. Furthermore, we need to shed our current way of doing things and adopt methods that are more robust.

Promulgating Policies and Plans Today to Prepare for the Economic and Political Drivers of Urbanization in the Years Ahead

Gerrit Knaap, Executive Director, the National Center for Smart Growth Research and Education, University of Maryland

To begin, **Knapp** described some key trends that will significantly affect the economic, environmental, and political drivers of urbanization in the future. First, the area of urbanized land is growing faster than the population. Secondly, total vehicle miles traveled, as well as the number of vehicles, are also increasing at a faster rate than the population. **Knapp** also points to the unprecedented growth in carbon dioxide emissions in the past century, and notes that, as an end use, transportation has recently overtaken all other sectors as a source of carbon emissions. Household composition is also changing, and there will be fewer children and more single-individual households in the future. This will affect housing demand, and thus change the predominant land use patterns. The current mortgage crisis will also have long lasting effects, and some predictions estimate a 40 percent surplus of large-lot homes by 2025.

Knapp outlined AB 32 and SB 375, and expressed that the rest of the country is interested to see how they will play out in California's land use planning. However, he also described some of the most significant limitations of SB 375 –it does not regulate land use, it does not supersede local land use regulation, it cannot abrogate any vested rights, and it does not require local policies to be consistent with any regional plan.

Knapp sees some parallels between California's statewide recent efforts and some of Maryland's experiences with Smart Growth. In 1997, Maryland passed a Smart Growth Legislative Package, which included the creation of both priority funding areas and rural legacy areas. These boundaries established where the state will spend money for urban growth and where it will dedicate funds for preservation, respectively. Maryland was instantly hailed for these efforts, and quickly gained a reputation as a Smart Growth state. However, recent research by The Center for Smart Growth examined a variety of development trends, and **Knapp** is convinced that the policies are not working. In particular, most growth since 1997 has occurred outside of the priority funding areas, and the share of residential parcels outside of these areas is

increasing. **Knapp** believes that the incentive-based approach is not strong enough to change the direction of development patterns, and that regulation is required.

How can they change this? Thirty years ago, Maryland passed a state law requiring officials to have a statewide plan for growth. However, the plan was never written. But the State's new governor has re-ignited the momentum for Smart Growth and wants to implement what is essentially a statewide land use plan. As part of these efforts, The Center for Smart Growth has been working with the Maryland State Departments of Planning, Transportation, Environment, and Natural Resources to draft a plan. More specifically, they recently invited a variety of stakeholders, from the builders association to environmental groups, to participate in a scenario planning exercise.

This exercise involves identifying the primary driving forces of change (social, economic, environmental, political, or technological), and using them to develop pictures of what the future might look like. They further articulate how these scenarios might play out spatially, evaluate them, and conduct a policy sensitivity analysis. As a group, they identified the driving forces that they believed would have the most impact. These were further divided into those that they were relatively sure were going to happen and those that they were more uncertain of occurring.

Their basic modeling framework is as follows. The driving forces that were predicted to have a large impact were fed into a national econometric model. This model fed into transportation and land use models, as well as indicator models (e.g. water quality and energy consumption). They then evaluated the end results using indicators.

Knapp shared some preliminary results from the Center for Smart Growth efforts. They ran the model under two assumptions: a high-energy price scenario and a business-as-usual scenario. Under a high-energy price scenario, they forecasted a significant national economic slump from which the country would recover in about 15 years. The general curve was the same for Maryland, although not as severe because they are not as sensitive to those industries as other states might be. These general economic trends are further broken down by sector, and from this, the model spatially articulates the effects on land use. The results were not surprising: high-energy prices translate into greater growth occurring in the existing urban areas of Baltimore and Washington, D.C. **Knapp** noted that these levels of growth are much higher than the zoning currently allows for, and illustrates how a top-down model differs procedurally from a bottom-up approach.

Their transportation model is based on three levels: region (top), state (middle), and MPO (bottom). This three-level concept addresses many of the complexities that arise from multiple jurisdictional boundaries on travel forecasting.

Knapp ended by criticizing five practices, which he called the worst planning tools in the world.

1. **Trend Extrapolation.** This practice often lacks critical assumptions and can lead to unrealistic claims (such as the previous prediction of a 40 percent surplus of large lot homes in 2025).
2. **Economic Incentives.** Even though **Knapp** is an economist, he does not believe that changes in price alone can lead to large-scale change such as the transformation of sprawl

to Smart Growth. To truly facilitate this, multiple parties (such as public agencies and private developers) must come together and coordinate their activities.

3. **Cooperative Forecasts.** These efforts try to incorporate the input of various political groups, but they usually end up in political mudwrestling for growth, and the forecasts result in unrealistic levels of growth in the Baltimore and greater Washington, D.C. areas.
4. **Local Control.** Regions and states set targets for reducing greenhouse gas emissions, but these can only be met by changing land use planning, which lies primarily in the hands of local jurisdictions. **Knapp** added that the process is complicated by the difference between politics at the state and local levels.
5. **Preferred Scenarios.** Too much focus is given to picking preferred ways of growth. Policymakers choose policies, not preferred scenarios. As important as it is to promulgate policies and plans to prepare for the changes ahead, it is just as important to build the tools to facilitate the process of doing so.

Discussion

Ikhata reiterated the problems of SB 375: it does not intervene into land use decisions, it is not linked to funding, and there is nothing requiring local jurisdictions to abide by it.

Kathryn Phillips of the Environmental Defense Fund appreciated **Wachs'** description of how forecasting can bring focus to the issue at hand and get away from value judgments. However, the demand for more forecasting is often used to delay action. **Phillips** also does not see Maryland's new efforts as much different from their original (and ineffective) efforts in 1997. There are many carrots, but no sticks, and the process is not much different than California's blueprint process. She asked **Knapp** how he thinks their new efforts will play out in Maryland.

Knapp agreed that what they are doing now is not considerably different than before, but the difference now is that they have the power of State government behind them. The State of Oregon has shown how a strong State government can play an important role by exerting its power. The implementation of a statewide land use plan will give Maryland strong authority, and he hopes that the role of the State government will grow. **Wachs** responded by saying that *any* analytical tool can be used as a source of delay. If stakeholders intend to delay a project, they will do so, be it a forecast or a cost-benefit analysis. This is not a problem with forecasting at large, but rather with the process.

Knapp admitted that academic researchers have the benefit of trying out things that current practitioners may be uncomfortable with. They do not have to use the cooperative forecasts that MPOs might have to, and they can experiment with new ideas.

Donald Shoup of UCLA liked **Knapp's** idea that economic incentives alone cannot change the nature of development. Smart Growth simply cannot happen in cities that require ample off-street parking. Parking requirements are not a carrot, but rather a very large stick. Furthermore, it is unrealistic for cities to dangle small incentives in front of developers, telling them that they would like development to occur in one way, while simultaneously beating them over the head with the stick of parking requirements that mandate that development occurs in another way. This is related to **Wachs'** criticism of forecasts; parking requirements have the veneer of being

rational, but they are indeed based on poor statistical practice and are wholly irrational. **Shoup** asks **Knapp** how off-street parking requirements affect what is being built now.

Knapp thought that **Shoup** would disagree with him. Parking is underpriced, and setting the right price is more consistent with an economic incentive than a regulatory approach. We need to get the prices right, but this is a necessary condition (as opposed to a sufficient condition) for Smart Growth to happen. We need to remove the institutional constraint while still encouraging cooperation. **Knapp** also stressed the need for a system of plans, where state, regional, and local plans work in concert, not against each other. **Shoup** emphasized that we will never get the prices right if we have the quantities wrong.

Michal Moore of the University of Calgary stated that public subsidies are important. But in our political system, politicians are often too concerned with defending their fiefdom and getting themselves reelected. How can we get politicians to cooperate on these policies without the incentive of capital? Where will the money come from?

Wachs echoed **Shoup's** point that current regulations deprive us of capital. The acres of parking that regulations require have an opportunity cost; these resources could go into higher densities instead. We could generate more capital by eliminating regulations that bind us to spend money in unproductive ways. **Knapp** described how in Maryland, public money was not being spent in the way they originally intended. While they had priority funding areas, there was no budgeting system in place to facilitate spending capital in those zones. He also does not think that the state will ever have enough money to incentivize Smart Growth. There needs to be political coalitions as support. **Wachs** drew attention to Jonathan Levine's book, *Zoned Out*. Levine argues that current zoning restricts Smart Growth, and that by reducing regulation, we can better facilitate Smart Growth.

Dennis Yates of Chino and the SCAQMD Governing Board expressed frustration with environmentalists. When city officials in Chino estimate the cost of a project, they must approximate how much mitigating environmentalists' concerns will cost them. **Yates** believes that environmentalists hold up local governments like armed robbers. He also complained that the California government is mandating Chino to increase densities in areas where they would rather not have them. In order for Chino's General Plan to be in concordance with the State's goals, Chino officials may not be entirely truthful about where they will locate higher density projects.

Wachs countered by stating that it depends on how you view and account for environmental costs on a larger scale. If you do not internalize environmental costs at the beginning, you perhaps get to develop more projects in the short term. But in the longer term, you will have to pay those costs in terms of mitigation. From a mayor's point of view, environmentalists may be bumping up the costs in terms of environmental mitigations, but this is the nature of the political process.

SESSION 2: MIGRATING IN, MOVING UP, AND SPREADING OUT: WILL RECENT DEMOGRAPHIC AND DEVELOPMENT TRENDS CONTINUE IN THE FUTURE, OR WILL NEW ONES EMERGE?

Allison Yoh (Moderator), Post-Doctoral Scholar at the UCLA Institute of Transportation Studies and the Ralph & Goldy Lewis Center for Regional Policy Studies

Yoh characterized our present situation as one of great uncertainty: we have an upcoming election likely to bring about new policy directions, fiscal crises in both the public and private sectors, as well as changing urban demographics. This session is concerned with what the future is likely to hold, as well as how to respond effectively, and **Yoh** hoped that these speakers will shed some light on how we might avoid future foreseeable crises through effective planning.

Out to the Burbs, or Back to the City: What Do Upcoming Demographic Waves Portend for Metropolitan Areas?

William A.V. Clark, Professor of Geography, UCLA

Clark does not believe that population growth will move out to the suburbs *or* back to the city, but rather in the exurbs. No matter what kinds of innovative planning policies we adopt to encourage Smart Growth or higher densities, the sheer number of additional inhabitants, as well as the demographic characteristics of the future population, will place great pressures for growth on the exurbs.

Population growth worldwide will likely end this century. **Clark** points out that the 20th century has been full of population and demographic change. We began the century with a population of 1.6 billion, and ended it with a population of 6.1 billion. Over the past 100 years, improving health conditions and living standards worldwide (albeit not equally across the globe) led to a decline in the death rate of many countries, as well as an eventual decline in fertility rates. However, the significant time lag between these two led to a rapid increase in the world's population. But as this generation ages and as global health and living standards improve, birth rates decrease, and population growth will eventually decline. This effect, known as the demographic transition, will continue throughout the 21st century, and eventually lead to zero population growth worldwide. We have seen this already begin to occur in developed countries (save for the U.S.), and the trend will soon manifest itself in the developing nations. **Clark** points out that even China, a rapidly developing nation, has begun to consider the demographic ramifications of industrialization, particularly economic growth fueled by immigrant labor.

Slowing population growth will lead to greater shares of older people than younger people. This coming gray dawn will be a driving demographic force. However, growth will not end until about 2070, and our central task will be to accommodate the increase in the population during the next 60 years, and then to have it taper off. In particular, while some European nations have already experienced some of the implications of an aging population, the United States will see prolonged population growth, due primarily to immigration. By the year 2050, forecasts predict

a nationwide population of 438 million, and this will have considerable implications for new infrastructure that may only be used for a few decades.

In California, the population is predicted to be nearly 50 million by 2030, fueled largely by immigrant populations with higher fertility rates. In particular, high-percentage growth is forecasted for the Central Valley, San Bernardino/Riverside areas, and San Diego. Where will all this growth go? The two classic paradigms are the dense, compact city and the polycentric city. **Clark** believes that this dichotomy needs to end, and that we will need to both expand outward as well as focus on dense development inward.

Clark pointed to a few trends of spatial patterns and travel to support his claim. Migration from the Frostbelt to the Sunbelt continues, as does economic growth in the suburbs. The old system of downtowns and suburbs is being replaced by networks of roads, telephone lines, and computer links. As this decentralization has continued, the wealthy have moved out even further into rural areas. These all serve as evidence that we must expand.

But at the same time, a graying population points to a need for densification. The share of non-work travel as a portion of all trips is now 83 percent. This means that an overwhelming majority of all trips are to a variety of destinations that are likely growing in distance from each other. As people reach their 80s and 90s, their ability to drive diminishes. This will increase the need for other modes of travel that depend on density.

Clark closed by speculating on transportation alternatives. It is perhaps most important that our system be characterized by flexibility, not permanence. Investing in new infrastructure without some sort of pricing system to manage demand may not be the way to go. We must also seriously consider the spatial effect of non-work trips on travel as well as allow for the changing workforce. **Clark** believes that we focus too much on the fixed aspects of transportation planning such as new investments in infrastructure and the journey-to-work. The fixed aspects are becoming less and less important, and we must become more flexible to deal with the coming changes.

Will Recent Patterns in Driving and Transit Use Continue in the Years Ahead? The Case for New Trends in Travel

Steve Polzin, Associate, Center for Urban Transportation Research, University of South Florida

Polzin opened with a few well-known assertions about travel behavior. Travel is a derived demand. Congestion occurs when someone with the freedom, desire, and resources to travel gets in the way of somebody else with the freedom, desire, and resources to travel. On the whole, people do not aspire to travel, but rather they seek the economic and social interactions that travel enables, and this is fundamental to the health of our society. Lastly, growth in income and knowledge fuel the desire to become more specialized in employment, social interactions, and consumption, and this increases travel. **Polzin** believes these are worth reiterating because in the past few decades, planners' goals have changed, and we sometimes seek to restrict mobility without thinking about the ultimate purposes of travel.

Polzin describes numerous trends in demographics and travel to illustrate that transportation needs and challenges in the future will not be the same as in the past. While vehicle miles traveled (VMT) has been growing over the past decades, this growth has been volatile, and we have more recently seen lower levels of growth, and in some cases, a decline. The growth in VMT has been fueled largely by the baby boomers, and as this generation ages, **Polzin** expects VMT to decline as early as 2020. Gender differences in mobility will also be less pronounced, and older baby boomers will travel via automobile at rates much higher than current elderly cohorts.

Changes in household size and vehicle availability will lead to changes in travel demand. Average household size has also stabilized at about 2.61, due to the de-densification of many areas. In addition, **Polzin** is surprised by the declining percentage of zero-vehicle households, which continues to dip below nine percent. Lastly, while growth in auto availability has historically translated into more vehicle travel, the market is largely saturated with automobiles now, and thus the effects of vehicle ownership will be less significant.

Walking and transit use have seen stark declines over the past decade, but this is not likely to continue. Walking's mode share has essentially bottomed out at about 3 percent, although this largely does not account for recreational walking. Transit use hit a low in 1995, but has gained modest increases since 2001.

A common misconception is that urban decentralization leads to greater trip lengths and is thus a significant contributor to growth in VMT. **Polzin** debunked this myth with a pie chart showing the contributors to VMT growth in the past quarter century. Trip frequency was responsible for nearly half of all VMT growth. About a quarter was due to population growth, and only 10 percent was due to greater trip length. Thus it is not so much that trips are getting longer, but rather that people are taking more trips.

In the future, **Polzin** expects real income growth to be a powerful explanatory variable in travel growth. While historical factors contributing to income growth, namely the addition of women to the workforce, are not likely to grow any further (due to saturation), we are likely to see new sources of income growth come into play. Income growth has not occurred equally across income distribution, and the type of growth in travel depends greatly on whether the rich get richer (e.g. air travel) or if the poor get richer (e.g. more trips to Wal-Mart). In addition, the effect of technology on income growth remains unknown.

Polzin cautioned the audience about inferring who might live in high-density areas in the future. Increasing specialization and rising incomes may mean that future urban dwellers may be richer than in the past. In general, important destinations such as schools, supermarkets, and churches have tended to become larger in size and fewer in number (e.g. more supermarkets and fewer corner stores). This might have an effect on the location decisions of residents.

Transit faces significant challenges regarding ridership and cost-effectiveness. Despite the recent trend of high gas prices, **Polzin's** work shows that innovations in technology can keep up with energy prices so that the end prices to the consumer are manageable. At the same time, we are now investing heavily in public transit, and we are at a point where the costs of building

transit infrastructure have grown higher than the Consumer Price Index (CPI). **Polzin** points to varying the cost per mile for different modes. A typical transit trip on a bus costs the public about \$0.95, whereas light rail costs about \$2.20. Private auto travel is much lower, at about \$0.40 per mile. Transit's productivity has declined over the years, and questions remain as to whether these new investments will translate to greater productivity. Lastly, as our vehicle fleet approaches zero emissions, will building transit still result in a net social benefit in terms of air quality and energy?

Transportation planners too often focus on the urban aspects of travel. The environmental effect of the average vacation is equal to a 10-mile annual commute. Thus, if urban dwellers who walk to work take three to four average weekend trips, their net environmental impact is zero. In addition, the growth of cross-country travel is quite large, and this is due to the concentration of growth in certain states (e.g. California). We often talk about growth boundaries for urban areas, but not so much about growth within states. **Polzin** suggested that more equal growth across the country might reduce a significant share of this environmentally significant cross-country travel.

A Developer's Perspective: What Drives the Evolution of Travel and Urban Form?

Randall Lewis, Executive Vice President, Director of Marketing, Lewis Operating Corporation

Lewis described that he is a developer operating primarily in the suburbs, especially in the Inland Empire, and thus his experience is biased towards those areas. He opened by describing a greater demographic heterogeneity in their market – there are fewer large families, as well as more households with singles, one-parent households, retirees, and unmarried couples. There are also smaller households, greater ethnic diversity in the suburbs than as compared to the past, as well as more jobs. In addition, there has been declining school enrollment in many communities. **Lewis** talked about the dynamics between transportation and the real estate industry, and suggested a greater collaboration between practitioners in both fields.

How has transportation affected the real estate industry?

- Transportation and proximity to work are now in the top three factors in residential location decisions, possibly even more important than the quality of school districts
- In order to reduce commute times, people are shifting back towards residential areas that are closer to jobs. This often means moving from a large house to a smaller apartment, simply to be closer to work.
- People are also driving smaller cars, and even more motorcycles. This presents challenges to developers, as they are now unsure of whether to plan communities around large SUVs or Priuses. **Lewis** echoed previous speakers' calls for flexibility.
- More people are working at home, especially part-time workers.
- People are taking fewer discretionary trips. This tends to hurt high-end restaurants and performing arts theaters, which often draw in people from long distances (which people are foregoing to travel)
- Transportation is playing a larger role in determining the winners and losers for cities seeking to draw industry. In particular, as transportation costs rise for the logistics

industry, cities that are closer to the ports tend to succeed while those farther away are not doing so well.

- Homeowners are much more likely to commute longer distances than renters. **Lewis** has observed high percentages of owners commuting from their communities in the Inland Empire to Orange County or Los Angeles. These percentages are much lower for renters.

How has the real estate industry affected transportation?

- There have been greater efforts towards compact building design. This is not occurring wholly in response to transportation, but also changing lifestyle choices and green issues.
- The development community is realizing the benefits of mixed use, infill and transit-oriented development, and more of these types of projects are being built.
- Developers are also trying to consider how they might lower transportation costs for their customers. The result is building in more facilities like gyms, community centers, and clubs located within planned communities to reduce travel time and distance. Developers are also thinking more about telecommunications and are providing home offices and business centers.
- As demographics are changing, developers are trying to understand how residential preferences and travel behavior will change. Amenities are also changing – trails have replaced golf courses as important amenities.

Lewis suggested that transportation professionals and real estate professionals could benefit each other, as well as those they intend to serve, by forming a tighter collaboration. These two sectors are not as separate as they might seem. **Lewis** also recommended that transportation professionals embark on more educational campaigns to promote better public understanding of these issues, as well as to garner support for more funding. Lastly, **Lewis** admitted that he does not completely understand the potential of buses and trains, but he knows that they hold great potential.

Lewis stressed the sense of urgency surrounding many prominent issues such as climate change. If we are ever to implement solutions, we need to think outside of the transportation industry. We also need to consider the synergy of these solutions, and market the non-transportation benefits of what might be considered to be solely transportation investments. This is the only way to get the resources we need.

Discussion

Mark Brucker of Mark Brucker Consulting asked why California's growth rate will slow if immigration is expected to continue. **Clark** clarified that he expects the population growth to slow after the mid-21st century due to the demographic transition effect. While immigrant populations (particularly Mexican immigrants) have higher fertility rates, this figure is declining, and **Clark** expects this trend to continue.

Emanuel Fleuti of the Zurich International Airport described Switzerland's experience with transportation policies over the past 30 years. In the 1980s, everyone wanted to live near transit. The release of plans for new transit routes resulted in an almost overnight doubling of land prices

along those corridors. However, even Switzerland has had to cope with outward development, mega-malls, and supermarkets. In these environments, people must travel long distances to meet their needs. In some cases, there has been excess travel, and Swiss policy makers introduced parking fees to reduce auto travel.

Hasan Ikhrata of SCAG asked **Lewis** if SB 375 will have a positive, negative, or neutral effect on his business. **Lewis** confessed that he is not sure, and does not believe that anyone really understands what SB 375 will mean for the development community. In addition, the effects of SB 375 will be different for residential, commercial, and industrial projects.

Robin Blair of the Los Angeles County MTA wondered what will happen if transportation costs more than double again (such as a rise in gas prices to \$8 a gallon). **Polzin** was surprised that, given the cost of fuel, VMT has only decreased by 3 percent. This suggests that people are captive to their existing energy use and cannot easily change their behavior. In the long run, **Polzin** suspects that the important questions will be regarding the magnitude and pace of changing energy prices and what alternatives people will have. If energy prices increase slowly, then improving vehicle technology will likely dampen the effect of those higher costs. **Polzin** added that the average person changes his or her residential location every four years, and this represents a chance for changing travel habits. **Clark** added that gas prices in Europe are much higher and Europeans still do not change their travel behavior very much in response to price.

Brian Taylor of UCLA pointed to Ken Small's research showing that, in response to changing fuel prices, people have been less responsive in terms of travel behavior but more responsive in terms of the vehicles they buy. **Taylor** also noted that in 2000, households only spent about 2 percent of their total budget on fuel. Even with high gas prices, that figure is estimated to only be about 3 percent now. Overall, households spend about 20 percent of their budget on transportation, so fuel is a small percentage of total expenditures.

Polzin highlighted the relative unimportance of commuting. Nationally, 26 percent of households have no workers, and given another 4 percent who work at home and the effects of cyclical unemployment, we should really focus on the other travel purposes.

Michal Moore of the University of Calgary asked how we might implement flexible transportation systems, given that financing generally flows to more fixed infrastructure.

Polzin explained that the issue is even more complex. On a national scale, it is difficult to scale transit to the point where it is economically and environmentally efficient. We cannot always assume that it is the best use of resources. The average bus carries 11 people, and while we are hopeful that we can use policies to increase this number, current trends are pushing it downward. In order for transit ridership to rise, there must be fundamental changes in the cost structure. A key motivation for investing in fixed-guideway transit is that it will induce development, but cities build transit systems for political reasons as well. For many people, having rail transit has community value, and while this is fine, we as transportation professionals must ensure that it is improving mobility as well. **Lewis** added that a sharp increase in gas prices to \$8 would be akin to a 7.5 magnitude earthquake.

Carol Whiteside of the Great Valley Center asked why all the talk has focused on density based around transit and not smaller cars. **Polzin** responded by predicting a revolution in the vehicle industry, and he hoped that a similar change will come around for transit. There is great demand for mobility, and innovations in technology can change our vehicles to adapt to demand. The average car is retired at 16 years, buses last about 12 years, and rail cars last 40 years. These life spans need to be accounted for when deciding which technologies to adapt. **Lewis** expressed strong interest in a suburban model of carsharing. We know it works in dense urban areas like Seattle or San Francisco, but is there any example in suburban settings?

Jody Litvak of the Los Angeles County MTA noted that her agency is focusing on high-capacity fixed-guideway transit systems. But given an aging population and the need for flexible systems such as jitneys, she wondered who will operate the transit vehicles 50 years from now.

Polzin stressed that the next generation of the elderly will be different than the seniors of today. By the time that the baby boomers age to the point that they cannot drive, it is unlikely that they will shift to transit. Rather, **Polzin** predicted that they will rely on other means of mobility such as paratransit or family members. But because of declining family size and population, it is less likely that these seniors will be close to the people they might rely on for transportation. Thus, there may have to be a stronger institutional role to enable the mobility of the elderly. **Clark** added that there is some evidence supporting a stronger family role in providing care for the elderly. Some older children move back to be near their parents, or elderly move towards the family. This is largely driven by the need for mobility.

Dario Hidalgo of EMBARQ noticed that the development industry seems to be moving faster than the data reflects. It seems like the government could play a more proactive role by investing and providing subsidies for smarter development, rather than the current reactionary approach.

Polzin clarified that transportation is not the sole driver of changes in the development industry. Other issues like the rising costs of utilities and climate change are creating greater demand for smaller homes and denser environments. In addition, people move to different communities in their lifetime to match their lifestyle needs. **Clark** similarly disagreed and thinks the development industry is well-aware of the changing demographics and is adjusting itself by providing more mixed-use projects.

Arnold Sherwood of the Institute of Transportation Studies noted that Smart Growth incentives have largely not worked, and asked **Lewis** what government incentives might work for the private sector. **Lewis** explained that sometimes a carrot is needed, and other times a stick. In many cases, government simply needs to *allow* development, as zoning often prohibits density. Some jurisdictions, such as the City of Chino or Riverside County, are progressive and have relaxed regulations. Another issue is how to get jobs to where the people live – we need to consider what motivates residential location decisions.

Walter Siembab of Siembab Planning Associates agreed with **Polzin's** point that there is simply not enough money to scale up transit to an effective level of service. **Siembab** noted that a recent study of the South Bay revealed that most trips are less than 4 miles long. In response, a neighborhood vehicle policy was adopted (small vehicles that can only travel 25 mph), but they

have experienced significant barriers to entering the market. **Siembab** hopes that neighborhood vehicles might exemplify a flexible transportation solution as well a new model for preserving mobility for seniors.

Clark reinforced the importance for flexible transportation systems. Jitneys, with semi-fixed routes, are prominent examples of such ideas. **Siembab** sees neighborhood vehicles as a crucial component of a healthy neighborhood economy and Smart Growth. **Polzin** noted that growth in income can enable households to have a spectrum of vehicles to accommodate different trip lengths and types. For those short neighborhood trips, we could scale down vehicles to hold one or two passengers without compromising the ability of those cars to serve the purpose of the individual trip. This could be just as efficient as transit. **Polzin** added that a car sharing service could provide other types of vehicles for much less frequent needs. **Lewis**, a parent, joked that he would love it if teenagers could only travel 25 mph.

SESSION 3: THE TRANSFORMATIVE EFFECTS OF TELECOMMUNICATIONS ON ECONOMIC AND SOCIAL LIFE: IMPLICATIONS FOR HOUSEHOLDS, TRANSPORTATION, AND LOCATION

Susan Handy (Moderator), Professor, Department of Environmental Science and Policy, University of California, Davis; Director, Sustainable Transportation Center, University of California, Davis

Handy opened the panel by noting there is little doubt that telecommunications will have some effect on travel, but we just do not know what effect that is. The questions to consider are what telecommunications are doing for travel today, what is going to happen in the future, and how will technology change in the future.

If Telecommunication is Such a Good Substitute for Travel, Why Does Congestion Continue to Get Worse?

Pat Mokhtarian, Professor, Telecommunications and Travel Behavior Research Program, Institute of Transportation Studies, UC Davis

Mokhtarian explained that she is interested in the question of why congestion continues to get worse if telecommunication is such a good substitute for travel. She noted that telecommunication is not new; saving travel was a motivating factor for developing communication technologies since the 1800s. Phone calls are increasing in number, but if there were a substitution effect, congestion would have disappeared by now. Yet VMT and airline travel have gone through the roof.

According to the Texas Transportation Institute, we have gone from 0.8 billion hours of congestion delay in 1982 to 4.2 billion hours in 2005. She cited five reasons why information and communication technologies (ICT) do not decrease travel:

1. **Not all activities have a technology counterpart.** Co-location of people is sometimes necessary; hair-cutting, for example, will never be done remotely. Also, people sometimes need to be in specific locations. Gardening, cleaning the house, and plumbing are examples of functions that are place-dependent.
2. **ICT is not always feasible because the infrastructure is lacking.** Internet grocery shopping, for example, is not available everywhere.
3. **ICT is not always desirable as a substitute.** Location amenities exist, and co-presence with other people is often important for relationship development. In addition, travel offers side-trip and trip chaining possibilities, a sense of escape, a departure from routine, authenticity, and even a sense of status that ICT does not.
4. **Travel carries some positive utility.** Not all travel is a derived demand; some is autotelic (undertaken for its own sake). Perhaps a good deal of the travel that we do anyway fulfills some of our autotelic desires.
5. **Not all uses of ICT replace travel.** The alternative may not be traveling to the activity but rather not conducting the activity at all. Mokhtarian discussed a Communication Pie that suggests that although certain types of ICT-substitutable travel are decreasing, overall travel is increasing.

Mokhtarian said there are seven reasons why ICT may be actively increasing travel:

- 1) **Time saved by ICT is replaced by other activities.** Some of these may involve travel.
- 2) **ICT allows travel to be sold more cheaply.** For instance, ICT makes price comparisons and last minute bargains possible.
- 3) **ICT increases the efficiency of the transportation system.** Lowering the monetary and time cost of travel increases travel demand.
- 4) **ICT increases the productivity or enjoyment of travel time.** Being able to talk on the phone or work on a laptop enables or induces more travel.
- 5) **ICT directly stimulates additional travel.** Mobile phones are used to schedule meetings, for example. Just-in-time manufacturing and the associated movement of goods is also technology-enabled.
- 6) **ICT drives increasing globalization of commerce.** This occurs through lowering information and transaction costs and requiring movement of more goods and people.
- 7) **ICT facilitates shifts to more decentralized lower-density land-use patterns.** However, facilities themselves are centralized. Mokhtarian pointed out that we cannot have skyscrapers without telephones for communication. Technology's effect is neutral, but we have a personal and collective choice in how it is applied.

In conclusion, Mokhtarian posed the question of whether there was any hope for ICT to reduce travel. Sometimes ICT does substitute for making a trip, and telecommuting appears to have a net benefit but it is not as popular as many expected it to be. ICT has an insignificant net effect, however, since substitution is likely cancelled out by additional ICT's trip generation. ICT also consumes time and money. Extreme events or higher gas prices tend to increase telecommuting, but only in the short term. The challenge, Mokhtarian said, is to minimize travel's negative externalities, and in that effort, ICT can work with us or against us.

Edge City: Life on the New Frontier

Joel Garreau, Author of *Edge City: Life on the New Frontier*; Principal, The Garreau Group

Garreau posed the question of whether there is any reason to have cities in the future. Given the networked computer, some think individuals will be able live in isolation, except to breed. But we are social creatures, **Garreau** said, and this means we will travel.

Cities have always been shaped by the most state-of-the-art transportation technology of their time, and this is currently the networked computer. **Garreau** showed an illustration of the Los Angeles region to illustrate that most white-collar jobs are concentrated not in downtown, but in edge cities. This is occurring elsewhere, too. For instance, the John Wayne edge city is now bigger than downtown Seattle. More white-collar jobs are found in northern New Jersey than in all of downtown Manhattan, and there are more white-collar jobs in New York's edge cities than in all of midtown.

The emergence of edge cities is nothing new, **Garreau** said. Old city centers—such as Jerusalem's—which were built in the days of shoes-and-donkeys technology, lost out when ocean freight and horse-drawn wagons arrived, facilitating edge cities. The first edge cities appeared in the Boston area. As transportation technology evolves, we move outward and do not rebuild. The jet age of the 1950s, for example, caused many changes in Dallas, Denver, Los Angeles, Houston and other metropolitan areas. If Chicago were hit by an earthquake, the airport area would probably be rebuilt before downtown because of its economic importance. Similarly, most jobs in the San Francisco Bay Area are outside Oakland and San Francisco, and are instead in Silicon Valley and the Interstate 680 corridor.

The best way to anticipate the future is to invent it yourself, **Garreau** argued. The networked computer is going to change the purpose of cities more quickly and more pervasively than the auto did. **Garreau** has counted 87 types of real estate that have already changed because of the computer: from bookstores, half of which have disappeared because of Amazon, to old discount markets that have lost out to Wal-Mart, and have instead been converted to Starbucks.

Despite these changes, agglomeration is still necessary. Although 95% of a supermarket's shrink-wrapped or flash frozen products could be mailed directly to the consumer, many people want face-to-face contact; they want to see their produce and test it. But supermarkets are changing, **Garreau** said. He showed a picture of Whole Foods turning into a restaurant. Prisons, too, could change. Many criminals do not need to be incarcerated; they just need to be tracked electronically.

Garreau discussed Moore's Law (that predicted that computer power doubles every 18 months), and pointed out that there have been 31 doublings in transistor power up until now, such that an iPhone has as much computing power as the entire Air Force Defense Command Center did when Gordon Moore developed his law. This is in contrast to the 14.5 doublings that railroads saw between 1840 and 1910, and which radically changed everything. Unlike the railroads, **Garreau** said, information technology has far fewer limitations—which are the laws of physics and our own willingness to shape our futures.

Even though technology could facilitate individuals' isolation from one another, agglomeration is necessary, **Garreau** argued. As an example, there is still value in the physical presence of universities since learning is an interactive process. Similarly, people go to malls because they like the experience even though they can buy clothes online. Even in office buildings, meetings at the water cooler—impossible online—can result in serendipitous information sharing.

The bottom line, **Garreau** said, is that the technologies that shape cities have equal and opposite effects. The car let Manhattan get denser at the same time that it facilitated Los Angeles. Information technology encourages concentration and simultaneously dispersion, too. **Garreau** said culture and the face-to-face enclaves that Class A downtowns (such as Boston, Washington, San Francisco, Portland, and Seattle) offer will continue to lure people, whereas Class B and C downtowns may have a harder time. There are shocking changes taking place, which **Garreau** called the Santa Fe-ing of America. The fastest appreciating metropolitan areas include Wenatchee, Washington and Provo, Utah, both cities near recreation that are not urban but which offer urbane benefits (such as sushi).

Places that are good for face-to-face contact will survive, **Garreau** said, and those that are not will die out. Savannah, and Marrakesh (Morocco) are growing like crazy, but megacities are over, **Garreau** argued. He quoted Leo Marx's statement that what we're trying to do is reunite our lives so that we can live, work, play, and pray... in the places we enjoy. Cities will always be needed, **Garreau** concluded, but the reasons for our needing them are changing.

Discussion

Robin Blair of the Los Angeles County MTA asked whether it is cheaper to build edge cities than to rebuild downtowns, and if the development was a function of providing housing for a growing population. **Garreau** answered that edge cities are not always cheaper. Some of the new edge cities have high percentages of young people because they understand the importance of what the edge cities have to offer.

Nathan Smith of Caltrans asked if any studies have been conducted on whether hands-free laws have precipitated any sort of mode shift from car to transit, where people can talk and text. **Mokhtarian** replied that people might be drawn to transit so they can get more work done but at the same time some people just love driving and will always drive. Still, en-route productivity will be a selling point for transit. **Garreau** added that he thinks texting will die out as technology brings forward voice-in, voice-out capabilities that enable you to talk to your car, and allow it to talk back.

William Clark of UCLA asked how major cities' cultural capital factors into **Garreau's** argument. **Garreau** reiterated that technology allows us to be urbane without being urban and contrasted urban Albuquerque with urbane Santa Fe, which has its own opera. **Clark** countered that the Santa Fe opera is not the same as what you would expect to find in Los Angeles. **Garreau** responded that opera is an exotic attraction and example.

Jesse Glazer of the Southern California Federal Highway Administration said he has telecommuted a lot over his career and noted that the journey to work is a rite of passage. Glazer wondered if more face-to-face contact will be replaced as the younger Web 2.0 generation comes of age. **Garreau** replied that to displace face-to-face preferences, oil prices would need to skyrocket and stay high—an unlikely scenario. Garreau added that he thinks the power of lust is sufficient to keep face-to-face contact alive.

Kathryn Phillips of the Environmental Defense Fund noted that some older downtowns are being replaced because of natural disasters and environmental problems. She asked **Garreau** if some edge cities will, in effect, become the central city due to the need for people to find a livable place. **Garreau** said he expects climate changes to modify settlement patterns. There are three steps of edgification: 1) people move out to the suburbs but still go downtown to work and shop, 2) malls move to the suburbs but people still go downtown to shop, and 3) jobs move out of the downtown area. A new generation of edge cities exists whose recreational opportunities attract newcomers, who then ask themselves why they shouldn't also work in those places since technology enables them to. **Phillips** wondered what would happen if those places don't have the resources to maintain themselves. **Garreau** said that they will simply die.

Walter Siembab of Siembab Planning Associates asked about barriers to the adoption of technology and said he thinks that institutional barriers are huge. **Mokhtarian** agreed that it is an issue but said she was primarily focused on individuals' decision-making and for individuals it is often simply a choice not to telecommute.

SESSION 4: HOW CAN INTELLIGENT TECHNOLOGIES HELP TO SOLVE OUR URBAN AND TRANSPORTATION PROBLEMS IN THE YEARS AHEAD?

Joan Sollenberger (Moderator), Division Chief, Transportation Planning, Caltrans

This session was primarily concerned with the state of technological capability, the implementation of such systems, and the challenges and policy questions we face for the future. **Sollenberger** opened by saying that the topics of today will build on the introductory themes from the previous sessions. We live in an era of rapid technological change, and we have great hopes for technology to help us deal with transportation issues, especially greenhouse gas emissions. She expressed hope that tools such as Geographic Information Systems (GIS) might help us develop the robust tools that **Martin Wachs** described.

Intelligent Planning and Institutions: The Role of Performance Measurement in Achieving Public/Private Cooperation

Tom Horan, Executive Director, Claremont Information and Technology Institute, Claremont Graduate School

Horan opened with two quotes. The first, by Mark Warner, points out that transportation is one of the least innovative sectors of the economy and transportation/information technology innovations could yield significant benefits to society. The second quote, by the National

Surface Transportation Policy and Revenue Study Commission, stresses the need for better transportation performance data. **Horan** believes that information technology (IT) and Intelligent Transportation Systems (ITS) can both drive the development of transparent performance metrics and spur innovation and cooperation. **Horan** stressed four key points.

1) Over the decade and a half of public ITS expenditures, there have been a range of accomplishments in achieving positive traffic management impacts. **Horan** points to the example of the NaviGator System in Atlanta, Georgia, which employs a variety of technologies such as traffic management centers, advanced traveler information systems, and an incident management system. All of these innovations have contributed to a measurable decline in incident duration and delay, as well as total crashes. The program has a 4.1 to 1 benefit-cost ratio.

2) While the ITS program has become mainstreamed into the federal aid program, the overall pace of deployment has been modest with only 6% of roadways being instrumented. ITS systems are indeed very valuable, but have seen limited implementation. In the past, experts predicted that all regions would have ITS by 2010, but only one-third of the 100 major metropolitan areas currently have these programs. The pace of ITS adoption has been described as glacial. In addition, transportation agencies have limited data collection abilities, and there is usually a long delay. Private sector firms, in contrast, often have a variety of performance metrics that are available almost instantly.

3) Given the relative lag in the use of IT to improve transportation system performance and innovation, there needs to be a more sustained focus on ways to accelerate this use, including leveraging private sector innovation and resources. There are two phases of ITS implementation. The first occurs largely within the public sector, while the second involves a greater role of private sector investment and innovation. Over the past few years, there have been more and more of the latter such as OnStar and INRIX.

Furthermore, **Horan** presented three major institutional reforms to encourage more IT/ITS development. He first proposes a third-party National Surface Transportation Performance Monitoring Service to credibly assess system performance at the regional, state, and national levels. Secondly, **Horan** believes that a Surface Transportation Technology Innovation Foundation can better accelerate public and private innovation in implementing IT than the U.S. Department of Transportation currently does. Lastly, a restructuring of the currently fragmented national transportation research program is needed to better align transportation needs and gaps in research.

4) The direction should be toward a Systems Intelligence capability that facilitates high performance transportation projects and the use of IT and ITS to achieve this high performance. Again, the private sector has been more innovative in implementing IT, and the information that these systems provide allows companies such as Amazon.com to improve their modus operandi. Such programs do not exist in surface transportation, and a greater implementation of ITS can help deliver the necessary information.

To illustrate the type of new system he envisions, **Horan** demonstrated SafeRoadMaps, a project he is currently involved with. SafeRoadMaps is a web-based (<http://www.saferoadmaps.org>) GIS mashup that communicates traffic safety information for any community in the country. The system is easily accessible, intuitive, and utilizes existing datasets that would otherwise be archived. **Horan** also gave a demo of Minnesota SafeRoadMaps, which maps where DUI offenders reported having their last drink. These bars are displayed as either green or red dots; green indicates that the establishment offers a free taxi ride home, while red marks bars that do not. **Horan** hopes that such systems that communicate performance data in an accessible way will, in turn, create a greater demand for performance information as well as changes in policy.

Intelligent Vehicles and Roads: The VII Program and the SafeTrip-21 Initiative

Greg Larson, Chief, Office of Traffic Operations Research, Caltrans Division of Research & Innovation

Larson explained that he is more of a technologist than a policymaker, and hopes that sharing the following information with a policy-oriented audience can help implement complementary policies with these technologies.

The basic concept of VII is a nationwide, roadway-based communications network. All new vehicles would ideally be equipped with in-vehicle displays, GPS receivers and dedicated short-range communication radios (DSRC). This would allow vehicles to communicate with a similar system of roadside equipment. Communications within the network would be sent to a backhaul network from which to launch a variety of subscriber applications. The VII team conceived of over 100 applications such as intersection collision avoidance, traveler information, electronic toll collection, and customer relations management.

However, as the VII system developers progressed, it became evident that the nearly \$10 billion project of roadside DSRC is currently too expensive to implement. Thus, the SafeTrip-21 program was born. SafeTrip-21 is essentially a demonstration program of VII which seeks to implement some of the VII concepts with existing communications technologies such as Wi-Fi or the 3G network (and thus avoid costly investment in DSRC). The idea is to expose travelers and decision makers to the benefits of VII (like improving safety, mitigating congestion, and conserving energy) with after-market technologies in the hope of generating momentum to invest in a more comprehensive network in the future. SafeTrip-21 will soon enter the field-testing stage in the San Francisco Bay Area, and interim findings will be released as they become available. The field tests will include two main programs: Mobile Millennium and Networked Traveler.

Larson describes Mobile Millennium as an inch wide and a mile deep. The program builds off an experiment by UC Berkeley, Nokia, and Navteq to collect traffic data from GPS-enabled cell phones. The six-month program will collect position and speed data from participating drivers (while protecting privacy and employing hands-free operation). The project is alluring because it employs equipment and networks that are already in place, eliminating the need for Caltrans to invest in infrastructure. In addition, the use of GPS systems allows Caltrans to collect data on major arterial streets, not just highways.

In contrast, **Larson** describes the Networked Traveler program as a mile wide and an inch deep. The idea is to utilize the traffic data from Mobile Millennium for personalized traveler services. Users will be able to download applications onto their Smartphone that will include such features as dynamic trip planning, real-time road safety information and pedestrian safety initiatives. Furthermore, additional information will be provided to transportation agencies that will help improve operations.

Intelligent Travelers: Promises and Challenges

Melanie Crotty, Director, Traveler Information & Coordination, Metropolitan Transportation Commission

Crotty began with a description of the Metropolitan Transportation Commission's innovative 511 traveler information program. 511 collects and centralizes multimodal transportation information (including real-time information) for travelers as well as other transportation agencies and the private sector. 511 also serves as the go-to place for information in times of emergencies, and usage has spiked during such events as the MacArthur Maze collapse, Bay Bridge closures, and extreme weather events. But while 30 percent of 511 users change some aspect of their trip after using the phone- or web-based services, only six percent make a mode shift.

The 511 program's annual operating cost is approximately \$11 million. This includes heavy investments to collect real-time freeway and transit information, something rather unique to the 511 program. While the capital and operating costs to collect this information are substantial, this has paid off in terms of high system usage. **Crotty** explained that there has also been an expectation that the private sector would come in and contribute to these efforts (and defray costs) with a variety of business models, but this has not happened.

Still, the private sector has been doing some interesting things with the data that 511 collects, and **Crotty** points to recent promising trends in the use of communications technologies. Cell phone ownership is now at 90 percent nationally, and text messaging has overtaken the number of cell phone calls. In addition, cell phone ownership is high among households making less than \$30,000 a year (about 61 percent). At the same time, the market share of Smartphones enabled with GPS receivers and open platform application programming is growing. These trends allow the information that 511 collects to be more widely and readily available to Bay Area residents. **Crotty** also sees great potential in phones with GPS receivers to serve as both providers and receivers of information.

Google Maps has also been providing real-time traffic information and more recently, trip planning assistance for transit, biking, and walking. Google Maps duplicates many of the services that 511 provides, but Google has explicitly stated that they do not want to be the primary distribution channel of traveler information. 511 has competitors other than Google Maps, but **Crotty** sees this rise of the private sector's role as favorable.

What does this mean for the role of the public sector in the future? **Crotty** questions the current model where public agencies collect, process and disseminate information. Since the private sector is now poised to take a greater role in delivering traveler information, the public sector could reduce its role to simply collecting and processing data. In the long run, as GPS-enabled devices become more ubiquitous and their data gathering and processing capabilities grow, the public sector might even want to consider withdrawing from the traveler information market altogether.

Still, the public sector has two advantages over the private sector with regards to traveler information: the stability and continuity that the public sector provides ensures that information will always be there *and* available to one hundred percent of the population.

Crotty closed by presenting a few policy questions that she will be grappling with in the near future with regards to a reduced role for the private sector in the traveler information market.

The growing trend towards road pricing will require that the public sector collects real-time and ubiquitous traffic information. If the public sector reduces its role in collecting data, how will this information be provided and guaranteed to be accurate?

A second concern is equity. Even though cell phone ownership is high across income levels, aging portions of the population tend to be more isolated from adopting new technologies. In addition, how will the need to provide information in multiple languages be worked out in the marketplace?

Lastly, there is a need to guarantee a message channel to the public in time of emergencies. Will the private sector be able to fill this role in the future as well as the public sector has done in the past?

In order to answer these questions, public officials should continue to monitor trends in traveler information and consumer adoption of new technologies, and ensure that all concerns are met.

Intelligent Movement of Goods: Will Trucks/Trains Be Able to Operate More Efficiently?

Jesse Glazer, ITS Engineer, Southern California Federal Highway Administration

The efficiency of goods movement is limited by congestion at the ports, on the roadways, and on rail lines. **Glazer** began by describing the scale and sources of congestion in California.

California is a populous state with the eighth largest Gross Domestic Product in the world. This economic activity leads to a great deal of travel and congestion. According to the Texas Transportation Institute, California's cities experience some of the greatest congestion delays in the country. In addition, the combined Ports of Los Angeles and Long Beach are the busiest in the nation, and the combination of their activity and location in the center of a major urban area makes California number one in freight traffic. In addition, current projections predict that demand will triple in the next twenty years. **Glazer** asks if supply will be able to meet demand.

In addition, California experiences the greatest levels of air pollution in the country. Environmental concerns and air quality conformity requirements place severe restrictions on adding new roadway capacity. The decentralized institutional landscape in California also makes consensus difficult to achieve and complicates the planning/programming process. **Glazer** points to the example of Southern California, where counties, metropolitan planning organizations, regional transportation planning authorities, and Caltrans districts are all out of alignment with one another. Decisions are made at many levels, and the goals of each agency often conflict. In addition, the majority of funding is concentrated at the local level. This fragmented institutional landscape translates to slow progress towards tackling freight congestion, a regional, if not national, issue.

Technology can help manage congestion by helping agencies to monitor and operate the transportation system, as well as manage demand. **Glazer** does not disagree with **Tom Horan's** earlier point about the low levels of ITS implementation nationwide, but California has a strong freeway management portfolio that includes many ITS elements. With only 12 percent of the nationwide population, California has 70 percent of all ramp meters, 27 percent of M/L detectors, 24 percent of freeway traffic cameras, and about 40 percent of HOV lane miles in the country. Clearly, California does not lag in ITS investment and implementation, especially in the most congested urban areas.

California has a similarly strong portfolio of arterial management systems. Again, **Glazer** stresses that with only 12 percent of the population, California has 41 percent of arterial traffic management centers and 32 percent of intersections with transit signal priority. California also has made significant investments in traveler coordination systems that have paid off.

How can intelligent technology solutions help freight in particular? One way is to provide traveler information for trucks and dispatchers that can reduce port queues and turn times. In addition, communications technologies can better coordinate truck parking and sending away approaching trucks in the case of an emergency at the ports (via a reverse 911 system). In the regulatory realm, technology can help with enforcing safety and weight restrictions, implementing congestion pricing, and monitoring trucks. At a larger scale, technology can help by collecting and disseminating information. In particular, container tracking systems, port terminal scheduling programs, and truck fleet communications can more efficiently manage supply chains and better inform port operators, shippers, and retailers alike.

Multi-modal and multi-organization approaches include electronic freight manifests that can make the supply chain more visible to all parties involved, virtual container programs that reduce the number of trucks without cargo (bobtailing), and goods-movement transportation management systems that can better manage freight movement like traffic management centers do for passenger vehicles. But again, California's institutional landscape is fragmented, and many of these integrated solutions require collaboration with no precedent.

Glazer closed by describing some of the main challenges and policy implications. New technologies can introduce more effective management that is more cost effective than increasing capacity, but these are short-term fixes, and in the long-term something will have to

be done about supply. These technologies are also constantly changing. With so many new innovations on the horizon, agencies must replace these systems every two or three years, and the costs of maintaining skilled employees to manage them are also high. Another challenge that remains difficult to overcome is building and maintaining public/private cooperation. Lastly, while freight is largely a private sector issue, there needs to be a greater role for the freight community in the planning and programming process.

Discussion

Joan Sollenberger thanked the panel for a broad description of where we are in terms of technology, where we are headed, and the challenges and policy questions we face.

Hasan Ikhrata of SCAG noted that the ITS developments have only been possible given a stable funding stream. Now that funding has dried up, **Ikhrata** asked how we will continue to fund ITS. **Glazer** acknowledged the challenge. The size of the federal wallet has indeed shrunk, and he honestly does not know what the future holds. The role of the federal government in ITS is now in question, and whether funding will be earmarked or discretionary remains to be seen.

Michael Fitts of the Endangered Habitats League noted that a high percentage of trips are discretionary and that people make better decisions when they are better informed. PDAs could offer information based on real-time data on the time cost, fuel cost, and carbon footprint of making a trip. This would enable travelers to make intelligent trip making decisions to decide, for instance, if going to Wal-Mart to buy a two-dollar pair of socks might actually be worth it, as well as inform people about the true costs of travel. To what extent has this been explored?

Sollenberger explained how we can use the internet to calculate our carbon footprint, but this does not yet seem possible for individual trips. **Crotty** stated that the technology is not quite there yet, nor has it been integrated to that extent. In the San Francisco Bay Area, the information is available through the private sector and they can make those sorts of predictions, but this is not so for the rest of the country. There is still much work to be done on the basics such as real-time traffic conditions and determining the best possible transit trip. She believes that the private sector may eventually be able to replace the public sector's role in communicating real-time traffic conditions, but that the public sector will have the advantage in providing transit information. Carbon footprints are fairly simple to calculate, but we need the basic inputs first.

Larson noted that the Networked Traveler program includes an environmentally friendly navigation option. They have developed the carbon footprint calculations for transit versus driving trips in New York City, so they have started along this path. But while there still remains a lot to do, it is at the front of their minds.

Emanuel Fleuti of the Zurich International Airport asked **Larson** about the status of using traveler-provided information as a source for real-time information (as a means of using cheaper sources of information). As an example, drivers stuck in traffic often call people at their destination to tell them they will be late. In addition, traffic management centers in Switzerland broadcast very localized traffic conditions on radio frequencies for drivers to use. **Larson**

mentioned that they have not considered those options, and thanks **Fleuti** for the suggestions. **Horan** noted that the ubiquity of the cell phone coupled with the Internet have produced major communications platforms with which to move forward. He does not believe that anyone could have predicted the magnitude of this effect.

Julia Lave-Johnston of the State of California asked **Horan** if they will map bicycle and pedestrian accidents with the SafeRoadMaps project. Since safety is an important concern with these modes (especially for children), more information might help encourage their use. **Horan** understood her concern. He noted that half of the places of last drink are residential locations, and this is an important issue for policy considerations. His group is planning to add pedestrian information, age segmentation, and a variety of other data.

Brian Taylor of UCLA expressed concern over the lack of exposure data provided by the SafeRoadMaps project. It is not so much the absolute number of accidents that is important than the percentage of these accidents of total traffic volume. When providing information to the general public, he stressed the importance of presenting data that can be consumed in an informed way. Without some sort of reference, the public could make erroneous inferences about safety. **Horan** described the future of SafeRoadMaps as not just a means to communicate raw data, but the results of research as well. For instance, they are currently conducting a spatial analysis where the system graphically displays how one intersection might have a significantly greater number of accidents, given its exposure rate.

Sollenberger noted that court lawyers are wary of releasing this data, but that they are moving in that direction. Caltrans has been collecting more detailed bicycle and pedestrian data in response to a mandate to increase their use by 20 percent while decreasing fatalities by 20 percent. She explained that they did not have a baseline, and are making significant investments in California to pay into the National Household Travel Survey. Obtaining more detailed data is necessary to determine the changes.

SESSION 5: THE NEXT GENERATION OF MOTOR VEHICLE SYSTEMS IN A RESOURCE-CONSTRAINED WORLD

Matthew Barth (Moderator), Professor of Electrical Engineering, UC Riverside

This session was concerned with the future of private vehicles in times of rising fuel prices, environmental concerns, and a variety of other issues regarding the resources automobiles require. The panel discussed the potential for alternative fuels, new visions for the private vehicle, and strategies for dealing with carbon emissions.

On the Drawing Boards: How Far Can Technologies and Fuels Currently Take Us?

John German, Manager of Environmental and Energy Analyses, American Honda Motor Company

German began by listing several of the new technologies that Honda and other car manufacturers are considering for their next generation of vehicles—diesel, hybrid, and fuel cell—and argued that all are needed because there is no magic bullet. He cited as an example of a modified technology, Honda's new variable cylinder management system that can run on 3, 4, or 6 cylinders depending on the engine load.

Lightweight materials will also be important for improving efficiency and performance while also reducing necessary engine power. In particular, **German** cited high-strength steel currently being used as well as aluminum, plastic, and carbon fiber. Challenges to overcome in using these materials include safety certification, expense, recyclability, and manufacturability.

German discussed next generation gasoline engines, which are centered on two technologies: camless valves actuation and controlled auto ignition. These allow for combinations of greater power and greater efficiency than conventional auto engines. But the problem with heat loss persists: a lot of energy is lost through heat exhaust and cooling. If heat loss could be controlled, big improvements in efficiency would be realized.

Hybrid system designs, **German** said, come in three basic types: belt driven with a bigger alternator, an integrated motor assist whereby an electric motor is positioned between the electric motor and the transmission (a relatively simple system that Honda uses), and power-split, whereby engine power can be sent either directly to the powertrain or through the generator and electric motor to the transmission. This is a flexible system that is complicated and expensive.

Honda has seen four generations of hybrids, starting with the 1999 Honda Insight. The newest model will be cheaper than previous models. But the improved gas engines keep raising the bar.

Comparing diesels and hybrids, **German** noted that diesels have low-RPM torque which is especially good for towing, and high highway fuel efficiency, but NOX emissions are a challenge; hybrids are more efficient for city driving.

German said he sees a market split emerging whereby hybrids will become ubiquitous in urban areas where their electrical motors are most efficient, and where electrical synergies exist; and diesels will thrive in rural areas and in larger-vehicle applications. But both technologies must slash their costs to be ready for the mass market, **German** said, and hybrids will probably get cheaper faster than the already-mature diesels will.

German then presented findings from an MIT report that by 2030, conventional gas engines will be nearly as efficient as diesels, with a 60 percent increase in efficiency over today's gas technologies. Hybrids will be 2.5 times more efficient than current vehicles. **German** noted that plug-in hybrids would not offer any CO₂ benefits in the U.S. (outside of California) due to the country's relatively dirty power grid. An additional problem, **German** noted, is weight: currently, the number of batteries and amount of hydrogen needed to propel a car as far as it could go with gasoline is very heavy.

In assessing future hybrid potential, **German** stressed that technologies must be compared to future gas engines. Power is important for hybrids and longevity is critical for plug-ins. The

market's size will be small until there is either a breakthrough in energy storage capability or an oil shortage that prompts mass-market acceptance.

German called for greater focus in the industry, saying that too many technologies are being simultaneously developed, which increases costs and the risk of mistakes. The current *tech du jour* approach is extremely disruptive and wasteful.

German also addressed fuel cell technology, recently used on a Honda vehicle (the Honda Clarity). Fuel cell vehicles offer CO₂ reduction and sidestep the plug-in hybrid's problem of grid emissions. Fueling infrastructure could start with natural gas and slowly shift to hydrogen. Like electricity, hydrogen is not an energy source but an energy carrier. **German** said he does not expect either battery or hydrogen technology to replace the conventional internal combustion engine (ICE) for a long time. The future improvements to ICE will raise the bar for other technologies. **German** called on the government to set performance objectives and requirements, saying we need advanced batteries and hydrogen storage capabilities. **German** reiterated that there is no silver bullet and warned against falling into the trap of single solutions.

Current biofuels are problematic; they can cause problems in some cars, and reduce fuel economy and range in others. More compatible fuels are needed. Gasification and pyrolysis (creating sludge that can be refined like diesel) are two promising methods for new biofuel production but it is hard to see how biofuels will be more than one-third of the solution.

German discussed the assumption that fuel prices can reduce VMT, and argued that even though real gas prices were higher in June 2008, efficiency has improved such that—when evaluated under the correct unit of analysis of cents per mile—fuel costs only a little more. But even cents per mile does not tell the whole story: in June, 5 percent of disposable income was spent on fuel, which is historically not high; **German** concluded that it was not the cost but the quick rise in price that spooked people. Looking forward, **German** predicted a flattening of the cost per mile due to gains in efficiency and said that gas needs to be \$6 per gallon just to maintain the current interest in efficiency, and added that he would not count on this for land use plans.

Smaller, Lighter, Smarter: What is the Future of New, Smaller, and Smarter Forms of Personal Mobility?

Geoffrey Wardle, Director, Advanced Mobility Research Center, Art Center College of Design

Wardle remarked that smaller, lighter, smarter types of mobility are personally important to him, and noted that he researches, supports, and advocates for all forms of transportation but particularly integrated systems. He asserted that in many parts of the world, the future of mass transit will remain the automobile, but the automobile must become smarter, lighter, and more ecologically efficient than what exists today. He stressed that we should be moving toward zero consumption of non-renewable energy and a zero lifecycle eco footprint in all our transportation systems. For all this to happen, **Wardle** said the status quo needs to change. Fortunately, climate change is already in the public consciousness and there is an increasing public and corporate awareness about ecological responsibility. Disruptive forces are also needed—and

they are on their way. China and India are emerging as major automotive players in the global energy industry, both as producers and consumers. This development will lead to the end of artificially cheap energy, particularly oil.

Specific disruptive products are also emerging, namely the Tesla, Aptera, and the Tata Nano. These cars are changing the public perception of what is possible, **Wardle** said, and will turn the industry on its head.

But to truly leverage the change, **Wardle** stressed that big-picture thinking and multi-disciplinary collaboration is needed. Planners, engineers and designers need to work across silos. Design, in particular, needs to be looked at as more than just aesthetics. Designers can also facilitate collaboration—they excel at this through their expertise with the creative process. Other disciplines seek the widest range of possibilities at the beginning of projects but not in the middle where this thinking is also needed. We have to balance interests and enterprises while also meeting the needs and expectations of end users.

Wardle introduced the vision integration process, designed at the Art Center, with very large-scale systems in mind. The process begins with the development of a shared vision prior to any policy or engineering decisions. As the process continues, experts and their forecasts are regularly and iteratively consulted so that quality ideas are developed throughout the entire process, and not just at the beginning.

Wardle described a card system to help people in the sustainable transportation industry to understand the complexity of the issues surrounding them. Seven of the cards describe scenarios and four describe the design activities to address certain challenges. He referred the audience to the project's website: www.mobilityvip.com.

Wardle stressed that even the most ingenious, energy efficient, ecologically responsible and economically viable mobility will be a complete failure if the end users do not totally embrace it. Two hurdles exist: first is the auto industry whose business model is outdated. Few car companies in the world consistently make a decent return on investment. The industry is not very innovative, and is therefore unprepared to meet a growing demand for personal mobility in the future. He argued that auto manufacturers need to think of themselves as providers of a total mobility service, not just a manufactured product. The car can be a means to an end but not the end itself. People need to get excited about their mobility experience, and the car industry needs to see alternative transportation systems not as a threat but as a huge opportunity to redeploy its expertise in manufacturing.

Wardle discussed another problem, namely that oil is too valuable a resource, and we have wasted it on inefficient forms of transportation. For every gallon of gas a motorist uses, he or she uses another 20 gallons just to move the car around. **Wardle** cited the need to find renewable alternatives to oil while using oil as efficiently as possible, to encourage land-use patterns that induce less travel, and to develop economic models that do not require transporting goods all over the world.

There is a complex relationship between vehicle operation, manufacturing processes, recycling, and raw materials production, and this presents a major challenge for designers. There is no silver bullet: an energy miracle will not solve urban gridlock, for example.

Reiterating the need to reach the ultimate goal of zero ecological impact in transportation through weight reduction and better driving performance (i.e., less braking and acceleration), **Wardle** argued that achieving this goal would be impossible without developing a ubiquitous autonomous vehicle system. Though contentious, such a car would improve safety by removing the human element; the subsequent improvement to safety would allow such vehicles to be 50 percent lighter, too. In addition, the cars could use bio-mimicked swarming technology to move in platoons at higher speeds, which would have two important benefits: first, a gain in aerodynamic efficiency; second, a greater use of existing infrastructure, which is important given the dearth of infrastructure investment.

Cars would involve an alternative propulsion system, and fiscal incentives would make them smaller: for the majority of single-occupant vehicle (SOV) journeys, a small one seat or two-seat car would suffice. They would also entail a different philosophy of sustainability, whereby vehicles are entirely recyclable, achievable in part through the use of modular design components.

Wardle concluded that in addition to being central to designing vehicles and vehicle systems, designers could be helpful public advocates, by virtue of their abilities to provide terrific visualizations of what the future should entail.

Energy for Vehicles in a Carbon Constrained World: What will it Take?

Perry Wong, Senior Managing Economist, Regional Economics, Milken Institute

Wong noted his interest in the topic of energy efficiency because it enables us to achieve environmental benefits without sacrificing how we prefer to live. He said it is unfortunate that federal policies on energy conservation are lacking, and noted that only 6.4 percent of the United States' energy is renewable, as compared to California's 10 percent and Europe's 40 percent. CO₂ emissions are harder, because unlike energy, CO₂ reduction cannot be achieved only at the local level.

Transportation accounts for about 2.5 billion metric tons of carbon dioxide emissions. Automotive emissions have no good metrics and congestion is a confounding factor. Some technologies for clean tech fuels are very old but have never managed to break through in the marketplace, namely coal liquification and biofuels (except for ethanol).

In the U.S., only six percent of energy consumption is from renewable energy and is not expected to increase much by 2030. Instead, an increase in coal use is expected according to the U.S. Department of Energy. VMT, **Wong** said, is not going to decrease. An increase in travel will occur, not necessarily in the U.S. but in China and India. Beijing, **Wong** said, is very congested compared to just five years ago.

Wong presented a slide showing a tradeoff between environmental impact and economic costs in the alternatives for transportation fuels. Oil is high impact and low cost whereas hydrogen is low impact and high cost. The goal is a combination of different technologies and fuels (for low cost, and low impact). The solution has to be market-based. The solution should not be the preferred technology as chosen by the government but chosen by consumers for economic reasons.

Wind and solar are carbon neutral technologies but are not well-used, constituting one percent and five percent, respectively, of the nation's energy grid. Renewable incentives are not sufficient, and do not offer a long enough timeline for development, testing, and delivery.

Because of the volatility of oil prices, we go back and forth on approaches, **Wong** said. He proposed four principles for energy policy to move forward: 1) reduce fuel consumption through CO₂ pricing, a gas tax, an increase in CAFE standards, or the use of a feebate, while also removing policies that subsidize oil consumption. 2) Diversify supply sources and types, achieved by removing barriers to alternative fuel sources/types, and allow a long enough horizon for technology to grow in clean fuel and technology research and design. 3) Stabilize the availability of resources despite oil price volatility through buying insurance against disruptions, and using strategic petroleum reserves wisely. 4) Use technology in the face of political uncertainty.

We also ought to think of energy in units instead of in gallons to better enable us to use the electrical grid and make it work, **Wong** said. Although it is capital intensive, investment is needed. The grid is very old and segmented. **Wong** argued that the grid needs to be federalized like the highway system, with a single regulator that can adjust rules to allow new investments in high-capacity facilities.

Wong cautioned that an optimum carbon dioxide emissions policy that works in the U.S. may not work in China and India. In considering how to get those countries to buy in to our values of efficiency, we need to build a market-based system that incentivizes participation from the developing world and which manages the initial volatility in abatement cost. The most effective and efficient policy option, **Wong** said, is a hard cap on CO₂ emissions and a global trading system. Although China has been reluctant to participate in Kyoto-style agreements, Chinese cities are looking to participate in a marketplace-based system quickly.

Discussion

Greg Larson of Caltrans thanked **Wardle** for discussing vehicle automation and suggested that cooperative is a better word than autonomous for describing the way in which the vehicles communicate. **Wardle** thanked **Larson** for the suggestion and promised to update the slides accordingly.

Susan Shaheen of the Transportation Sustainability Research Center at UC Berkeley asked about home fueling options and its effect on consumer decisions. **German** replied that demand has exploded. **Barth** added that there are challenges with meeting fire codes and getting permits. The costs are significant, too.

Michael Fitts of the Endangered Habitats League asked if, thanks to technological fixes, we no longer need to be concerned about travel behavior. He also asked if policies are in place to advance these technologies. **German** replied that we need to do everything we can, and added that land use planning now will be important for autonomous/cooperative vehicles in the future. **Perry** stressed the need for a policy barometer to measure change, and said incremental changes will not change behavior as consumer reactions to gasoline prices have shown. **Wardle** added that to get people to change their habits, they have to be enthused about something. Government regulation could give people economic incentives to behave in certain ways, but Wardle suggested it is more important for the private sector to offer compelling solutions and improvements, and for them to do so quickly. **German** pointed out that hybrid vehicles get a lot of publicity but are only two to five percent of the new car market. Most customers are very risk-averse and worry about service and reliability. This is a problem with doing anything dramatically.

Ty Schuiling of SANBAG asked how the emissions of plug-in cars would change if the clean electricity that California uses was available throughout the country. Schuiling also wondered how cleaner coal factored into the analyses. **German** responded that the effects would be substantial, with a 40 percent reduction in CO₂ emissions, but he added that he is not optimistic about the nation's grid getting cleaner because of rising demand, which utility companies are planning to meet by building many coal plants.

Felix Oduyemi of Southern California Edison rebutted that California's grid is very clean and that the national grid will become much cleaner. He noted that the grid is underutilized by about 82,000 megawatts.

SESSION 6: THINKING OUTSIDE THE BUS: THE FUTURE OF ALTERNATIVES TO PRIVATE VEHICLE TRAVEL

Elizabeth Deakin (Moderator), Professor of City & Regional Planning, University of California, Berkeley; Director, University of California Transportation Research Center.

Deakin opened the panel by outlining the roles and strategies of paratransit and carsharing. Technology presents transit with an opportunity to reverse its long declining ridership, and to perhaps compete even in areas of low density and free parking where conventional transit cannot compete. She then turned over the discussion to **Brian Taylor**.

Emerging Markets, Evolving Roles: Lessons from Research on Cost-Effective Ways to Improve Transit in the Years Ahead

Brian Taylor, Professor and Chair of Urban Planning; Director, Institute of Transportation Studies, UCLA

Taylor began by noting that transit ridership has been relatively flat for four decades, though transit patronage is up 16 percent since 2005. Transit use tends to rise in response to increasing auto costs but falls during economic downturns. In 2001, transit ridership accounted for 3.2

percent of all transit trips. **Taylor** highlighted some other important facts about ridership: poor workers in metropolitan areas are 11 times more likely to commute by private vehicles than by transit; and even poor workers without vehicles are 38 times more likely to commute by private vehicles. The transit journey to work is twice as long as by car. An increasing number of trips are non-work, and involve *schlepping*, which works against transit ridership, as does trip chaining. Mode shares are much higher in and around the centers of the oldest, largest U.S. cities. Two markets remain where transit has an advantage over the private vehicle: where parking is limited or expensive and among people who have low income or disability.

Taylor outlined the discussion with a conceptual model that includes regional geography, the economy, population, and the characteristics of transit and the road network. He identified factors as being both external or environmental (such as population, employment, etc.) and internal or policy-based (such as level of service and fare cost). Through looking at factors that predict service supply (size of area, percent voting Democrat) and that explain consumption, **Taylor** concludes that transit ridership is primarily a function of external factors, i.e., natural endowments which determine the quality of service more than other factors. In other words, it's more nature than nurture, **Taylor** explained. Given a natural endowment, service frequency and fare levels are associated with a doubling or halving of transit use in the area. Furthermore, service frequency and fare levels exert far more influence than other factors such as modal availability (i.e. rail versus bus).

Thinking Outside the Bus is important, **Taylor** argued, because passengers view the time spent walking, waiting, and transferring as being between 1.5 and 3.5 times more onerous than the time spent traveling in transit vehicles. This suggests that shaving passengers' wait time by five minutes is equivalent to shortening travel time by 10-15 minutes, and underscores the need to reduce perceived burden of waiting and transferring. Contrary to many expectations, the most important factor in determining passengers' satisfaction is not design, amenities, or cleanliness but the experience of not waiting long for a bus or train.

Taylor next discussed the hierarchy of transit user needs. Once security and safety needs are met, connections and reliability are important; beyond those, facility access, and amenity availability become desirable. The best and most inexpensive way to close the gap between perceived and actual wait and transfer times is to provide certainty, **Taylor** said, through announcing the actual arrival time of the transit vehicle.

Who rides transit is changing. Bus riders have been getting poorer relative to auto drivers. When NYC is omitted from the data, rail riders tend to be higher income and bus riders lower income compared to car drivers. People making bus trips in the U.S. are less white, profoundly poor, and getting poorer compared to rail travelers who are getting wealthier. **Taylor** concluded that bus transit is increasingly a social service for the poor. Even though this is an important and compelling rationale for increased subsidies, this fact is not touted. It remains transit's dirty little secret.

Taylor noted that transit ridership increased 11 percent between 1993 and 2003 but inflation adjusted government subsidies increased by 57 percent. Taylor asked how we can get more bang for the buck, and suggested that too much is asked of transit. Decision makers ought to focus on

problems like congestion or providing mobility for those without, not on solutions like adding a new rail line.

In concluding his opening remarks, **Taylor** said the take home message is that travelers like speed but they like reliability even more, so service providers should increase service frequency and schedule adherence. Agencies also ought to use smartcards to vary fares to reflect costs, which vary considerably with time, direction, and distance. Finally, we must solve the ribbon cutting problem (i.e., policy makers tend to prefer capital projects for the public visibility over improvements to operations, which can sometimes be more useful.) **Taylor** joked that it is hard to have a press event for operating improvements and dynamic fares. How to solve the ribbon cutting problem is the challenge.

Deakin reiterated that as costs go through the roof, it is important to look at providing other options. On that note, **Deakin** introduced **Susan Shaheen**, who has investigated carsharing.

The Look of Carsharing Today: North America and Abroad

Susan Shaheen, Research Director, Transportation Sustainability Research Center, University of California, Berkeley

Shaheen began by defining carsharing as a network of cars and trucks which are maintained by a company or organization and made available to members/customers in a variety of locations. Carsharing allows households and businesses to access the shared fleet on an as-needed basis at an hourly or mileage rate; it also allows individuals to gain the benefits of private car use without the hassles of ownership.

Most of the world's carsharing is in the U.S. As of July 2008, the U.S. had 279,174 carsharing members, 5,838 carsharing vehicles, and 19 programs. In contrast, there are roughly 600,000 carsharing members worldwide.

The impacts of carsharing include replacing between 4.6-20 cars per carsharing vehicle in North America, and between 6-10 cars per carsharing vehicle in Europe. Up to one-third of carsharing members report selling their cars due to car sharing. Many also report avoiding purchasing a car. Carsharing also reduces VMT by 44 percent in North America and between 28-45 percent in Europe, and reduces car-related expenses by between \$154-\$435 per month per user. Lastly, through low-emissions vehicles and decreased VMT and carbon offset programs, **Shaheen** said carsharing reduces GHG emissions, too. Additional benefits include reduced parking demand, improved mobility, and complementary access to transit.

Carsharing started in 1998 in the U.S. and has grown significantly, though some firms have since closed. **Shaheen** noted it is difficult to get proprietary data, but the average growth rate was about 50 percent in North America. Member-vehicle ratios in particular have increased from 7:1 to 48:1 in the U.S. and from 14:1 to 24:1 in Canada. Worldwide, the ratio is about 20:1. But **Shaheen** cautioned that there are issues with the data: companies may boost their ratios to justify their investments, some people use shared cars as mobility insurance, there may be some double-

counting of members who belong to both a business and individual plan, and membership lists may include inactive members.

Only five out of 19 (29 percent) U.S. operators are for-profit but they account for 74 percent of all carsharing members and 81 percent of all carsharing vehicles. Canada reports similar results, with 36 percent for-profits accounting for 36 percent of all organizations, but 87 percent of members and 84 percent of vehicles. Nonprofit operators are growing both in the U.S. and Canada: the top three in the U.S. grew from 6,600 members in 2005 to 71,000 members in 2008. Some are in cooperatives with housing groups.

Recently, **Shaheen** said, competition has heated up: Enterprise and Hertz have joined the hourly rental business. Other market developments include the large Zipcar-Flexcar merger in October 2007, and a market diversification with a focus on the college market. There are some signs of greater operator collaboration, with roaming user agreements, policy collaboration and coordination as examples.

In the U.S., rates are usually hourly with limited mileage. In Canada, fees are typically mileage based to discourage environmentally harmful long trips.

Carsharing operators had a difficult time getting insurance at first. After September 11, 2001, increased premiums became a huge barrier, with premiums jumping 500 percent in one case; they have since stabilized, however, and cost on average \$2,014 per shared vehicle in the U.S. and \$1,742 per car in Canada.

In North America, operators are seeking growth in the college market, which with 130 campuses served by 11 organizations, constitutes about 10 percent of the market.

Carsharing organizations make heavy use of electronic and wireless technologies, with user-issued smart cards for vehicle access, vehicle tracking, member reservation and data collection. U.S. operators tend to use technology more than Canadian organizations.

Policies on taxation can hurt or help carsharing, **Shaheen** said. They support carsharing with credits, subsidies, and grants, and hurt carsharing by applying car rental taxes to car sharing, which are not the same thing. Parking policies are also critical to carsharing. The visibility, safety, and access of on-street parking is important to carsharing organizations, but many administration issues exist around street cleaning, enforcement, and new charges from municipalities for use of the space. Parking variances, zoning codes, and reduced parking minimums are also factors that impact car sharing companies.

Shaheen concluded by noting that continued growth is expected especially in the business and college markets. In North America, competition will increase, but high energy costs and increased climate awareness are likely to facilitate carsharing's ongoing growth and expansion.

Paratransit for the Masses: Can Technological Advances Mainstream this Niche Mode?

Jay Jayakrishnan, Associate Professor, Civil and Environmental Engineering, UC Irvine

Jayakrishnan asked the audience to consider our current fixed-route transit systems from an inter-galactic point of view. In the big picture, it is clear that we are not taking full advantage of our advanced technology for communication and computing. **Jayakrishnan** argued that we should get rid of the 20th century schemes with no information technology. Rather, it is possible for people to communicate their travel wishes to a vehicle that can communicate back to them and pick them up.

Jayakrishnan argued that what is now called paratransit, at a much larger scale, could be the mass transit of the future if routing algorithms and schemes are developed to optimize real-time routing so as to enable on-demand passenger pick-ups and drop-offs. He argued that the need for fixed routes and schedules derives mainly from a lack of real-time information and the inability to use the information even when it is available. A better solution, **Jayakrishnan** said, is High Coverage Point to Point Transit (HCPPT), a system which uses a large fleet of densely distributed shared vehicles (including taxis). Real-time information on the passengers' trip requests and the systems vehicle positions are used in dispatching decisions.

Jayakrishnan's HCPPT calls for a mix of trunk lines and more circuitous routes. Under this system, hub regions, or cells of roughly 10 square kilometers, are connected by an inter-hub network of trunk lines. Each trip is comprised of re-routable and non-re-routable portions, and each trip would have multiple possible routes with multiple vehicles. Route assignments can be changed dynamically based on demand. In a model for Orange County, the area is divided up to five areas, and natural hub areas and transfer points, with freeways making up the trunk lines. **Jayakrishnan** also proposed a hybrid adaptive-predictive control model that ensures that the system can learn from trip requests.

Unlike carpooling that requires passengers to share origins and destinations, **Jayakrishnan** said HCPPT requires only the origin to be the same; destinations can be anywhere. Whereas an average 10 - 15 mile transit trip costs \$8.50, HCPPT would cost between \$20 and \$30 (with a three person occupancy), which puts its costs between those of current dial-a-ride paratransit systems which cost \$20 per trip (based on 1-1.3 person occupancy) and a taxi ride at \$30 per trip. **Jayakrishnan** said the costs for the shared-ride HCPPT trip would be approximately \$7 per person or \$4 per person with a subsidy. **Jayakrishnan** said it has been found that HCPPT or a similar scheme could replace the Barcelona bus system with individual vehicles at less public expense.

In conclusion, **Jayakrishnan** said analytical schemes to run real-time routed transit (true paratransit) are becoming available, such that—given the available technology and the vehicle density called for by HCPPT—a vehicle would be able to pick up passengers within three minutes of a trip request. It is time to take a new look at the DRT systems that were thrown out in the 1960s, 70s, and 80s, **Jayakrishnan** said, because the computer and communication technologies that they needed to become successful are now available.

Discussion

Matthew Barth of UC Riverside asked if there will be a demonstration of the HCPPT scheme. **Jayakrishnan** replied that there are no plans for a demonstration, because an effective demonstration would require adding many vehicles. **Brian Taylor** added that the sample problem exists in carsharing—there is a need to reach critical fleet mass before the system can be effective. **Jayakrishnan** said that, as an incremental approach, taxis could be subcontracted.

Peter Haas of the Mineta Transportation Institute complimented Brian's ridership model and questioned whether some transit systems (particularly the older ones) perform roles other than the social service function. **Taylor** referred to the point he had made about transit in older neighborhoods, especially those with limited or expensive parking, and where income or disability present barriers to car access. Most research looks at individual systems, **Taylor** said, and he wanted to look at transit nationally.

A question was asked about research on fare elasticity. **Taylor** explained that most research looks at small changes in fares or fare-free zones. Between 1980 and 1984, a reduction in fare resulted in a significant increase in ridership. In addition, when New York City's Metrocard effectively made transfers free, the city saw a huge increase in ridership. There are two markets for transit, **Taylor** explained: choice riders who elect to ride transit though they could drive, and dependent riders who choose between taking transit and not making a trip. When operators raise fares, the first group will drive and the latter group will either walk or just not travel. **Taylor** noted that higher base fares exist in high minority areas. A big irony, **Taylor** said, is that systems with the highest marginal cost to provide services are in outlying areas and used by wealthier riders who are the most sensitive to fare increases because they can so easily drive.

Dario Hidalgo of EMBARQ asked if there was a difference between rail and similar bus service, provided that buses have short headways. **Taylor** answered that it doesn't matter if it's rubber tires or steel wheels. We tend to be expanding service in commute hours and making new rail investments, where marginal cost is high. However, the exclusive right of way is what causes the high cost, regardless of the mode, **Taylor** said. He added that we tend to go after rail to lure choice riders, but it comes at a very high cost.

Hidalgo also asked **Shaheen** about the future of carsharing. **Shaheen** responded that new entrants are important, and said she has been tracking bike sharing. She predicted there will be increased interest in programs in the U.S., and noted that Washington, D.C. already has a program. Carsharing will encompass more modes, **Shaheen** said.

Deakin asked about the market for carsharing, and wondered whether the emphasis was on encouraging people to give up cars, or on providing something like a transit option in low-density areas. **Shaheen** responded that carsharing is currently popular in urban areas where people are transit users; carsharing is supplemental. But it is starting to spread to other locations, such as college campuses. The business model for suburban carsharing has to be radically different. **Shaheen** said existing providers will not venture into the suburban market.

Norm King of the CSUSB Leonard Transportation Center said it seemed that **Jayakrishnan** was assuming the public subsidy per trip would be a huge incentive for people to forego their second and third car, and **King** questioned this. **Jayakrishnan** answered that he was using existing subsidies as the basis, and that even though the subsidy would attract more riders, it was not necessary. Even without the subsidy, HCPPT could still be cheaper than current fixed-route transit buses in some instances.

Deakin asked how **Jayakrishnan's** proposed one-to-many scheme differed from the model used by airport shared ride systems that she said have not been all that successful, or the old dial-a-ride systems. **Jayakrishnan** replied that neither of those systems could guarantee pick up within four to five minutes because the vehicle coverage is lacking.

Deakin followed up by asking how HCPPT costs will be cheaper than those systems since they are both one-to-many. **Jayakrishnan** answered that the density of the service and the occupancy makes the system fundamentally different than existing models. He said the confluence of all these factors would lead to short waiting times.

Ryan Snyder of Ryan Snyder Associates said he used to regulate taxis and jitneys, and this seemed to be where **Jayakrishnan** is heading. Smart Shuttle seemed to work fine when it was the only provider, Snyder said, but competition diluted the market. Snyder suggested that taxis could be allowed to provide shared rides, but said that for home zones, operators would need to be guaranteed monopoly status. **Jayakrishnan** agreed, and said that maybe a public-private operation would be more successful. The transit agency could initiate and market the service while outsourcing the service provision to taxi companies.

Jesse Glazer of the Southern California FHWA asked **Shaheen** what policies would accelerate the spread of carsharing. **Shaheen** replied that incorporating carsharing into high-rise development would help (as is currently being done in Taiwan) by offering residents the choice to opt out of paying for a parking space if they use a carsharing program. **Shaheen** mentioned AB32 and said it could be a boon for car sharing if it is implemented in areas where it can be successful, but she cautioned that the issue of applying rental car taxes to carsharing could kill the business, and this threat needs to be dealt with.

SESSION 7: INCREASING LOW-IMPACT TRAVEL IN CITIES: SUCCESSFUL EFFORTS TO INCREASE WALKING, BIKING, AND TRANSIT USE IN OTHER COUNTRIES

Katherine Perez (Moderator), Executive Director, Southern California Transportation and Land Use Collaborative

Comparing Travel Trends in the U.S., the Developed World, and the Developing World: What are the Causes, Consequences, and Lessons for Public Policy

John Pucher, Professor, Urban Planning and Policy Development Program; Research Associate, Alan M. Voorhees Transportation Center, Rutgers University

Pucher began by stating that although everyone agrees sustainability is a good goal, and that transportation ought to be more sustainable, there is no silver bullet. He stressed that it is important to integrate walking and cycling into the solution because they are complementary modes, as many European cities demonstrate.

Pucher discussed several worldwide travel trends. People are traveling increasingly longer distances per day; more people own cars and use them; public transit use is increasing, but the mode is falling by percentage of trips made. There is less walking almost everywhere, including in developing countries, and cycling levels are low or falling everywhere except northern Europe. In western Europe, rates of car ownership are relatively low: whereas the U.S. has 750 cars/trucks per 1,000 people, Germany (with the highest level in Europe) has 550 cars per 1,000 people. But car ownership rates in Europe have been doubling and tripling.

Americans use their cars much more, **Pucher** said. Whereas Americans travel 25,000 km per capita per year in the U.S. and 15,000 km in Canada, Europeans travel by car about one-third to one-half that amount. Despite the increase in European car ownership, there are much higher levels of walking, cycling, and transit use in Europe. In Germany, 50 percent of elderly Germans walk or bike.

Pucher joked that mode choice is not in the genes; Americans enjoy these modes in Europe. The reason they cycle, ride, and walk less is because options are unsafe and inconvenient. It is not just because trip distance is shorter in Europe: controlling for trip distance, 85 percent of trips under 1 kilometer in Germany are made by walking or biking versus 45 percent in the U.S. Similarly, 50 percent of trips between one and two km are by walking or biking in Germany vs. 12 percent in the U.S.

Car dependence has consequences, **Pucher** said. There is a negative correlation between increased walking, cycling, and transit use and obesity. People should be able to integrate activity into their daily lives. Not only is it healthy (the British Medical Association says for every hour of exercise, an hour of healthy living is added), but walking and cycling are the most sustainable transport modes, as well as the most equitable, and most economical. A zero-emissions vehicle exists right now and it is called the bike, Pucher joked.

Pucher pointed out that Europeans were not always pro-walking and transit; during the 1950s and 1960s, many European cities had pro-car policies in place that caused a huge decline in walking and cycling. A dramatic policy turnaround in the 1970s changed things; now 70-80 percent of urban residential German streets are traffic controlled, and cycling has boomed. They achieved this through expanded and modernized transit, improved pedestrian and cycling facilities, full integration of modes, restrictions on car use in central cities, raising the cost of car ownership and use, and implementing smart land-use policies. As one example, Germany made transferring between modes quick and easy through a complete coordination and integration of public transit services, modes, fares, schedules and routes.

Pucher said facility provision is the best way to incentivize walking and biking. We should provide public bike washes, bike repairs, and bike lockers and separate pedestrians and cyclists

from other modes. And instead of giving people free parking, we should give them free bikes, **Pucher** suggested, adding that this is already done in Odense, Denmark. Making driving more expensive would also help: high taxation on gasoline has this effect all across Europe, but the Danes have gone above and beyond, with a 170 percent automotive sales tax. Lastly, European land use policies encourage mixed use development and the higher land costs also foster higher density.

Pucher concluded by recommending that the U.S. follow Europe's lead in integrating and coordinating all transit services and by offering attractive fares, while at the same time improving cycling and walking conditions, implementing stricter land use controls, and making car use as resistible as possible through higher fuel, parking, and licensing costs.

Planning for Sustainable Transportation Systems in Asian and Latin American Cities: Some Lessons Learned

Dario Hidalgo, New Business Development Director/Senior Transport Engineer, EMBARQ

Hidalgo identified three major challenges for sustainable transportation systems. First, rapid urbanization is occurring in the rest of the world: by 2030, 4 billion people will live in urban areas in developing countries. Second, vehicle use is increasing even faster than the population. Third, constraints on our financial, institutional, and physical resources are escalating—which is not aided by the fact that we are losing wealth on the inefficiencies caused by air pollution, noise, accidents, and congestion.

Hidalgo discussed two possible paths for addressing these challenges. First, capital and land intensive solutions on the level of the 1950s Eisenhower Interstate system could be built to accommodate the growth in vehicle use and ownership, but as we have seen from the examples of implementation, this results in severe traffic congestion and pollution. Alternatively, we could focus on low-cost and reduced land use solutions. Focusing on non-motorized transport is very important for sustainability and it is doable if supportive policies are in place, as the pedestrian and bike paths in Bogota show.

Travel demand management (TDM) is also important to changing traveler behavior. Specific TDM techniques include congestion charging, administrative measures (such as rotating restrictions on car use by license plate), parking controls, and taxes on fuel or property.

Transit Oriented Development (TOD), too, is effective. **Hidalgo** cited Curitiba, Brazil as the poster child for bus TOD, where TOD and development have come together. Patterns of high density have originated around transit lines and have been sustained for 30 years.

Bus Rapid Transit (BRT), whereby priority is given to BRT buses, is a new word for an old thing, **Hidalgo** said. He argued that buses do not necessarily need right of way along the entire route, just at stations. Prepayment and level boarding are important. Centralized control is beneficial. Image is essential. **Hidalgo** listed several BRT implementations as examples, and cited BRT as a distinctly Latin American invention. Curitiba has a 65 km system using 80 ft

long buses, but has issues with very high passenger loads. Quito's narrow streets and old Spanish-style development prompted a decision to bar vehicles from certain areas and to use only buses. Bogota's BRT features dual lanes and at-grade stations that enable the system to support 45,000 passengers per hour in each direction for a total of 1.4 million passengers a day. Hidalgo noted that no system in the U.S., whether bus or rail, boasts that level of ridership. Mexico City's BRT line boasts 315,000 passengers per day along a 28 km busway. In China, 11 cities have each built their own BRT line in less than two years, the first of which was completed in Beijing. **Hidalgo** also mentioned Santiago and Istanbul as examples of implementations. Where ridership is higher than expected (as it was in Istanbul) buses can just be added. Capital costs are relatively affordable.

Hidalgo concluded that many BRT systems have improved travel conditions and transit's quality and performance, as measured through travel time savings, enhanced reliability and safety, a reduction in energy consumption and emissions, and urban enhancements. In general, problems have been related to planning and budgeting, not to technology.

Policies associated with these new systems take into account equity, the need for mobility services, the need for clear continuous processes, proper coordination and institutional arrangements, the dedication of sufficient technical and financial resources, the inclusion of stakeholders in the process, the planning for the long-term, the assurance of financial sustainability, and the delegation of transit service provision to the private sector.

Planning for the Next Generation of Transit in Toronto, Canada

Adam Giambrone, Chair, Toronto Transit Commission

Giambrone provided an overview of Toronto's transportation system. The Toronto Transit Commission (TTC) is a municipal commission that started in 1921 with the takeover of private transit services. It is Canada's largest transit agency with 444,544,000 annual customer trips. Commissioners separate their political and TTC duties, and the TTC drives a business-like focus to transit; TTC does not consider itself a social service and does everything in house because of an absence of government funding.

Streetcars were nearly removed in 1970s, but now are mostly at capacity. The system is still bus-fed: 60 percent of the passengers ride to the subway, which forms the system's spine. Some lines are slated to be automated.

Giambrone said the TTC's criterion for service provision is that every dollar of subsidy has to win four riders in order for the TTC to add the service. The TTC's mandated paratransit service carries 3 million riders a year; the system carries 1.5 million riders a day on the transit system, and 830,000 daily subway riders. The system has 1,700 buses and 200 streetcars. **Giambrone** touted the TTC's frugality, noting that one of their buses was purchased in 1981 and is still in operation after being refurbished four times.

The TTC invested heavily in heavy rail during the 1970s and 80s, but cut back during the recession of the 1990s. Still, it managed cost recoveries of 85 percent. Between 2000 and 2005,

ridership grew enormously though the system did not. Now, the TTC is improving its buses, **Giambrone** said, by reducing crush loads and expanding hours, which will be financed by a \$0.20 fare increase.

Eighty percent of Torontonians ride transit at least once a month, with no economic segregation among passengers, **Giambrone** said. The TTC monitors ridership regularly and adjusts service accordingly. Schedules are re-crewed ten times a year and to keep costs in line, the TTC resists route expansion unless it is absolutely justified, **Giambrone** said, noting that transit is the city of Toronto's second largest expense after police service.

The TTC's revenue-cost ratio is high but has fallen slightly in recent years. Capital projects took a long time in the past, **Giambrone** said, so the TTC instead asked what they could do with existing service. Realizing that frequency is essential, headways are kept to a maximum of 20 minutes between 6 a.m. to 2 a.m. Transit accounts for 78 percent of trips to downtown, 65 percent of trips to central area, 40 percent of trips to the suburbs, and 19 percent to the city boundary. **Giambrone** noted that BRT was considered but rejected.

Transit is tied into other city initiatives, such as housing renewal. This affords better mobility and increases property values. Although TTC wanted light rail, provincial government decisions forced the commission to install heavy rail even though the TTC thinks Toronto's conditions do not justify it. Many campaigns exist for the Toronto and the Transit City, including a green belt to improve density, and upzoning. Rather than building more subways or highways, which the TTC has long resisted, the TTC wants to instead provide frequent service on buses and light rail and to live up to their old streetcar-era motto of "Always a car in sight." In addition, TTC initiatives call for rider engagement through blogs and public consultation that asks riders to consider what their TTC is. Riders have weighed in on decisions ranging from fare increases to the color of seats.

Giambrone said the TTC is preparing a massive renewal program, which will give transit priority on city streets, and make the whole system accessible by 2018. Private money has already been raised for station modernization, and soon all stops will have service advisory technology. **Giambrone** concluded by saying the TTC's goal is to be the most environmentally friendly transit agency in North America, and there's a lot happening in Toronto.

Discussion

Diane Forte of The Climate Group commented that surely as a matter of public policy, the high cost of car ownership is a large factor in determining how people travel. **Pucher** agreed and said that the cost of car ownership is more important than setting transit fares. The United States' low cost of car ownership means transit cannot be incentivized without disincentivizing the car. Car ownership could be made more expensive through taxation and higher parking charges.

Michael Gainor of the Los Angeles County MTA asked **Giambrone** about one of his statistics, specifically whether Toronto's municipal boundary was the same as the metropolitan boundary. **Giambrone** explained that from a planning perspective, there are three major areas: the old urban downtown, the suburbs of the 1950s and 60s, and the newer suburbs that followed. The

TTC's jurisdiction ends after the second category, and **Giambrone** noted that transit ridership is abysmally low in the newer suburbs.

Bill Pfanner of the California Energy Commission commented that Davis, California has the highest bike use per capita because two residents were inspired by the Netherlands' bike culture, and fought for a similar culture in Davis. **Pfanner** asked that if two people could have that influence, what could happen if we each brought that energy to the task.

Geoff Wardle of the Art Center College of Design commented that the last time he lived in the United Kingdom, he thought it was terrible that tourists came to see these sights and just saw cars parked all over the historical landscape. **Pucher** responded that the UK is not as successful as the rest of northern Europe. The UK's levels of cycling are not much higher than United States', and transit ridership outside of London fell dramatically after deregulation. He noted that just because it's Europe does not mean it's necessarily right: There is a lot of variation across the continent.

Ryan Snyder of Ryan Snyder Associates contrasted Giambrone's and Hidalgo's presentations. Snyder asked why TTC chose LRT over BRT if BRT can do everything that LRT can do but less expensively and with more flexibility. **Giambrone** answered that the issue is context-dependent and TTC considered the culture and the city when choosing LRT. He added that 90 percent of the TTC's operating cost is salaries, so replacing five buses with one LRT constitutes one-fifth of the salary, and LRT vehicles last longer. In addition, Toronto is improving and widening roads anyway, so the marginal cost of the rail infrastructure is low. A neighboring city has chosen to do BRT, which is only slightly cheaper in the short run, and a 40-year cost-benefit analysis shows those costs to be equivalent. **Hidalgo** agreed that the contexts are different and that labor costs are not as high in Latin America as in North America. But the capital costs are significant. The TTC did the right analysis but some communities err by picking the technology first. If you give people a good system, they will respond accordingly, he argued, and buses are still perceived as lower-class. People prefer the train.

Rick Bishop of the Western Riverside Council of Governments commented that the TTC's 75 percent farebox recovery rate is unheard of in the U.S., but wondered to what extent Toronto's restrictions on road building were responsible for this. **Giambrone** said he wanted to clarify that their 75 percent recovery rate is a source of pride, but it is because they cram people into buses. Were they to provide more service and a more comfortable ride, their ratio would drop. Their target is a recovery rate of 68 percent. **Giambrone** also stressed that the highways were stopped by citizens: Toronto's 1972 highway plan was massive, but public pressure was so intense that the highway plan became a subway plan instead, and no major highway has been built since. Rather, elevated expressways are being converted to LRT right of ways.

SESSION 8: SUSTAINABLE URBANISM: LINKING RESEARCH, POLICY, AND PRACTICE

Catherine Showalter (Moderator), Director, UCLA Extension Public Policy Program; Director, Osher Lifelong Learning Institute at UCLA

This session was primarily concerned with efforts to promote sustainable development through a variety of approaches, from innovative pricing systems to planning at the ports. **Showalter** expressed her enthusiasm for the diversity of the panel that includes elected representatives, public agency officials, decision-makers, practitioners, and international interests.

Paying For What We Get: Progress in Pricing Transportation Externalities to Increase Economic Efficiency and Environmental Quality

Paul Sorensen, Associate Operations Researcher, The RAND Corporation

Sorensen opened with the premise that road pricing is increasingly able to facilitate greater economic efficiency and address environmental concerns. In addition, a number of transportation challenges and opportunities have led to a greater willingness among decision makers to explore road pricing.

Sorensen began by describing the challenges. The failure to raise the fuel tax, combined with inflation and the rising fuel efficiency of the vehicle fleet, has led to serious transportation revenue shortfalls. In addition, congestion has only worsened over time, and there have been increasing concerns over environmental quality.

For the most part, we face these challenges because driving is underpriced, and thus road space tends to be over consumed. However, pricing road use by distance traveled, time and location of travel, as well as vehicle characteristics such as weight and emissions class can help address the aforementioned challenges. This will internalize social costs such as congestion, emissions, and road maintenance and will create incentives for drivers to forego certain trips as well as generate revenue.

But while the benefits of road pricing have been long known, technology has been a limiting factor in implementing these theories. However, recent technical advancements have finally allowed road pricing to be put into practice. In particular, in-vehicle transponders, license plate recognition, and GPS receivers have played a central role in facilitating nearly one hundred road pricing programs around the globe.

Sorensen described the various classifications of road pricing programs, as well as named a few examples of each. *Partial facility tolls* (such as the SR-91 Express Lanes in Orange County) price a subset of lanes, typically underused capacity on HOV lanes. *Full facility congestion tolls* (like the Toronto 407 ETR) are similar in concept, but all lanes are subject to the tolls. *Cordon congestion tolls* (like those in London, Stockholm, and Singapore) levy a fee to enter a busy urban area during peak periods, typically a central business district (but the PierPass program at the Ports of Los Angeles and Long Beach is a cordon congestion toll program as well). *Weight-distance truck tolls* (such as the German Toll Collect System) charge heavy vehicles based on both weight and distance traveled, usually to reflect the extra wear and tear they cause on roads. Similarly, *VMT-based tolls* charge a distance-based fee for all passenger vehicles. There have not been any full-scale implementations of this type of program to date, but there have been studies and field tests in Oregon and at the University of Iowa.

The type of pricing has implications for technology and level of implementation. Typically, facility and cordon tolls employ in-vehicle transponders and are enacted at the local level. However, the greater scale of weight-distance truck tolls and VMT-based tolls require the use of GPS systems and need to be implemented at the state and/or federal level.

The existing applications of road pricing have been very successful in meeting their aims. Still, pricing raises a number of concerns, equity and privacy to name two, but there are good answers to all of them. Some of the solutions involve education, while others involve careful design.

Sorensen also presented a few thoughts regarding these concerns. First, the relevance and degree of concerns vary considerably with the different types of pricing. Secondly, when evaluating a new pricing program, it is also important to hold up the status quo to a similar level of scrutiny. We often raise pros and cons, but we must also ask, compared to what? Lastly, pricing programs can also raise considerable revenue, and thoughtful allocation of these funds can help mitigate concerns as well as help political feasibility.

Implementing AB 32: A Local Government Perspective

Ron Loveridge, Mayor of Riverside, Member of the Southern California Air Quality Management District and the California Air Resources Board

Loveridge presented ten ideas for consideration regarding AB 32 and local governments:

1. **California is Dysfunctional.** Is California governable? The examples of the budget, water issues, and health care have shown the inability of the state government to come to agreement. California might be too large or too diverse, or perhaps the decision rules may just not work.
2. **Importance of AB 32 as a State of California Policy and Planning Framework.** AB 32 is one of California's most important state initiatives and a major call to action. Some of California's best and brightest were involved in the scoping plan, including researchers, policymakers, and stakeholders. In addition, there were over 42,000 comments on the first draft. While California cannot make significant changes to climate change on its own, AB 32 can change California.
3. **Uncertainty of the Times...Economy, Green Initiatives.** Loveridge expects some sort of federal climate policy, especially under an Obama administration. California is taking the lead and will serve as a model for the rest of the country.
4. **Cities as Essential Partners.** Cities should not be viewed as adversaries of AB 32, and it is important to recognize cities that make the commitment to "go green." For instance, the National League of Cities is creating a Star Program to recognize efforts. Cities are engaged and ready to work with the State to implement AB 32.
5. **Riverside's Green Action Plan.** The City established 38 goals regarding energy and greenhouse gas reduction, urban design, transportation, and water. To date, they are largely on track to meet them. For example, one third of the energy in Riverside's municipal utility company comes from renewable sources, and their General Plan includes Smart Growth initiatives that have received the attorney general's approval.
6. **Role of SB 375 Regarding Cities, Regions, and Transportation/Land-Use Planning.** A unique coalition of local governments, environmental groups, builders, and regional

councils of government supported this legislation. **Loveridge** believes cities are rational decision makers, and SB 375 offers important opportunities and incentives for cities that will help with implementing AB 32.

7. **EPIC's San Diego County Greenhouse Gas Inventory: An Analysis of Regional Emissions and Strategies to Achieve AB 32 Targets.** This is an important report stating that meeting AB 32 targets is indeed possible, and that there are a variety of choices by which to do so.
8. **Smart Growth and Gasoline Prices.** Smart Growth is becoming conventional planning wisdom. Even though gas prices are changing, questions of location and fuel efficiency are common. **Loveridge** has also observed that foreclosures have changed the nature of residential development – builders often now propose a different way of planning and development.
9. **Convener Role for University of California.** **Loveridge** believes the University of California is the best public university system in the world, but it is strangely disconnected from policy. The AB 32 Scoping Plan calls for unleashing the potential of universities and the private sector. Each UC campus could be a site for conferences where local governments could convene to think about ways to implement AB 32. The decision-making public needs to embrace more research and innovative policy.
10. **Implementation is Work in Progress – Time to Engage!** AB 32 is the most promising game in town. AB 32 calls for a variety of changes, from reducing dependence on oil to improving public health. This represents an opportunity for California to translate good ideas into public policy. Cities are ready to participate and to be partners.

Global Trade, Greener Airports: Dramatically Reducing the Environmental Footprints of Trade-Related Activities

Emanuel Fleuti, Environment Manager, Zurich International Airport, Switzerland

Fleuti hopes to offer a window inside the airport industry and to give some ideas of how to bring practitioners, researchers, and thinkers together. He opened by describing the significant economic relevance of the Zurich Airport. Zurich Airport handles almost 21 million passengers annually. This is substantial considering Switzerland only has a population of about 7 million. The airport has also generated nearly 100,000 jobs, and is responsible for about nine percent of total Swiss export value (typically high value goods).

In the past, airports have generally served as a transportation gateway for cities. More recently, however, they have begun to become a city of their own. Flight operations have become only a fraction of an airport's function, and more services that could be found in a city can be found in the aerotropolis. Zurich Airport has indeed become a city in its own right, and serves as a major intermodal transportation hub (some people come to the airport and never see a plane) and has the third largest shopping mall in the country. Increasing numbers of air passengers and the growing reasons that people might come to the airport have led to more landside travel demand, and they are continually investing in multi-modal options, including a dedicated bike path to the airport and a new light rail line.

But there are also other environmental challenges of airports that are not unique to the Zurich Airport. Concerns include noise, air quality, energy, climate change, and the impact on surrounding land uses. This is further complicated by the large amount of residential development surrounding the airport. The Zurich Airport also faces a nitrogen oxide emissions cap, a mandate to stabilize their infrastructure energy consumption to 1994 levels, and a decree to keep at least 42 percent transit mode share of total landside traffic.

Fleuti described their approach to mitigation planning as trying to develop a solution to an existing problem and not to find a problem with an existing solution. In addition, mitigation planning should be a combined approach where managers look at the entire system and consider a broad range of options as well as a joint approach that favors cooperation with partners and tenants at the airport.

Fleuti described a variety of solutions to their environmental constraints. Their energy conservation strategies included installing solar panels, introducing climate buffer zones, and reducing the operating times of machines. To reduce airport emissions, they have reconfigured the airport layout to reduce taxiing and introduced a departure planning tool to reduce queuing. Their efforts have been quite effective, and they have managed to reduce energy use and carbon emissions despite growth in traffic and the size of the airport.

Can this be a model for sustainable development at airports? **Fleuti** closed by identifying the nature of airports and the challenges for sustainability. First, the growth of air travel and shipping often leads to traffic levels that exceed the achieved benefits. Secondly, trade, industry, and residents often follow airports, creating strong pressures for airports to reduce their impact on congestion and the environment. Are evolutionary development and improvements enough? **Fleuti** does not think so, and believes that at some point, revolutionary steps will be needed.

Global Trade, Greener Seaports: Dramatically Reducing the Environmental Footprints of Trade-Related Activities

Alan Lowenthal, Senator, State of California and Chair of the Select Committee on California Ports

Lowenthal stated that it is good business practice to green the ports. California's current system of goods movement is not sustainable and we are too dependent on old technologies and fuels. Thus it is important to green the industry not just to mitigate environmental problems, but to relieve congestion as well. Our landside transportation system at the ports is antiquated as well; we rely mainly on trucks, our freeways are located in the middle of a dense urban area and cannot be expanded, and we still use an out-of-date single track rail system. We cannot do more of the same.

We are also in the middle of a public health crisis. In Southern California, the Air Resources Board estimates that two-thirds of particulate matter in the air is from mobile sources, particularly from diesel emissions related to goods movement. In California, about 3,700 premature deaths per year can be traced to goods movement. At first, there was little interest in dealing with environmental issues, and the ports were engaged in a growth contest, with little

regard to pollution and congestion. But during the past 15 years, there has been a growing understanding that we must incorporate environmental issues into our overall goals for growth. This means we need better measures and performance standards.

At the local level, the ports of Los Angeles, Long Beach, and Oakland have taken a leadership role in cleaning up by investing in greener technologies such as cold ironing, and have demonstrated how we can have world-class ports that are integrated with their communities.

At the state level, there have been less successful efforts to make the ports greener and more efficient. While state legislation played an important role in implementing the PierPass program, there have been more state plans and legislation that have not been adopted or passed. In particular, **Lowenthal** described Bill 974, which described air quality and congestion issues as crises, and established a vision to shift landside goods movement from trucks to grade-separated and electrified rail. The bill also brought the ports into a regional, rather than local, focus. The bill sought to fund these improvements by levying a container fee; one half would be spent on emissions reduction while the other half would be invested in rail infrastructure. However, the bill was vetoed, dealing a heavy blow to the regional movement towards greener ports. **Lowenthal**, in particular, had worked hard to garner a coalition of supporters and preserve important aspects of the bill, and was disappointed to see those efforts eventually fail.

However, **Lowenthal** believes the efforts were still useful and that the federal government is beginning to understand the role of the ports in the economy as well as the need to mitigate the local effects on pollution and congestion. California has long been bearing the costs as the “tailpipe of the nation” for cheaper goods in the rest of the country. **Lowenthal** believes there needs to be a greater political will to stay focused, and while the defeat of 974 was a shock, we need to recover and continue our efforts.

Robert Kanter, Director of Planning and Environmental Affairs, Port of Long Beach

Kanter stressed that the Port of Long Beach is not just concerned with minimizing its environmental footprint, but with being an environmental steward as well. The Port of Long Beach is the 2nd largest port in the U.S., and is an economic engine for the region and the country. But while the Ports of Long Beach and Los Angeles take in over 40 percent of the nation’s goods, the surrounding communities pay the costs of pollution and congestion. Still, the national demand for goods is rising, and the Ports must keep them moving.

The Port of Long Beach’s board-adopted environmental policies reflect their comprehensive approach towards mitigating the effects of goods movement. The policies aim to protect the surrounding community, distinguish the Port as a leader in environmental stewardship and compliance, promote sustainability, employ the best available technology, as well as to educate and engage the local community. To accomplish this, the Port has established goals and criteria by which to measure progress. Staff must make annual reports to the Board and general public.

In particular, the policies are directed towards wildlife, air, water quality, soil/sediment, community engagement, and sustainability. In order to promote change, there must be cross-departmental collaboration. For instance, compliance with the Clean Water Act requires action

by the Departments of Environmental Planning, Construction Management, Maintenance, and Trade Relations. Since the Port is primarily a landlord, they have had to take a more active role in ensuring that their tenants comply with policy.

To illustrate their environmental stewardship, **Kanter** elaborated on a number of the Port's programs. With regards to air quality, the Port seeks to reduce emissions per ton of cargo, and they established the Clean Air Action Plan to reach this goal. Because there has been a long legacy of noncompliance with air quality standards, this has been one of the Port's most ambitious plans. Working with the Port of Los Angeles, the Port of Long Beach targeted emissions reductions from all modes – vessels, cargo equipment, locomotives, and trucks – and established specific requirements for each. To reduce emissions from vessels, the Port introduced a speed reduction program, shore to ship electrification, and nitrous oxide and particulate matter limits. For landside operations, the Port has tried to replace or retrofit trucks, locomotives, and cargo handling equipment, as well as facilitate a movement towards alternative fuels. This has necessitated heavy investment by the Port as well as offering incentives to and placing requirements on tenants.

The Port also monitors the number of fish and bird species, performs routine evaluations of their programs that affect water quality, has cleaned up soil and sediment, and has tried to organize clean-up efforts upstream of the Los Angeles River. All of these undertakings have resulted in significant and measurable improvements in environmental quality. In addition, they have implemented numerous sustainable practices such as recycling construction materials, retrofitting facilities for energy conservation, and ridesharing programs. Some new buildings will also be LEED certified.

Lastly, the Port has also ventured on a number of community outreach and engagement programs. They offer tours, publish a newsletter highlighting interesting events, and host an annual "Green Port Fest" open house in October (the most recent of which had over 10,000 attendees).

How do they accomplish all this? The most important leverage point is lease requirements. They also utilize Port-wide tariffs (such as the Dirty Truck Ban), CEQA mitigations, and offer financial incentives. In addition, the Port and its tenants often take voluntary measures to be good environmental stewards.

Discussion

Gregg Albright of Caltrans posed a difficult situation – given that the three major California airport hubs will experience demand that exceeds supply by 2015 and that physical expansion is complicated, how do we deal with sustainable air transportation in an environment where airports are being choked?

Fleuti acknowledged physical limits. Even with 24/7 operations, there can only be so many airplanes coming in and out. Many runways are independently operated, such as Atlanta's airport, which has five runways, and in many ways is operated as two separate airports. Operating an airport that serves as a hub is particularly difficult, especially because it is the

airlines, not the airports, that decide where to centralize their operations. Today, the challenge is not necessarily overall capacity, but rather peak hour capacity. Some airports have tried the “divide and conquer” approach to managing capacity. By moving general aviation and point-to-point operations out, some airports have been successful in accommodating the hubbing system. But one strategy that does not work is planning for regional transfers (e.g. flying an international flight into LAX and having passengers travel to Ontario airport to connect to a domestic flight). London tried this and it did not work.

Diane Forte of The Climate Group described how many speakers have mentioned pricing as a way to manage mobile source pollution and generate revenue to turn over the vehicle fleet. How can we create the political will to implement this in California and the United States? **Lowenthal** concedes that it is difficult for him to answer questions about political will because he thought it existed for transit, but when the budgets hit, that money was taken for other projects. He is still shocked by the defeat of Bill 974, which would have represented such political will towards multi-modal planning and a system to see the diversity of the situation.

Kanter has seen some local political support in the truck replacement program at the ports. A politically appointed Board made a commitment to replace dirty trucks while at the same time maintaining a commitment to keep trade flowing. To accomplish this, they adopted a container fee that charges the end receivers (such as Wal-Mart). They are subsidizing about 80 percent of the cost, with money from Proposition 1B helping as well.

Jacki Bacharach of the South Bay Council of Governments stated that she understands the benefits of congestion pricing, but asked **Sorensen** for his thoughts on the pricing proposal for the 110. Given that this freeway ends in a heavily congested area that is not a downtown, what kind of facility design issues must one consider? **Sorensen** clarified that the proposal for the 110 was a HOT lane, a partial facility toll that is not the same as a fully priced facility. We do not see many standalone facilities today, and most HOT lanes do not cover the full trip. Still, there is some benefit to using the facility, as illustrated by the SR-91 Express Lanes. There are some drawbacks to the facility approach, but at the same time he does not see a full rollout of pricing as possible. These individual facilities may help us overcome some of the feasibility humps he talked about earlier.

Jacki Bacharach also asked **Lowenthal** about the plan to reintroduce Bill 974. **Lowenthal** answered that the first step is to see what needs to be changed. There are systemic dysfunctions in the way we do legislation and this recent process illustrated some of them. The bill had been in print for two years, and although Governor Schwarzenegger liked it, he instructed **Lowenthal** to hold it. Retailers in particular did not like the idea of a fee, so the Governor decided to wait and see if another idea could be proposed. The problem was that there were no other ideas, only proposals to raise sales taxes. **Lowenthal** described how they had worked for years with the communities of Southern California and developed a vast coalition of supporters (from chambers of commerce to environmental groups) who would have each had their needs met. Yet after all this bridge building, the Governor came in at the last minute and asked them to change the bill. Systematically, this is just not possible. If **Lowenthal** made the changes to the bill, he would have lost the coalition, but if he did not make the changes, it would not get passed.

Jennifer Gress, Consultant to the Senate Transportation and Housing Committee, added to the discussion about political will. Three state bills have been passed authorizing HOT lanes, but they have been local level, project specific bills. To a certain extent, this is good, but some people think the piecemeal approach is inefficient. Pricing for externalities is a good rationale for pricing more generally, but the tolls have been historically set according to demand. **Sorensen** elaborated that the toll depends on the overall goal. The I-15 HOT Lanes uses a formula to set the toll to achieve a certain level of throughput. But if the goal was another specific externality, the price could be set accordingly as well. If we had a statewide system, we might want to think more about what the *externality* cost is, and charge that. Not all congestion is considered as an externality, and at peak places, times, and directions, there is often an optimal level of congestion.

Joan Sollenberger, Division Chief of Transportation Planning at Caltrans, pointed to the major infrastructure challenges related to climate change at seaports and airports. In particular, how will sea level rise affect Los Angeles' ports?

Kanter explained that the Port of Long Beach was built in 1911, and at that time, sea level rise was not a concern. But as terminals are added or redeveloped, they consider sea level rise mitigation into their cost-benefit analyses. **Kanter** likened the situation to engineering for the worst possible earthquake. At a certain point, they stop engineering due to high costs. In the ultimate worst scenario they will most likely not have fully addressed those problems. **Fleuti** added that airports face the same situation. Some, like Amsterdam, are below sea level, and we may just have to let some go. The Dutch could use engineering to fix it by raising dams. However, these problems are generally not addressed in the world of international aviation.

SESSION 9: WALKING THE TALK: LINKING LONG-RANGE FORECASTS WITH SHORT-TERM DECISION-MAKING

Brian Taylor (Moderator), Professor and Chair of Urban Planning; Director, UCLA Institute of Transportation Studies

Steve Heminger, Executive Director, Metropolitan Transportation Commission

Carol Whiteside, Founder and President Emeritus, Great Valley Centre

Brian Taylor opened the panel discussion with some reflections on the conference's themes, notably the significant environmental and financial pressures that the transportation field is facing. From Sunday's sessions, he noted that the planning horizon seemed to be shortening around election cycles and financial crises, and put forward the premise that today's pressing issues may not be the same ones in the future. Are we doomed with dealing with crises as they arise, or will we be able to plan more effectively? An additional takeaway from Sunday was that extraordinary demographic changes are occurring, which present enormous policy challenges. Developers have to be more flexible and agile in providing diverse housing situations. And we are in the midst of truly dramatic communications technology developments.

On Monday, **Taylor** noted that conference participants saw that some developments seemed haltingly slow but not because of technology, and heard how the future might entail smaller, lighter, and cleaner automobiles. Participants were also treated to an inspiring presentation of what's going on in the rest of the world, and on Tuesday, the panelists looked at developments on the ground and the dissonance in public policy between what we are doing now and the changes that are on the horizon. **Taylor** then introduced **Steve Heminger** and **Carol Whiteside**.

Steve Heminger began by offering some meditation on change, and explaining the difference between precision and accuracy, and noted that we often mistake precision for accuracy. Our tools are not as sharp as we think they are, he said, and argued that the most important value forecasters can have is humility. Paraphrasing **Martin Wachs**, **Heminger** said assumptions are often a culprit: though they are the most important factor of every forecast, they are rarely debated.

Heminger then offered two confessions. First, the SB 375 implementation plan calls for reducing carbon emissions to 40% below 1990 levels, but MTC's long-range plan—while very strong—does not fully capture the needed change, because their budget does not allow for the necessary expansions.

Second, MTC's original assumption was that gas would reach \$3 by 2035. When moving forward, we have to deal with unknown unknowns. We are supposed to have contingency, but we have an unfortunate habit of putting known risks into contingency which is a misuse of the process.

Heminger next identified two policy breakthroughs, in reducing cigarette consumption and in increasing California's recycling rate, to show that a policy-enforced trend can become a reinforcing trend, such that the cultural norm will say that if, for example, you smoke or don't recycle, "there'll be hell to pay." These are examples of government policy that have worked. We also had breakaways in technologies that could lead to massive changes in travel, **Heminger** said. We ought to look at the "notions of possibilities" not just the predictions of forecasts. One possibility for achieving the important goal of sustainability is rationing and regulation. But this runs deeply counter to the cherished American ideals of individual initiative and optimism about growth. **Heminger** then discussed public private partnerships (PPPs) and market forces. With congestion pricing, for example, we are trying to marry economic incentives with a "soviet style" system of infrastructure, whereby we provide a free good and line up for it. An additional challenge is that, as a nation, we have become "incredibly risk-averse," **Heminger** said. We are now very distrustful of the market, and we don't accept the possibility of failure. But if we are going to get to a market approach then we need to accept that the market doesn't produce "100% winners."

The climate challenge seems well suited for an investment approach, rather than a regulatory solution. If we try to deal with climate change in a regulatory context, we will fail miserably, and this is the "death of environmentalism." Instead, we need to invest in clean vehicles and clean infrastructure. **Heminger** acknowledged that this is a major challenge, but a country as wealthy as the U.S. should be able to meet it. But, **Heminger** mused, this country—and especially California—has forgotten how to build big things. The CEQA/NEQA process has

sucked out all the risk of capital projects. There is not one single risk that we do not litigate over, **Heminger** said, but the cost of delay is too high. In the name of saving the village we'll destroy it, he warned. More specifically, in the name of protecting the environment we'll hold back the investment we need to combat climate change.

Heminger concluded by echoing calls for the University of California to be involved. Academic engagement with policy needs to be deepened. And in general, we need to get out of "old ruts and habits" and break through to new ways of doing business.

Carol Whiteside remarked that the conference has been thought-provoking and forward-looking but uncertain about the right approach, which she called a healthy outlook. It is clear to many that we're on the "brink of a new world." Noting the possibility of having a new federal administration voted in, **Whiteside** said she hoped they will deal with the unknowns and offer a vision for a bold new world, instead of pandering as they have done so far.

Life and politics are enmeshed in ways we often don't recognize, **Whiteside** reflected, and similarly transportation has connections to other things that are not often recognized: transportation is not just about a project or a region; it is connected with markets, social causes, economics, housing, and the environment. **Whiteside** spoke of the "giant hula hoop in the sky" where everything is connected and our job, she said, is to keep it level and balanced.

Impacts are still emerging. Telecommunications will have an enormous impact on our lives, she said. When breakthroughs or "disruptive events" occur we need to act quickly, **Whiteside** argued. There is no time to do studies. Instead, we need to envision and analyze scenarios ahead of time. **Whiteside** stressed the need for flexibility and for us to choose a direction even when we are not sure the decision is perfect. "He who waits for all the information to make a decision never decides," she said. After making the best decision we can with imperfect information, it is important to stay focused. Our greatest fallacy is when we change policy decisions and our past investments are cast aside for the newer thing.

It is important to remember that attitudes can change, as our experience with cigarettes and drinking has shown. Younger people are "getting it" about climate change, she said. What we need is an adaptive or internal change systemwide. **Whiteside** said she was surprised that the speakers representing Milken and Honda (**Wong** and **German**) called for more federalization of clean automotive technologies, and utility grids, but supposed that perhaps some federal overlay that enabled more local control would be justified.

Whiteside concluded by expressing great optimism for the next generation. They have different assumptions and expectations and the challenge for us, she said, is to let go fast enough, and to let new solutions rise to the top rather than to hang on tenaciously to what we know. This is a brave new world.

Discussion

Norm King of the CSUSB Leonard Transportation Center commented that government attempts to reduce externalities sometimes results in solutions that cost us more than is gained. But smart

pricing is different because it creates honest demand. Smart pricing breeds smart growth and consumption, **King** said. Pricing is also the most moral choice because it makes individuals personally accountable for their choices. Not pricing amounts to subsidizing the most affluent.

Participant **Mark Brucker**, Mark Brucker Consulting, said he believed Heminger's point about mistaking precision for accuracy is important. The idea of precision, Brucker said, means we seek *the* "right" answer or alternative. But instead, we need flexibility to deal with uncertainty. Our solutions should be robust for a variety of circumstances. **Heminger** replied that although we like to think we are innovative, we are really risk averse. The notion of experimentation is important and we need not be afraid to fail. He cited President Franklin Roosevelt as an example of a leader who tried many things. Some ideas were great, and others were awful, but he was not risk averse. **Whiteside** added by saying that whether it is due to risk aversion or something else, we are not holding people accountable for their own financial decisions. Some considerations are never brought to the table because we are against causing someone pain and holding them responsible.

Taylor mentioned that at a previous conference, Robert Teale talked about how the private sector takes on all the risks, and the public sector makes the safe choice. The subsequent opportunity costs for the region can be huge.

Heminger distinguished between smart risk and foolish risk. If you are doing something that entails much uncertainty, it is probably better to try it out in one community, and not nationally or statewide. He added that the financial bailout confirms Teale's wisdom: risk has been socialized to the extent that we have private benefits and public costs.

LeRoy Graymer, formerly of the UCLA Extension Public Policy Program, asked about the appropriate role of government, and how government investments should be structured to achieve policy objectives. **Heminger** replied that government does not do a good job of picking winners and losers; officials won't pick the losers because they don't want to lose votes. Instead, government needs to create ground rules and take up investment. Those who say that private investment alone should finance public works are wrong: there are not enough private funds and it is not the way forward. Instead, we must set our minds to it, and regain our imagination and nerve. **Whiteside** agreed and said that we have made decisive action almost impossible. If you look for 100% consensus, the decision will never get made.

Diane Forte of The Climate Group noted that **Heminger** gave examples of how government sets the stage for policy actions (such as reducing smoking) and asked how government is going to precipitate a change in greenhouse gas emissions (GHG). **Heminger** acknowledged that reducing GHG emissions is a daunting task and a global problem, the solution to which not all parties will buy into. At the same time, he said, the public is "dying to do something" and many people are forming new, greener habits. From a policy standpoint, **Heminger** argued the right approach is not through regulation but through investment in new technology and new jobs. Both presidential candidates understand that, albeit in different ways.

Walter Siembab of Siembab Planning Associates joked that he was beginning to feel almost inspired before reflecting on local government's lack of flexibility and innovation, and

commented that the changes discussed are a long way from reality. **Whiteside** replied that we need to lead and then they will follow. We need to take on the message and leadership, and not have a conversation just with ourselves. She cited Al Gore's success in taking his message directly to the people in a way people understood. Public policy discussions should be held on sitcoms, talk shows, and wherever everyday people think about the big issues, she argued. The discussion has to take place in a different way and different place.

Siembab followed up with a comment that the state government ought to adopt a policy of reducing travel by moving workplaces to where people live and then also moving services closer. But this does not seem to be on the table, he said. **Whiteside** added that going online is another way not to have to go anywhere, and asked why we don't start there. Telecommuting could make a lot of sense. Alternatively, reducing vehicle size would increase the highway capacity. There are "lots of ways to slice and dice" the problem, she said.

Jody Litvak of the Los Angeles County MTA agreed with **Heminger** that government has an important role in shaping the future. She referenced the feats of the "greatest generation" and noted that young people are now very cynical, having seen government's failures in the past few decades. We are at a precipice she said, with a lot of paradigm-shifting issues, but faith in government is still lacking, and she asked how we can realize government initiative as well as private investment. **Heminger** said in the era of the greatest generation, we were more in contact with the world and we need to get back in contact. We cannot pretend we are the "only game in town," he said. The world that is emerging is a multipolar one, and we need to be in contact with it.

Brian Taylor noted the allusions in the conversation to structural and budgetary problems in government that limit good people in their determined efforts to make positive change. But he added we have also seen charismatic leadership making a difference, as **Giambrone** is doing in Toronto. **Taylor** asked as to how many of these issues require changing the structure, and how much depends on the charisma and leadership of the next generation of leaders.

Heminger replied that leadership can accomplish structural change, but it takes time. He said "dysfunctional" was a "kind" word to describe the state budget system and added that a good approach is to work around a bad structure. He referenced the governmental regionalism that exists in California, in spite of the structure, and said it has been entrepreneurial, innovative and even sneaky.

Whiteside agreed and added that many resources are going into changing things at the state level, but only a small number of people are involved. We tend to get the leaders we need in the times we need them, she said, adding that she was optimistic the nation will respond to a call to its higher self. People are willing to change so long as they perceive sufficient fairness as existing; leadership can inspire this necessary confidence.

Susan Handy of UC Davis commented that the University of California is doing lots of relevant research, and invited all attendees to the upcoming PATH (Partners for Advanced Transit and Highways) conference, which is designed to link research to policy, she said. Handy asked the panelists to comment on what else the University could do. **Heminger** replied that he does not

know, but he has learned a lot from the University's publications, and their scale should be broadened. **Whiteside** added that academics tend to focus on the past and to "tell us what went wrong," and said she hopes for more predictions and forward-looking dialogue.

Mark Brucker of Mark Brucker Consulting echoed **Heminger's** sentiment that we have to inspire people and referenced FDR's success in getting people to work during the Great Depression. This kind of inspiration is needed.

Taylor thanked the two panelists, and brought the conference to a close.

III. Conclusion

The 18th annual **Transportation, Land Use and Environment Connection** symposium took stock of where developments in transportation stand in a year fraught with uncertainty about economic, ecological, and political factors. Looking retrospectively, the symposium noted where current crises—both economic and ecological—could have been foreseen and perhaps forestalled. Considering this, the symposium considered how planners, researchers, and policy makers can plan intelligently for the future while also dealing with ever-pressing needs and crises of the present. Looking forward, the symposium stressed the need for accurate information and forecasts, but also emphasized that decisions cannot wait for perfect information. Effective policymaking and planning require a greater degree of risk-taking, flexibility, and imagination than we currently employ and this is especially true when the economic, budgetary, and political climates are as uncertain as they are.

The U.S. and California in particular face the implications of an aging population whose travel behaviors are expected to differ from those of earlier generations. Will this demographic shift change urban and suburban land use patterns and travel behavior accordingly? If demographics themselves will not alter our current patterns, technology might—perhaps by enabling a continuation of current land use and travel behaviors through improvements that neutralize the volatility in energy costs, or alternatively, by reducing the importance of distance and location.

Technology is certain to affect the ways in which both transportation facilities and vehicles are designed and used. Concepts exist for making roads “smart,” enabling more intelligent movement of people and goods in a number of ways -- from better disseminating information on roadway conditions to synchronizing vehicle movements such that “platooning” is possible. Major advances in developing gasoline alternatives are also occurring. Which of them will prevail remains an open question, but alternative fuels of some description are likely to power our vehicles in the future, though continuing improvements in conventional gasoline engine technology suggest the gas engine will remain ubiquitous for some time. At the same time, vehicles seem poised to benefit from smarter, lighter, and more efficient designs.

What will transportation in ten years look like? What will it look like in twenty years? Will carsharing be commonplace? Will transit incorporate technology to such an extent that passengers could make “on-demand” transit trips? Will walking and biking reverse their near-worldwide decline? To what extent will trade manage to get “greener”? Will carbon and emissions regulation help or harm? With its focus on the future, this year's Symposium took on many issues and presented many imaginative possibilities and solutions for some of our most pressing concerns today: the volatility of energy prices, our economy's overreliance on fossil fuels, and the ecological effects of our current way of life.

The current challenging economic climate challenges this inventiveness and threatens to increase our already pronounced aversion to risk-taking. But if we are to plan effectively and make decisions beyond those that concern the immediate future, we need to accept less-than-perfect information as bases for our decisions, be imaginative, make decisions without being afraid to take on reasonable risks, and build into our solutions the flexibility that will allow for unanticipated developments. If we don't, we risk repeating our past mistakes of dealing with problems only as they arise—and we risk failing to plan for otherwise foreseeable crises such as the ones in which we are now embroiled.

The Future of Cities and Travel

**The Transportation – Land Use – Environment
Connection**

Appendix A – Symposium Program

UCLA Lake Arrowhead Conference Center
Lake Arrowhead, California
October 19-21, 2008

Program

UCLA Conference Center at Lake Arrowhead
The Transportation—Land Use—Environment Connection
October 19-21, 2008

Overview

The conditions faced by planners and policymakers in cities large and small are far different today than in years past, and promise to be even more different in the years to come. Geopolitical stability and trade, environmental quality and climate change, evolving regional demographics, and rapid technological innovations have combined to radically change the planning landscape in recent years. And while many more changes loom on the horizon, there is no assurance that recent trends will continue into the future. For example, increasing female labor force participation and travel patterns have changed significantly and in concert over the past quarter century, but these changes appear to be tapering off. On the other hand, both expected change—like a significant increase in elderly drivers—and uncertainties—like the cost of petroleum a dozen years hence—suggest that the status quo will be anything but.

To public and private leaders struggling to meet this year's budget and plan for next year's obligations, worrying about how climate change, new technology, or changing demographics will affect the transportation—land use—environment connection in 5, 10, or 20 years might seem less than pressing, even fanciful. But many of the pressing planning issues of today—from rapid increases in goods movements due to reduced international trade barriers, or carbon dioxide emissions becoming a central consideration in land use and transportation planning—were foreseeable ten and twenty years ago when forward-looking planning could have mitigated some of our present day crises. This suggests wisdom in looking ahead even as we struggle to cope with today's challenges.

Scanning the horizon for developments and trends that will affect travel, land development, and environmental quality in the years ahead is the goal of this year's UCLA Lake Arrowhead Symposium on the transportation—land use—environment connection. Over the course of two and one-half days we will examine major change drivers, examine future trends in land development, and explore the many factors affecting transportation systems and their use. Our goals are not fanciful but pragmatic: We aim to identify economic, social, environmental, and technological trends that may significantly alter the planning landscape in the next 5, 10, or 20 years. We will ask: What should planners, forecasters, and policymakers today know about such possible change agents to help better prepare for an uncertain future? To help us answer this question we will draw on some of the best researchers, practitioners, and thinkers on transportation, land use, and the environment.

Symposium Co-Organizers:

Catherine Showalter, Director, UCLA Extension Public Policy Program;
Director, Osher Lifelong Learning Institute at UCLA

Brian D. Taylor, Professor and Chair of Urban Planning;
Director, Institute of Transportation Studies, UCLA

Sunday, October 19, 2008

- 1:00pm Registration, Check-In & Refreshments
- 1:30 Welcome
Catherine Showalter, Director, UCLA Extension Public Policy Program; Director, Osher Lifelong Learning Institute at UCLA
David Menninger, Associate Dean, UCLA Extension and Continuing Education
- 1:45-2:15 *Symposium Overview*
Speaker:
Brian D. Taylor, Professor and Chair of Urban Planning; Director, Institute of Transportation Studies, UCLA
- 2:15-3:30 **INCORPORATING FORECASTS INTO POLICIES AND PLANS: PREPARING FOR ECONOMIC AND POLITICAL DRIVERS OF URBANIZATION IN THE YEARS AHEAD**
The opening session of the symposium explores the roles of forecasts and longer-range planning in decision making. How are forecasts developed, used, and misused in practice? What can and is being done to improve both the utility and reliability of projections about the future? How can planning and decision making both respond to pressing needs and anticipate likely changes on the horizon? How can planners and decision makers better link likely future realities with aspirations for change?
■ Linking forecasts to action: The roles, uses, and misuses of forecasts in transportation, land use, and environmental decision making
Speaker:
Martin Wachs, Director, Transportation, Space & Technology Program, The RAND Corporation
■ Promulgating policies and plans today to prepare for the economic and political drivers of urbanization in the years ahead
Speaker:
Gerrit Knaap, Executive Director, the National Center for Smart Growth Research and Education, University of Maryland
Discussion
- 3:30-3:45 Break



3:45-5:30

MIGRATING IN, MOVING UP, AND SPREADING OUT: WILL RECENT DEMOGRAPHIC AND DEVELOPMENT TRENDS CONTINUE IN THE FUTURE, OR WILL NEW ONES EMERGE?

This session examines the future of U.S. metropolitan areas from three perspectives. The first examines how the demographic trends of the next couple of decades are likely to differ from those of the last few, and what these imply for the future of urban settlements. The second examines how future travel trends are likely to differ from current patterns in the years ahead. And the third considers how private land markets are likely to respond to these trends.

■ **Out to the burbs, or back to the city: What do upcoming demographic waves portend for metropolitan areas?**

Speaker:

William A. V. Clark, Professor of Geography, UCLA

■ **Will recent patterns in driving and transit use continue in the years ahead? The case for new trends in travel**

Speaker:

Steve Polzin, Associate, Center for Urban Transportation Research, University of South Florida

■ **A developer's perspective: What drives the evolution of travel and urban form?**

Speaker:

Randall Lewis, Executive Vice President, Director of Marketing, Lewis Operating Corporation

Discussion

5:30-6:30

Check-In and Reception

6:30-8:00

Dinner

8:00-9:30

THE TRANSFORMATIVE EFFECTS OF TELECOMMUNICATIONS ON ECONOMIC AND SOCIAL LIFE: IMPLICATIONS FOR HOUSEHOLDS, TRANSPORTATION, AND LOCATION

The first evening session of the symposium investigates the cumulative effects of the ongoing telecommunications revolution on both economic and social life, and the implications of these changes on the future of development and travel. The first presentation will examine what we have learned about how telecommunications affect travel, and the second will explore alternative urban futures given these transformative changes.

Speakers:

Pat Mokhtarian, Professor, Telecommunications and Travel Behavior Research Program, Institute of Transportation Studies, UC Davis

Joel Garreau, Author of *Edge City: Life on the New Frontier*, Principal, The Garreau Group

Discussion

9:30-11:00

Informal Reception



Monday, October 20, 2008

8:45-10:15am

HOW CAN “INTELLIGENT TECHNOLOGIES” HELP TO SOLVE OUR URBAN AND TRANSPORTATION PROBLEMS IN THE YEARS AHEAD?

Does technology have the potential to dramatically improve the efficiency and safety of our transportation system? Is it more cost-effective than construction? The four presentations in this session will examine: *What are the implications for land use, mobility, energy, and the environment? What are the best roles for the public and private sectors? What policy changes are needed to make it happen?*

■ **Intelligent Planning and Institutions**

Speaker:

Tom Horan, Executive Director, Claremont Information and Technology Institute, Claremont Graduate School

■ **Intelligent Vehicles and Roads**

Speaker:

Greg Larson, Chief, Caltrans Division of Research & Innovation

■ **Intelligent Movement of Goods**

Speaker:

Jesse Glazer, Information Technology Systems (ITS) Engineer, Federal Highway Administration

■ **Intelligent Travelers**

Speaker:

Melanie Crotty, Director, Traveler Coordination and Information, Metropolitan Transportation Commission

Discussion

10:15-10:30

Break

10:30-12:00pm

THE NEXT GENERATION OF MOTOR VEHICLE SYSTEMS IN A RESOURCE-CONSTRAINED WORLD

Rising fuel prices have renewed consumer interest in fuel efficiency, and have raised concerns about the role of private vehicles in consuming petroleum resources, and contributing to both local air pollution and global climate change. This session explores the future of private vehicles in a resource-constrained world. Are they unsustainable, or will they be transformed into new, more environmentally benign forms?

■ **On the drawing boards: How far can technologies and fuels currently in development take us?**

Speaker:

John German, Manager of Environmental and Energy Analyses, American Honda Motor Company

■ **Smaller, lighter, smarter: What is the future of new, smaller, and smarter forms of personal mobility?**

Speaker:

Geoffrey Wardle, Director, Advanced Mobility Research Center, Art Center College of Design



■ **Energy for vehicles in a carbon-constrained world: What will it take?**

Speaker:

Perry Wong, Senior Managing Economist, Regional Economics, Milken Institute

Discussion

12:00-1:30

Lunch

1:30-3:15

THINKING OUTSIDE THE BUS: THE FUTURE OF ALTERNATIVES TO PRIVATE VEHICLE TRAVEL

Many believe that the future of sustainable mobility lies with public transit. But what forms will public transit take in the years to come and who will ride it? Does the future of transit lie with largely familiar buses and trains operating on fixed routes and schedules? Or are means of travel emerging that can offer meaningful alternatives to private vehicle travel in settings less conducive to traditional transit service? The presentations in this session will consider both current innovations and those still on the horizon.

■ **Emerging markets, evolving roles: Lessons from research on cost-effective ways to improve transit in the years ahead**

Speaker:

Brian D. Taylor, Professor and Chair of Urban Planning; Director, Institute of Transportation Studies, UCLA

■ **The Look of Carsharing Today: North America and Abroad**

Speaker:

Susan Shaheen, Research Director, Transportation Sustainability Research Center, UC Berkeley

■ **Paratransit for the masses: Can technological advances mainstream this niche mode?**

Speaker:

Jay Jayakrishnan, Associate Professor, Civil and Environmental Engineering, UC Irvine

Discussion

3:15-5:30

Free Time

5:30-6:30

Reception

6:30-8:00

Dinner

8:00-9:30

INCREASING LOW-IMPACT TRAVEL IN CITIES: SUCCESSFUL EFFORTS TO INCREASE WALKING, BIKING, AND TRANSIT USE IN OTHER COUNTRIES

There are striking similarities, and striking differences, in the travel patterns of metropolitan dwellers around the world. This evening session explores those similarities and differences with an eye toward ideas that might be applied to cities in the U.S.



■ **Comparing travel trends in the U.S., the developed world, and the developing world: What are the causes, consequences, and lessons for public policy?**

Speaker:

John Pucher, Professor, Urban Planning and Policy Development Program; Research Associate, Alan M. Voorhees Transportation Center, Rutgers University

■ **Planning for sustainable transportation systems in Asian and Latin American Cities: Some lessons learned**

Speaker:

Dario Hidalgo, New Business Development Director/Senior Transport Engineer, EMBARQ

■ **Planning for the next generation of transit in Toronto, Canada**

Speaker:

Adam Giambrone, Chair, Toronto Transit Commission, Canada

Discussion

9:30-11:00

Informal Reception



Tuesday, October 21, 2008

8:45-10:30am

SUSTAINABLE URBANISM: LINKING RESEARCH, POLICY, AND PRACTICE

This penultimate session examines efforts to promote sustainable development and transportation systems locally, and around the world. The presentations will review efforts to use pricing to increase the efficiency and reduce the environmental costs of transportation systems, local efforts to begin planning for reductions in greenhouse gas emissions, and the latest plans to reduce the environmental footprints of air- and seaports.

■ **Paying for what we get: Progress in pricing transportation externalities to increase economic efficiency and environmental quality**

Speaker:

Paul Sorensen, Associate Operations Researcher, The RAND Corporation

■ **Implementing AB 32: A local government perspective**

Speaker:

Ron Loveridge, Mayor of Riverside, SCAQMD Board Member

■ **Global trade, greener airports: Dramatically reducing the environmental footprints of trade-related activities**

Speaker:

Emanuel Fleuti, Environment Manager, Zurich International Airport, Switzerland

■ **Global trade, greener seaports: Dramatically reducing the environmental footprints of trade-related activities**

Speakers:

Alan Lowenthal, Senator, State of California and Chair of the Select Committee on California Ports

Robert Kanter, Director of Planning and Environmental Affairs, Port of Long Beach

Discussion

10:30-10:45

Break

10:45-12:15pm

WALKING THE TALK: LINKING LONG-RANGE FORECASTS WITH SHORT-TERM DECISION-MAKING

This closing session asks some leading policy makers to lead a closing audience discussion by reflecting on the many presentations and discussions at this symposium from the perspective of their experiences in practice. What lessons can practitioners take in planning effectively for the future, and what challenges remain?

Speakers:

Steve Heminger, Executive Director, Metropolitan Transportation Commission

Carol Whiteside, Founder and President Emeritus, Great Valley Centre

Closing Discussion

12:15-1:45

Lunch and Adjournment

The Future of Cities and Travel

**The Transportation – Land Use – Environment
Connection**

Appendix B – Speaker Biographies

UCLA Lake Arrowhead Conference Center
Lake Arrowhead, California
October 19-21, 2008

The Transportation/Land Use/Environment Connection *The Future of Cities and Travel*

UCLA Conference Center at Lake Arrowhead

October 19-21, 2008

SPEAKER BIOGRAPHIES

William A.V. Clark focused his research efforts on understanding and modeling the changing urban mosaic, especially the changes in population at local neighborhood scales. He studied residential mobility and tenure choice, the interrelationships of population migration and the nature of demographic change in large metropolitan areas. He lectured and taught in Europe, Australia, New Zealand and Canada and published widely on demographic issues including most recently *The California Cauldron: Immigration and the Fortunes of Local Communities* (Guilford) in 1998, and *Immigrants and the American Dream: Remaking the Middle Class* (Guilford) in 2003. His current research focuses on neighborhood effects on housing choice, commuting, and health, using the rich data of the Los Angeles Family and Neighborhood Study (LAFANS), a longitudinal study of mobility and neighborhood change.

Melanie Crotty is the Director of Traveler Coordination and Information at the Metropolitan Transportation Commission. MTC is the regional transportation planning, finance and coordinating agency for the San Francisco Bay Area. Ms. Crotty has worked at MTC for 15 years. Her responsibilities include delivery and operations of a variety of traveler and customer services, including the 511 traveler information program, whose key services include provision of real-time traffic incident and congestion information, real time transit information and a regional transit trip planner. Now more than 10 years old, the Bay Area's service is the most used 511 system in the United States. The award winning 511 program averages over 2 million calls and web sessions each month. Other responsibilities include implementation and operation of the TransLink® transit smartcard program, the regional rideshare program, the Vehicle Infrastructure Integration California testbed, and the Regional Transit Connectivity Plan. She is a member of the Institute of Transportation Engineers, Women in Transportation Study and the AASHTO 511 Advisory Committee. Ms. Crotty currently serves on the ITS California Board of Directors and the USDOT VII National Working Group.

Emanuel Fleuti completed his studies at the University of Berne, majoring in physical geography and computer science. After working as a meteorologist for short term weather forecasting in the private sector and in hazardous waste management with the Federal Office for Environment, he has been working with Unique (former Zurich Airport Authority) since 1990, heading the Environmental Services Department. He is responsible for all environmental topics excluding aircraft noise, but specializes in environmental management and airport air quality. Zurich Airport has gained worldwide reputation and expertise in airport air quality assessments and mitigation planning. Unique has held an ISO 14401 certificate for its Environmental Management System since 2001, the Environmental Department also an ISO 9001 certificate for Quality Management. Emanuel Fleuti has participated in a number of different international programs like the IPCC Special Report on Aviation and Global Atmosphere (1999), AERONET II and III and the CAEP process. He also represents the airport in the ADV (German

Airports Association), ACI EUROPE and the ACI World Environment Standing Committee, acting as the current chairman. He was involved as a consultant in air quality initiatives of international airports and organisations.

Joel Garreau is the author of *Radical Evolution: The Promise and Peril of Enhancing Our Minds, Our Bodies – and What It Means to Be Human*, published in 2005 by Doubleday. Joel's latest book takes an unprecedented, sometimes alarming, look at the hinge in history at which we have arrived. For hundreds of millennia, our technologies have been aimed outward at altering our environment in the fashion of fire, agriculture, or space travel. Now, for the first time, we are increasingly aiming inward at modifying our minds, memories, metabolisms, personalities, progeny and possibly our immortal souls. *Radical Evolution* is about altering human nature – not in some distant tomorrow, but in the next 10 or 20 years. The book was nominated for the Pulitzer Prize. Joel is a reporter and editor at The Washington Post and principal of The Garreau Group, the network of his best sources committed to understanding who we are, how we got that way, and where we're headed, worldwide. He is a James Martin Fellow at Oxford's Said School of Business. He has served as a senior fellow at the University of California at Berkeley and George Mason University, and is a member of Global Business Network, the pioneering scenario-planning organization.

John German is Manager of Environmental and Energy Analyses for American Honda Motor Company. His responsibilities include anything connected with environmental and energy matters, with an emphasis on being a liaison between Honda's Research & Development people and regulatory affairs. Mr. German has been involved with advanced technology and fuel economy since joining Chrysler in 1976, where he spent 8 years in Powertrain Engineering working on fuel economy issues. Prior to joining Honda 10 years ago, he spent 13 years doing research and writing regulations for EPA's Office of Mobile Sources' laboratory in Ann Arbor, MI. Mr. German is the author of a variety of technical papers and a book on hybrid gasoline-electric vehicles published by SAE. He was the first recipient of the Barry D. McNutt award, presented annually by SAE for Excellence in Automotive Policy Analysis.

Adam Giambrone is the Toronto City Councillor representing Ward 18 Davenport, and Chair of the Toronto Transit Commission (TTC.) As Chair of the Toronto Transit Commission, Adam has ambitious goals for increasing TTC ridership and improving service. In early 2007, he announced the acclaimed "Transit City" plan for a network of 7 new light rail lines across the City. He has also announced plans for cleaner and better-designed stations, and a new fleet of modern streetcars. As former Chair of the Toronto Cycling Committee, Adam has fought for new funding for cycling infrastructure, and ensured that cycling has stayed on the city agenda. As Vice-Chair of the Public Works and Infrastructure Committee, Adam has helped to develop solutions to Toronto's garbage challenges, and promote recycling and organic collection. In addition to his work as a City Councillor, Adam served as Federal President of the New Democratic Party of Canada from 2001 - 2006. He is a regular guest panelist on Canadian radio and television, speaking on issues that affect all levels of government, in both official languages.

Lawrence Jesse Glazer has forty years experience in traffic, transit, Transportation Demand Management, and Intelligent Transportation Systems. He worked within the public sector, private sector, and academia. His experience includes eighteen years of experience in ITS, together with training, research, evaluation, design, deployment and marketing of products and services. Furthermore, Mr. Glazer has eight years experience delivering education and training programs for ITS, traffic, transit and TDM professionals and five years of experience in evaluation of transportation innovations, including regional ITS deployments, HOV facilities, and TDM programs. He conducted over 100 transportation surveys for transit, highway and TDM projects and developed transportation management programs for governments, employment centers, and offices.

Steve Heminger is Executive Director of the Metropolitan Transportation Commission (MTC). MTC is the regional transportation planning and finance agency for the nine-county San Francisco Bay Area. It allocates more than \$1 billion per year in funding for the operation, maintenance and expansion of the Bay

Area's surface transportation network. Since 1998, MTC has served as the Bay Area Toll Authority (BATA) responsible for administering all toll revenue from the seven state-owned bridges. BATA has a "AA" credit rating and plans to issue over \$6 billion in toll revenue bonds to finance bridge, highway, and transit construction projects over the next several years. MTC also functions as the region's Service Authority for Freeways and Expressways (SAFE) and operates a fleet of 80 tow trucks and 2,600 roadside call boxes to assist motorists in trouble. In addition, MTC manages the TransLink® universal fare card program for public transit and the popular 511 traveler information telephone number and web site. Mr. Heminger was appointed by House Speaker Nancy Pelosi to serve on the National Surface Transportation Policy and Revenue Study Commission, which will help chart the future course for the federal transportation program. In addition, he is a member of the Board of Trustees for the Mineta Transportation Institute and the Board of Directors for the Association of Metropolitan Planning Organizations and International Bridge, Tunnel and Turnpike Association.

Dario Hidalgo is Senior Transport Engineer at *EMBARQ*, the World Resources Institute Center for Sustainable Transport. He is a civil engineer from Universidad de los Andes in Bogotá, Colombia, and holds a Ph.D. in transportation planning from The Ohio State University. He spent the last 16 years in the field of urban transport, working both as a government official and a consultant for various international agencies and local governments. He advised cities and led training courses on planning and implementation of BRT systems in Asia, Africa and Latin America. An important experience in his extensive career was his participation in the planning and implementation of TransMilenio, the advanced Bus Rapid Transit system of Bogotá, Colombia, now moving over 1.4 million passengers per day. Hidalgo was a member of the board of directors and deputy general manager during the implementation of TransMilenio Phase 1 (81 km), and the planning of its second phase (82 km).

Thomas A. Horan is Associate Professor and Director of the Claremont Information and Technology Institute at Claremont Graduate University (CGU). Dr. Horan has over 25 years experience in conducting applied research focused on the innovative use of technology to improve surface transportation system performance. Dr. Horan also serves as Research Director for the University of Minnesota's Center for Excellence in Rural Safety, where he is leading the development of SafeRoadMaps, an innovative citizen-centered transportation safety GIS system. Dr. Horan has published two books (*Digital Places, Digital Infrastructures*) and over two-dozen technical articles. He has received funding from numerous sources, including the US Department of Transportation, National Science Foundation, and Economic Development Administration. Prior to joining the faculty at CGU, Dr. Horan served as Senior Analyst for the US General Accounting Office (GAO) in Washington, DC. Dr. Horan has both his master's and Ph.D. degrees from Claremont Graduate University.

Robert G. Kanter is the Managing Director of Environmental Affairs and Planning for the Port of Long Beach. As director, Dr. Kanter guides the port's environmental, transportation, and master land use planning divisions. He coordinates short- and long-range land-use planning with an eye toward forecasted commodity trends in international trade and commerce. Dr. Kanter's responsibilities include development of policies and plans for truck, rail, and transportation infrastructure improvements that are required to meet the demands created by increasing international trade. He is also responsible for developing port environmental policies, ensuring that the port is in compliance with existing environmental regulations, and planning for future requirements. He is one of the principal architects of the San Pedro Bay Port's Clean Air Action Plan.

Gerrit-Jan Knaap is Professor of Urban Studies and Planning and Executive Director of the National Center for Smart Growth Research and Education at the University of Maryland. Knaap's research interests include the economics and politics of land use planning, the efficacy of economic development instruments, and the impacts of environmental policy. On these subjects, Gerrit published over 50 articles in journals that include the *Journal of the American Planning Association*, the *Journal of Urban Economics*, *Land*

Economics, Regional Science and Urban Economics, Policy Analysis and Management, and *State and Local Government Review*. He received the Chester Rapkin award for the best paper published in Volume 10 of *The Journal of Planning Education and Research*, with Greg Lindsey he received the 1998 best of ACSP award, and in 2007 he received the Outstanding Planner Award from the Maryland Chapter of the American Planning Association. Knaap is the co-author or co-editor of six books: *Incentives, Regulations, and Plans: The Role of States and Nation States in Smart Growth Planning*; *Partnerships for Smart Growth: University and Community Collaboration for Better Public Places*; *Land Market Monitoring for Smart Urban Growth*; *The Regulated Landscape: Lessons on State Land Use Planning from Oregon*; *Spatial Development in Indonesia: Review and Prospects*; and *Environmental Program Evaluation: A Primer*. He serves on the Science and Technical Advisory Committee to the Chesapeake Bay Commission and the Smart Growth Subcabinet of Governor O'Malley.

Greg Larson spent eight years working for the United States Air Force as a System Engineer for electronic warfare systems. He worked for Caltrans for more than 17 years, first as a Research Engineer at the Transportation Laboratory, then as a Senior Electronics Engineer and an Engineering Manager. Greg is currently assigned as the Chief of the Office of Traffic Operations Research in the Division of Research and Innovation. He is responsible for managing and overseeing the efforts of a professional technical staff performing research in the area of Intelligent Transportation Systems, with the Division of Traffic Operations and various Districts as their primary customers. He also serves as one of the AASHTO representatives on the national VII Program's Technical Working Group. Prior to his current assignment, Greg served as the Chief of the Office of Advanced Highway Systems in the New Technology and Research Program. There he managed the resources and activities of a multidisciplinary technical staff, consisting primarily of Civil, Electrical, and Mechanical Engineers. The six Branches of his Office performed research in three major Program elements: Advanced Transportation Management Systems; Advanced Highway Maintenance and Construction Technology; and Advanced Vehicle Control and Safety Systems. These research areas are key elements of the national Intelligent Transportation Systems Program.

Randall Lewis is Executive Vice President and Principal of Lewis Operating Corp., a member of the Lewis Group of Companies. Lewis Group is one of the nation's largest privately held real estate organizations focused on developing shopping centers, planned communities and multifamily projects throughout California and Nevada. The Lewis Group of Companies is currently involved in developing more than a dozen master planned communities that will include over 60,000 homes at build out. Randall was named in the Los Angeles Times 2006 "West 100" list as one of the top 100 influential people in Southern California. He also received the California Business Properties Association Champion of the Industry Award was inducted into the California Building Industry Association Hall of Fame. Randall is a trustee of the Urban Land Institute, as well as a Governor of the Urban Land Institute Foundation. He serves on several executive boards, including the UCLA School of Public Affairs, the USC School of Policy, Planning and Development, The Loma Linda University Medical Center Orthopedic and Rehabilitation Institute Advisor Council and also serves as the Co-Chair for the San Bernardino County Alliance for Education and is a member of the Southern California Leadership Council.

Ronald O. Loveridge is a motivated and inspirational public servant who is currently serving his fourth term as Mayor of Riverside. Recognized not only for his local and regional leadership skills he is an advocate of town-grown relations and takes pride in Riverside's four higher education institutions. His commitment to clean air issues is evidenced through his longtime board membership on the South Coast Air Quality Management District. Governor Arnold Schwarzenegger appointed Mayor Loveridge to the California Air Resources Board in 2004. Mayor Loveridge also serves on the Board of Directors of the National League of Cities as its 2nd Vice President and on the California League of Cities Board. A political science professor at the University of California, Riverside, since 1965, with a PhD. from Stanford, Mayor Loveridge looked at the inner workings of local government first as an observer, a teacher who involved his students in the life of the City, and as a participant on local boards and committees. Mayor Loveridge

was elected to public office in 1979 as a City Councilmember for Riverside's 1st Ward and elected as Mayor in 1994.

Alan Lownethal was elected to represent the 27th District of the California State Senate in November of 2004 following six years in the California State Assembly. The 27th Senate District includes the Los Angeles County communities of Avalon, Long Beach, Signal Hill, Lakewood, Cerritos, Artesia, Bellflower, Downey, South Gate, Lynwood, Paramount, Hawaiian Gardens, Florence-Graham and Willowbrook. Senator Lowenthal serves as Chair of the Senate Transportation and Housing Committee, Chair Transportation and Housing Committee Sub-Committee on California Ports and Goods Movement, Chair of Senate Legislative Ethics Committee as well as Chair of the Budget and Fiscal Review Subcommittee No. 2 Resources, Environmental Protection and Energy. Prior to his election to the Senate, Lowenthal served six years in the State Assembly and six years on the Long Beach City Council. A professor of community psychology, Lowenthal is recently retired from California State University, Long Beach, where he taught between 1969 – 1998.

Patricia Mokhtarian is a Professor of Civil and Environmental Engineering, Associate Director for Education of the Institute of Transportation Studies, and Chair of an interdisciplinary graduate program in Transportation Technology and Policy at the University of California, Davis. She joined UC Davis in 1990, after nine years in regional planning and consulting in Southern California. Dr. Mokhtarian has specialized in the study of travel behavior for more than 30 years. A key research interest has been the impact of telecommunications technology on travel behavior, with additional interests in congestion-response behavior, attitudes toward mobility, adoption of new transportation technologies, land use and transportation interactions, and the transportation/air quality impacts of transportation demand management measures. She has authored or co-authored more than 160 refereed journal articles, technical reports, and other publications. Dr. Mokhtarian is the founding chair (emerita) of the Transportation Research Board committee on Telecommunications and Travel Behavior, is a member or friend of several other TRB committees, and has served on a number of study committees of the National Academies. She serves on the editorial boards of the journals *Transportation*, *Transportation Research Part A*, *Transport Policy*, and *Transportation Letters*.

Steve Polzin is the Director of Mobility Policy Research at the Center for Urban Transportation Research at the University of South Florida. His research concentrates on travel behavior, public transportation, mobility analysis, planning process development, travel data analysis, performance measurement, and transportation decision-making. Dr. Polzin carries out research for a range of clients at the federal, state and local levels. His twenty plus years of research experience coupled with industry experience enables a comprehensive perspective when addressing applied problems for clients ranging from local transit agencies and planning bodies to state and federal agencies. Dr. Polzin is on the Editorial Board of the *Journal of Public Transportation* and serves on several Transportation Research Board and APTA Committees. He teaches graduate courses on *Transportation and Land Use* and *Public Transportation*. He is in his seventh year of service on the Board of Directors of the Hillsborough Area Regional Transit Authority (Tampa, Florida) and has served on the Hillsborough County Metropolitan Planning Organization Board of Directors.

John Pucher is a professor of planning and public policy in the Bloustein School of Planning and Public Policy at Rutgers University in New Jersey. For over three decades he conducted research on a wide range of topics in transport economics and finance, including numerous projects for the U.S. Department of Transportation, the Canadian government, and various European ministries of transport. Pucher's particular focus has been on international comparisons of travel behavior, transport systems, and transport policies in Europe, Canada, and the USA. Currently, Pucher's research focuses on ways to promote safe and convenient walking and bicycling for daily travel and thus improve overall public health.

Susan Shaheen holds a joint research appointment at the Transportation Sustainability Research Center (TSRC) at the University of California (UC), Berkeley and at the Institute of Transportation Studies-Davis. She is the Co-Director of TSRC. She also is the co-director of the transportation track of the Energy Efficiency Center at UC Davis and was honored as the first Honda Distinguished Scholar in Transportation in 2000. She served as the Policy and Behavioral Research Program Leader at California Partners for Advanced Transit and Highways from 2003 to 2007, and as a special assistant to the Director's Office of the California Department of Transportation from 2001 to 2004. She has a Ph.D. in ecology, focusing on the energy and environmental aspects of transportation, from UC Davis and an M.S. in public policy analysis from the University of Rochester. After completing her master's degree, she worked as a consultant to the U.S. Department of Energy and the Environmental Protection Agency in Washington, D.C. From 2000 to 2001, she was a post-doctoral researcher at UC Berkeley. She has authored 31 journal articles and over 45 reports and proceedings articles and co-edited one book. Her research on car-sharing, smart parking, and older mobility have received national awards. Susan served on the ITS World Congress program committee since 2002 and is the chair of the Emerging and Innovative Public Transport and Technologies Committee of the Transportation Research Board.

Catherine Showalter (SYMPOSIUM CO-CHAIR) is the Director of the Public Policy Program at UCLA Extension. In this position, she uses the expertise she developed linking transportation demand management (TDM), land use and environmental management as a foundation from which to build programs that impact policy decisions at local, regional and national levels. Catherine also serves as Director of the Osher Lifelong Learning Institute at UCLA, fostering a community of active learning for older adults in the greater Los Angeles area. Prior to joining UCLA, Catherine led a non-profit organization, RIDES for Bay Area Commuters, Inc. as Executive Director. She held the position of Director of Transportation Programs at the South Coast Air Quality Management District, responsible for the development and implementation of transportation control measures. And finally, her experience at Transportation Management Services as a TDM consultant directly followed her tenure at the Orange County Transit District as a Transportation Systems Management Specialist. Catherine held management responsibilities within the public, private, and not-for-profit sectors disseminating technical information in a straightforward manner for ease in understanding by diverse audiences

Paul Sorensen is an operations researcher at the RAND Corporation, and conducts policy research in the areas of transportation, energy, environment, and emergency response. Dr. Sorensen served as principal investigator for a study of short-term policy options to reduce traffic congestion and improve transportation alternatives in Los Angeles. Other recent transportation work includes examining the use of performance-based accountability systems in transportation planning and policy, evaluating the potential for electronic tolling technologies to support innovative forms of transportation finance, and analyzing physical design measures to improve security at future LAX facilities. Examples of Dr. Sorensen's work in other fields include assessing the costs and benefits of endangered species habitat conservation in Riverside County, examining logistical challenges associated with mass distribution of antibiotics in the event of a large-scale public health emergency, and evaluating potential strategies to promote the recovery of the affordable housing stock in coastal Mississippi in the wake of Hurricane Katrina.

Brian D. Taylor (SYMPOSIUM CO-CHAIR) AICP, is Professor and Chair of Urban Planning and Director of the Institute of Transportation Studies at UCLA. His research examines both transportation finance and travel demographics. He has studied the politics of transportation finance, including the influence of finance on the development of metropolitan freeway systems, the effect of public transit subsidy programs on both system performance, and measuring equity in transportation finance. His research on travel demographics behavior has emphasized access-deprived populations, including women, racial-ethnic minorities, the disabled, and the poor. His work in this area has also explored the relationships between transportation and urban form, with a focus on commuting and employment access for low-wage workers. Most recently his research has examined the effect of travel experience on cognitive mapping; technological and political obstacles to pricing roads and public transit systems; the

factors explaining changes in transit ridership on public transit systems, including the deployment of rapid bus service in congested suburban settings, and transit system design for increased security and patronage; and alternative ways of measuring traffic congestion. At UCLA Professor Taylor teaches courses in transportation policy and planning and research design. Prior to coming to UCLA in 1994, he was a faculty member in the Department of City and Regional Planning at the University of North Carolina at Chapel Hill, and before that a Transportation Analyst with the Metropolitan Transportation Commission in Oakland, California.

Martin Wachs is Director of the Transportation, Space and Technology Program and of the Supply Chain Policy Center at the RAND Corporation. Until the end of 2005 he was Professor of Civil & Environmental Engineering and Professor of City & Regional Planning at the University of California, Berkeley, where was also Director of the Institute of Transportation Studies. He earlier spent 25 years at UCLA, where he was Chairman of the Department of Urban Planning. Wachs is the author of 160 articles and four books on subjects related to relationships between transportation, land use, and air quality, transportation needs of the elderly, techniques for the evaluation of transportation systems, and the use of performance measurement in transportation planning. His research also addresses issues of equity in transportation policy, problems of crime in public transit systems, the response of transportation systems to natural disasters including earthquakes. His most recent work focuses on transportation finance in relation to planning and policy. For two decades, Wachs has written about the uses of forecasts by policymakers and the ethical issues in the uses of forecasting. Dr. Wachs served on the Executive Committee of the Transportation Research Board for nine years and was the TRB Chairman during the year 2000. He is the recipient of a Guggenheim Fellowship, two Rockefeller Foundation Humanities Fellowships, a UCLA Alumni Association Distinguished Teaching Award, the Pyke Johnson Award for the best paper presented at an annual meeting of the Transportation Research Board, and the Carey Award for service to the TRB. He is a Fellow of the American Institute of Certified Planners and a Lifetime Associate of the National Academy of Sciences. In 2006 he was named "Member of the Year" by the San Francisco Chapter of the Women's Transportation Seminar and was awarded the lifetime achievement award as "Distinguished Planning Educator" by the Association of Collegiate Schools of Planning.

Geoff Wardle was educated as an automotive engineer and designer. He has over thirty years of experience as a professional designer and design educator. He is currently director of Advanced Mobility Research at Art Center College of Design in Pasadena. Geoff has a unique overview and deep understanding of the global transportation industry in addition to a thorough knowledge of the technologies and processes that are changing the industry, the product and the product development process. However, as a designer, his real interest is in the future of transportation and complex systems thinking which requires continual thought about all the factors that will influence and shape our mobile lives. Geoff has also been part of the core team that created the Series of Sustainable Mobility Summits at Art Center (see www.artcenter.edu/summit).

Carol Whiteside, brings California Strategies nearly three decades of experience in public policy and has served in a number of elected and appointed positions. With a focus toward good governance, she utilizes her extensive knowledge in government relations, land use and community development to ensure win-win situations for clients and Californians. Whiteside most recently worked to improve the quality of life for Central Californians as she founded and presided over the Great Valley Center in Modesto California. There, she successfully raised more than \$40 million to promote good public policy and meet the growing challenges in the region. For more than a decade, Whiteside led efforts to improve transportation and internet connectivity in the region and established the center as a permanent part of the University of California at Merced. Currently is an Executive Committee Chair for the Public Policy Institute of California and has previously served on the California Center for Regional Leadership and The Lincoln Institute for land policy Cambridge MA.

Perry Wong is a Senior Managing Economist in Regional Economics at the Milken Institute, helping to develop the research agenda and solicit funding for research projects. Wong is an expert on regional economics, development and econometric forecasting, and specializes in analyzing the structure, industry mix, development and public policies of a regional economy. He designs, manages and performs research on labor and workforce issues, the relationship between technology and economic development, and trade and industry, with a focus on policy development and implementation of economic policy in both leading and disadvantaged regions. Wong is actively involved in projects aimed at increasing access to technology and regional economic development in California and the American Midwest. His work extends to the international arena, where he is involved in regional economic development in southern China, Taiwan and elsewhere in Asia. Prior to joining the institute, Perry was a senior economist and director of regional forecasting at Global Insight Inc. He earned a master's degree in economics from Temple University.

The Future of Cities and Travel

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Appendix C – Participant & Speaker Rosters

UCLA Lake Arrowhead Conference Center
Lake Arrowhead, California
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The Future of Cities and Travel

**The Transportation – Land Use – Environment
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Appendix D – Sponsors

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UCLA Conference Center at Lake Arrowhead
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