

October 2016

PAYING IT FORWARD:
INVESTING IN
SUSTAINABLE
MOBILITY

The 26th Lake Arrowhead
Symposium

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INTRODUCTION

Over the past few decades, our systems for financing transportation from year to year have grown less predictable, while mandates have increased for transportation systems that are environmentally sustainable in the long term. This growing cleft between short-term finance and long-term planning has created enormous challenges for public officials who seek to strategically manage land use, transportation systems, and environmental policy on behalf of the private firms and residents who are their customers. Big-ticket, capital projects win both headlines and funding, while support and funds lag behind for existing systems' operation and upkeep. The shortage of funding for operations, and especially maintenance is a serious and growing problem that could have dire consequences for future generations.

The 26th installment of the UCLA Lake Arrowhead Symposium on the Transportation-Land Use-Environment Connection, held this past October in the San Bernardino Mountains, was dedicated to exploring this link between sustainable finance and sustainable transportation outcomes. Panelists and attendees came from all over the country to discuss funding innovative transportation programs, coping with fiscal uncertainty, and planning for future innovations like Autonomous Vehicles. The Symposium is always an intimate, invite-only gathering, which gives attendees a chance to collaborate, debate, and think critically with peers and across disciplines.

Featured Panels

Adding Capacity without Concrete

Funding Transportation Through Cap and Trade

Transit Investment: More Bang for the Buck

Getting Ready for the Rise of Autonomous Vehicles

How Will High Speed Rail Change California?

Local Heroes: Strategies for More Sustainably Financed Communities

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Main Takeaways



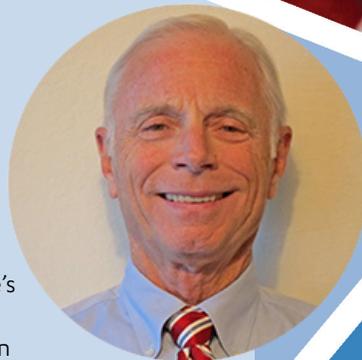
“Financial crises in transportation are rarely solved, but they are always resolved.”

Susan Binder



“We can absolutely fund high-speed rail. The question is whether we want to do so.”

Lou Thompson, on the state’s megaproject, which has an estimated price tag of \$64 Billion





“Will people really want to share autonomous vehicles with strangers?”

Joan Walker, on one of many questions and uncertainties that surround autonomous vehicles

From the Closing Panel

In transportation finance, big problems, big ideas, and big aspirations are borne out (or not) in many incremental decisions made in complex social, political, and economic environments. Concepts like equity, efficiency, fairness, and sustainability are enacted (or not) via incremental decisions on individual projects and referendums.

Change is happening. Rapid technological change in the transportation sector bodes corresponding changes in how we fund transportation. We are also witnessing exciting new finance innovations, like increasing adoption of high-occupancy toll (HOT) lanes, various kinds of road-user charges, and California’s cap-and-trade program.

The symposium touched on some major subsectors within transportation and interrogated the state of transportation finance in each. In goods movement, our speakers catalogued the enormous growth of goods movement and the many changes that are coming. There has been progress on reducing the environmental footprint of goods movement. On the other hand, there are enormous capital needs, but little consensus on who should pay.

There is an existential crisis in public transit. Investment is up, especially for new capital projects. Per capita ridership

is flat, though, and performance is declining. New private sector services like Uber, Lyft, and others are moving in. It remains to be seen whether these will threaten transit’s viability or save transit from its long decline.

Policy gridlock at the federal level has spawned laboratories of local innovation. This experimentation allows for trial and error, and ultimately produces valuable knowledge. On the other hand, it is not without its difficulties: for one, it’s easier to raise money in growing areas with rising employment and land values, potentially leaving economically stagnant areas in the lurch. Second, all taxes and fees have consequences—there is no free lunch.

We need to have more conversations about the public sector’s role in transportation finance. This role has been articulated by economists and other scholars. The public sector is uniquely positioned to account for market failures, protect public goods, price externalities, ensure fairness, and promote equity. As we move on into an uncertain future, it remains critically important for us focus on who pays for and who benefits from transportation—for we cannot efficiently, effectively, and equitably finance without knowing this.



“People are more willing to tax themselves than change their travel behavior.”

Michael Manville, on the popularity of transit sales taxes and declining transit ridership



Adding Capacity Without Adding Concrete:

How to Make Transportation Financially Sustainable



Traffic congestion is a condition that Los Angeles residents know all too well. But how do we fix traffic? The speakers from Sunday afternoon’s panel offered sustainable and cost-effective solutions, including pricing, policy, and technological solutions, to add capacity to our roads without adding more concrete.

The highlight of the session was the study on California’s Road User Charge Pilot Program, discussed by UCLA Professor Emeritus Martin Wachs. Infrastructure is aging,

while the funding to maintain infrastructure is shrinking. Revenue from gas tax has declined due to the increasing fuel-efficiency of cars. Road-user charges offer a new revenue source for the state to fund infrastructure improvements. The California Road User Charge program replaces the current gas tax, in which drivers pay a tax on each gallon of fuel they purchase, with a road-user charge based on Vehicle Miles Traveled (VMT). There are approximately 5000 participating vehicles statewide with a 9-month long demonstration.

Interestingly, those who have the most efficient cars (such as electric vehicles and hybrid cars) make up a majority of the volunteer participants of this program. This finding indicates a promising future and viability for the program because it shows people (even those who might end up paying more under this program) are receptive to this idea.

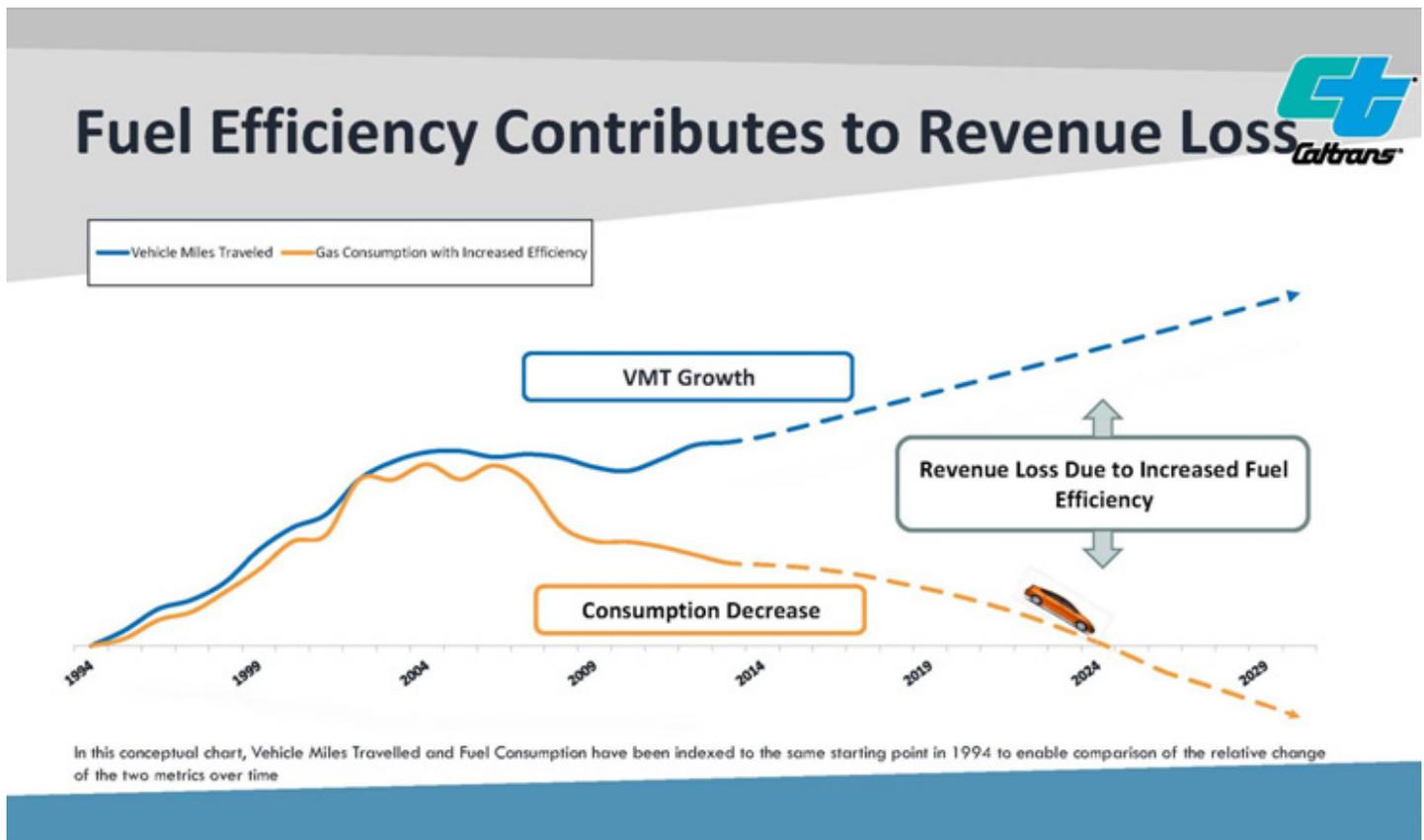
Wachs mentioned that there is potential for the technology of this program to merge with road-tolling systems or incorporate itself into transactions made at gas stations. Ultimately, he concluded, there is hope that this program could result in a more equitable and efficient use of roads, as peak-hour road use would cost more and the use of costlier roads would be more expensive.

Patty Rubstello of the Washington State DOT spoke about using roadway tolling to increase effective capacity. She discussed I-405 in Washington, which contains 17 miles of express toll lanes between downtown Bellevue and SR 522, as a case study. The revenue of \$10.56 million generated from the express toll lanes was well beyond the initial estimate of \$3.14 million (from its launch in September 2015 through May 2016). The revenue generated was enough to fund corridor improvements, and Rubstello ended with her thoughts on the future of tolling, saying that the technology would keep evolving and that we must continue to learn. The future of tolling

should also be open to technological innovation, she said. A simple-to-use and comprehensible system is necessary for the future of road-user charges. Finally, Eric Sundquist of the State Smart Transportation Initiative discussed how we can evaluate accessibility (ease of reaching destinations) and trip-making (actual use of the system to reach destinations) to provide more efficient access to destinations without new road construction. He summarized the case studies on accessibility and trip-making in a few major U.S. cities and found that short trips are often not connected to the local network. Sundquist emphasized the need to locate accessibility barriers throughout cities, set standards and nomenclature around accessibility and mobility, and provide a network that can truly connect people to where they are going.

In short, building more roads is far from the only way to add capacity to our road system. As discussed by the panelists in this session, there are in fact far more sustainable and cost-effective ways to approach the traffic congestion problems that many cities face.

Below | A graph presented by Martin Wachs illustrates how vehicle miles traveled has decoupled from fuel consumption due to increases in fuel efficiency. If the trend continues, VMT could be very high, but revenues from the gas tax to support all that travel could be lower than ever.





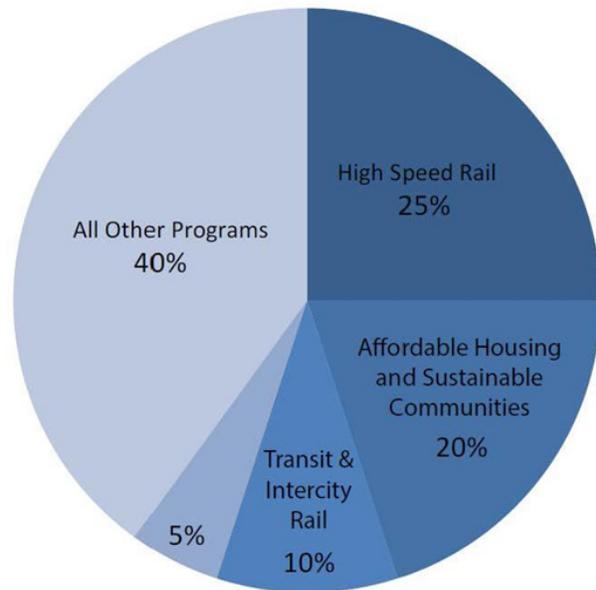
Funding Transportation Through Cap and Trade



Sunday night’s panel, “Cap and Trade and the Implications of Stop-And-Go Transportation Funding,” provided a crash course on one of the state’s most innovative funding mechanisms for public transit.

Ever since California passed AB32 in 2006, the state’s greenhouse-gas reduction mandates have been some of the strictest in the nation, setting the goal of reducing GHG levels to 1990 levels by 2020, and then reducing them again by 80% by the year 2050. The state-run Cap and Trade program has been a highly publicized part of this process, and because a certain portion of C&T funding is set aside to fund low carbon transportation, a panel of environmental experts got together to discuss the program’s successes and failures.

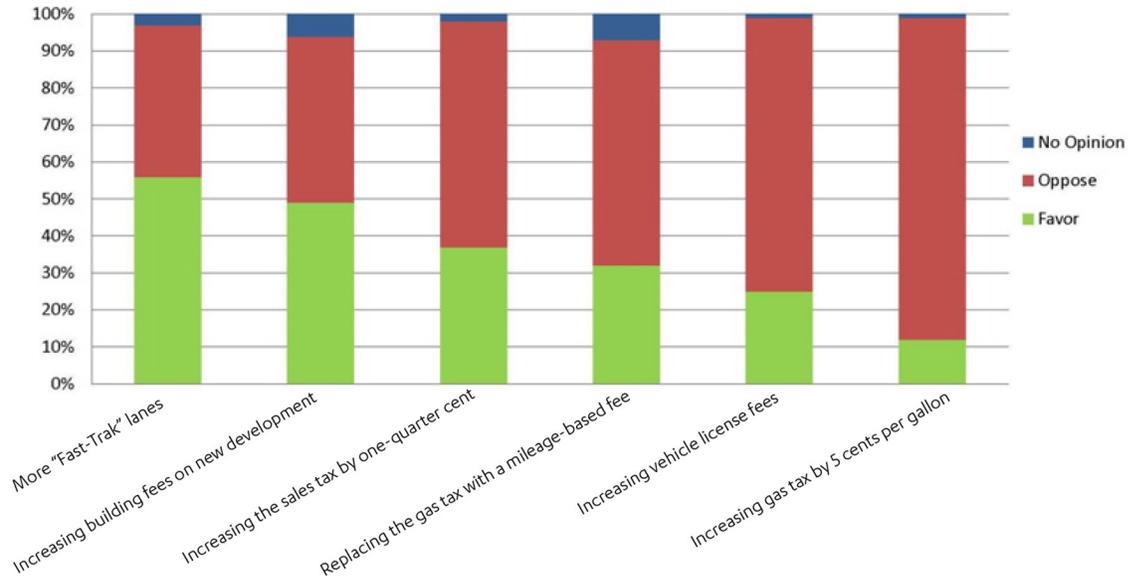
JR DeShazo of UCLA’s Luskin Center for Innovation explained the basic structure of the



Where the money collected from California’s Cap-and-Trade program is spent, in a chart presented by JR deShazo. Specific transportation-related programs comprise a large share of the spending; a “grab bag” of various energy efficiency programs is also funded.

Graphic from Ann Mayer's presentation, depicting the different levels of support that each revenue option has received, as well as the high level of opposition to taxes and fees more generally.

Revenue Options



state's Cap and Trade program: A business needs a permit to emit a ton of carbon, and there is an overall statewide cap on the number of permits that can be issued. These permits are then auctioned off to businesses around the state, and the revenues go toward the Greenhouse Gas Reduction Fund, which funds Sustainable Transportation initiatives, Sustainable Energy initiative, and a "grab bag" of state and local programs. According to DeShazo, this innovative combination of environmental planning and public finance may have been too successful: After 4 years of constantly growing revenues, this year revenues have gone down sharply.

In a sense, this is a good thing for California: It means businesses are polluting less. But when local transportation agencies depend on Cap and Trade revenue for funds, the following speakers explained, it can lead to uncertainty and stress about funding capital and operations plans.

Ann Mayer of the Riverside County Transportation Commission explained the local context she deals with: a fast-growing, geographically huge county with a low rate of jobs to housing. As a result, she said, local voters are often skeptical of transit improvements and are reluctant to do things like approve new tolls or levy new sales taxes, as other California counties have. Less money from the state means a direct hit on her budget for much-needed improvements. The final speaker was Assemblymember Richard Bloom, who represents Santa Monica in Sacramento and brought the much-

needed perspective of an elected official. As the Chair of the Budget Subcommittee on Resources and Transportation, Bloom admitted that the dropoff in Cap and Trade revenues has taken many in Sacramento by surprise. But he also pointed out that at the program's inception, it was meant to help get cash-strapped cities through the Great Recession, not represent a stable, permanent source of funding.

Like DeShazo, Bloom expressed the view that permanently high revenues from Cap and Trade should not be the state's aim, saying, "We would rather not have the money; we'd rather have less pollution. That is the real goal here." A permanently sustainable stream of transportation funding, he warned, would only come when the governor and state legislature step up to the plate to ensure new sources of revenue.

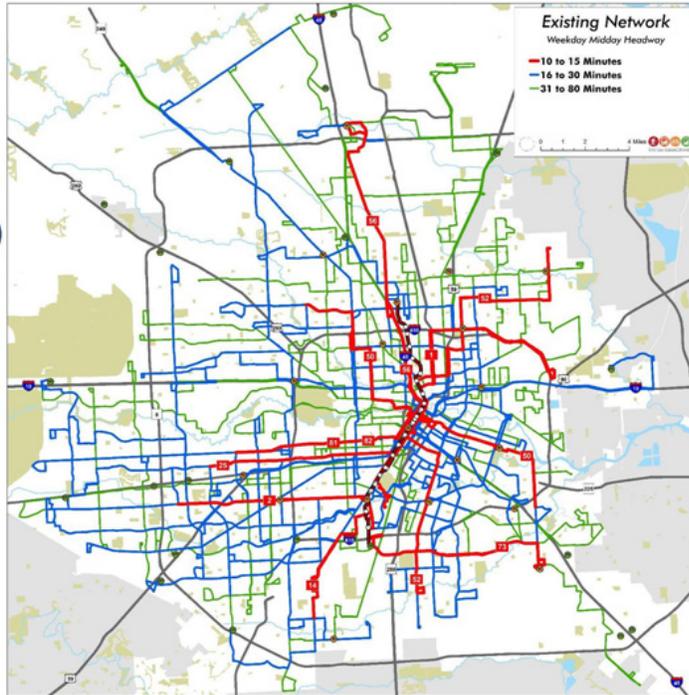
"We would rather not have the money; we'd rather have less pollution. That is the real goal here."

- CA Assemblymember Richard Bloom

Transit Investment: More Bang for the Buck

The Old Network: Weekdays

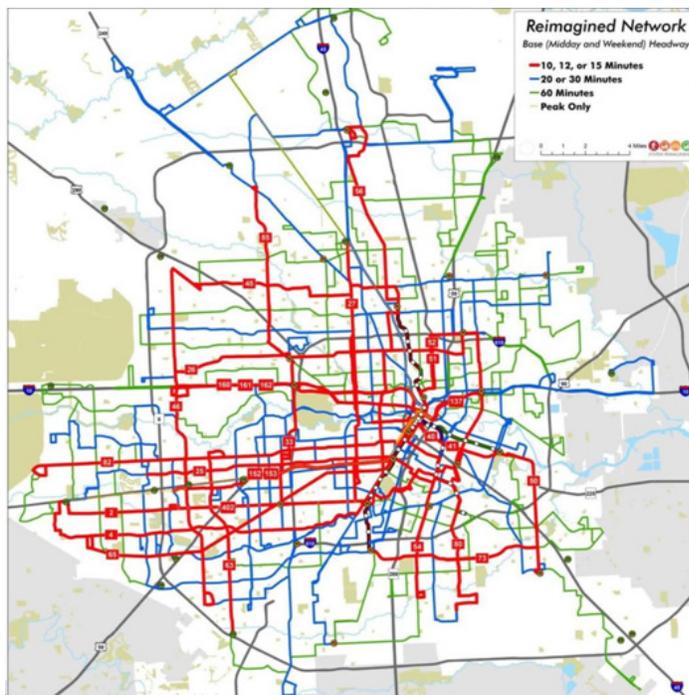
A largely radial (downtown-based) bus system.



- Red:** Frequent Network
- Blue:** 16 to 30 minute headways
- Green:** 31+ minute headways
- Orange:** Peak Only

The New Bus Network: All Days

Built frequent network on a solid grid structure, with coverage service more meandering



- Red:** Frequent Network
- Blue:** 16 to 30 minute headways
- Green:** 31+ minute headways
- Orange:** Peak Only

While several panels at this year's symposium discussed how we choose to pay for new transit, this panel took a different approach: Once the transit has been built, how do you get people to ride it—and make sure they keep riding it?

Steve Polzin of the University of South Florida presented some sobering statistics about the current state of mass-transit ridership and spending in the United States. While transit use is up overall, transit ridership per capita has been flat for decades, despite a push to build new rail systems in cities around the country. Polzin paid particular attention to the growing resource gap between bus and rail travelers: New projects tend to be capital-intensive, and most transit agencies prefer building rail to bus because they see it as more “prestigious.” The effect, Polzin said, is that we are doubling down on a mode of transit that is already preferred by wealthy riders.

Left | Houston overhauled their transit service to drastically improve the scope of their frequent network. Presented by Kurt Lurhsen.



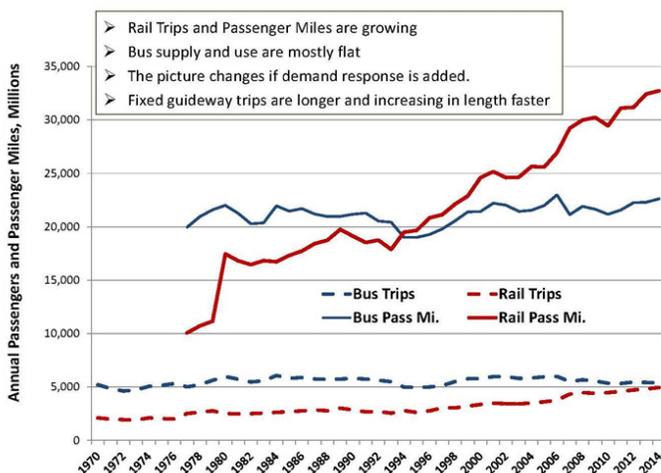
Bus riders, who tend to be poorer and more dependent on public transit, have not seen improving levels of service.

Kurt Luhrsen of Houston Metro and Emily Castor of Lyft provided on-the-ground evidence of transit planning at work. Luhrsen described how Houston overhauled its bus network in the past year, changing from a hub-and-spoke system to a citywide grid that improved service in the areas where transit riders lived. Responding to Houstonians' concerns about infrequent service and a state mandate to make the redesign cost-neutral, Houston Metro took a "blank slate" approach to designing a new bus network, becoming one of the few transit agencies in the country to see increases in bus ridership. Castor explained that Lyft arose as a response to the inefficiency of a transportation system that relies on single-occupancy vehicles. By forming partnerships with transit agencies and GM, Castor said, Lyft is looking for way to solve the first-mile/last-mile problem and bring about a future where vehicles are shared, autonomous, and environmentally friendly.

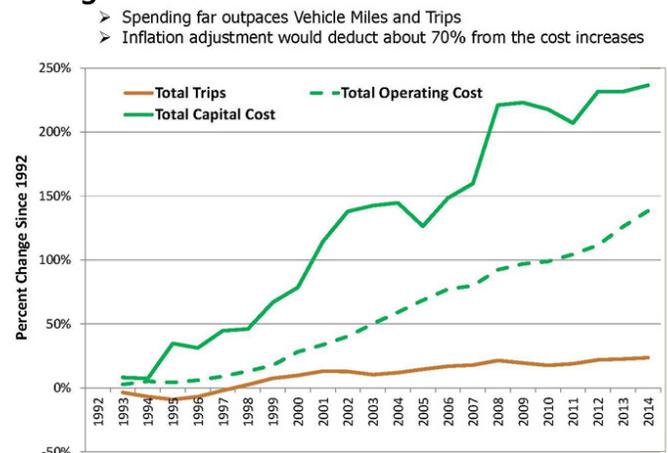


Below | Graphs from Steve Polzin's presentation illustrating the changes in transit supply, demand, and costs over time.

U.S. Transit Supply and Demand



Changes Since 1992



Autonomous Vehicles: A Focus on Uncertainties and Unintended Consequences



Autonomous vehicles (AV) are coming, and they are coming faster than we imagined (possibly within the next 5-10 years), but are we ready? AVs have the potential to transform the way people travel, but their impacts on congestion, greenhouse-gas emissions, and travel patterns will largely depend on planning and policy choices. A reoccurring question of concern in this Monday afternoon session was whether a world of driverless cars would be considered heaven or hell in the realm of transportation.

Randy Iwasaki, Executive Director of Contra Costa County Transportation Authority (CCTA), showcased the progress CCTA has made with AVs. Under his leadership, CCTA has founded a

large connected vehicle (CV) and AV test facility located in Concord, CA (GoMentum Station Program). Among other things, CCTA is exploring how shared AVs like autonomous 12-passenger vans that serve as shuttles to BART and other destinations could complement mass transit to overcome first-mile/last-mile challenges.

Following Iwasaki's presentation, Prof. Joan Walker, co-director of the Center for Global Metropolitan Studies at UC Berkeley, discussed

the implications of AVs on trip-making. She presented three "visions of the future." Vision 1 included AVs improving efficiency and safety, but increasing congestion and vehicle miles traveled (VMT) per capita, with increased population and urbanization as more people own and operate personal AVs for single-occupancy trips. On the other hand, Vision 3 (the future we should aim for) is a clean, connected, and equitable future where the majority of AV trips are shared rides made in shared vehicles. Shared AV rides could lead to fewer cars on the roads, reduced congestion and VMT, and therefore fewer GHG

emissions.

Walker asked the group to participate in an exercise. She asked the audience to imagine themselves in an AV making a trip somewhere. She then

asked the audience to raise their hands if they imagined themselves alone or with other people in the AV. Surprisingly, very few people

“Shared AV rides could lead to fewer cars on the roads, reduced congestion and VMT, and therefore fewer GHG emissions.”

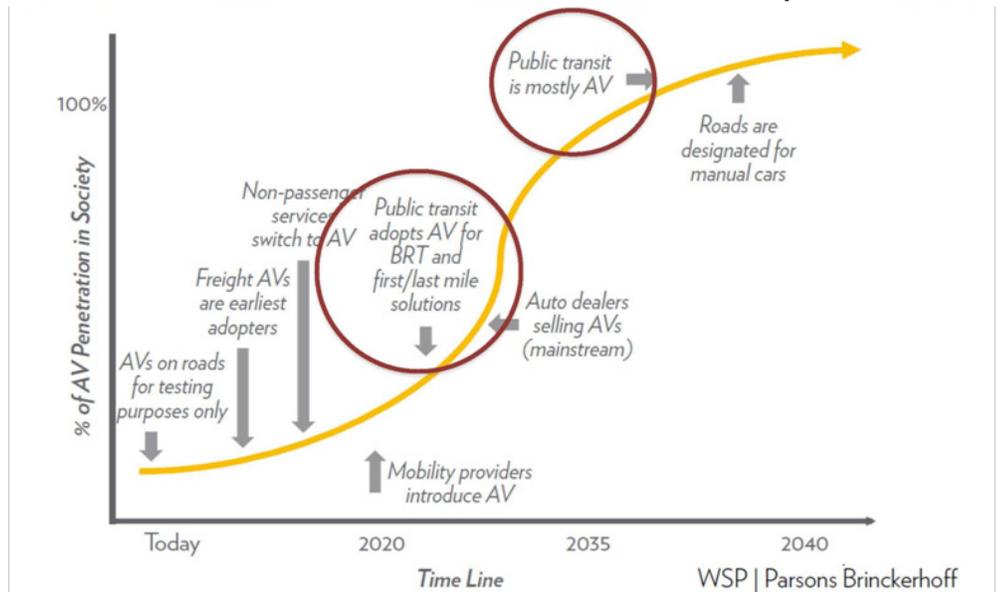


imagined themselves in a shared trip, thus underscoring the need for policy changes that influence and change travel behaviors to reduce single-occupancy trips.

Colin Peppard (Office of Extraordinary Innovation, LA Metro) echoed Walker in calling for policy changes now to accommodate and influence the distribution of social and economic impacts and benefits of AVs in the future. He presented a spectrum of future AV mobility scenarios. On one end, there is a new mobility utopia where 100% of AVs are shared, connected, and electrified, thus reducing congestion and VMT. On the opposite end, there is a new mobility nightmare with 0% of AVs being shared, connected, or electrified, resulting in more congestion and VMT.

While a future with AVs is foreseeable, it remains unclear whether this future will present additional challenges to the compounding effects of

Providers Facilitate AV Adoption



increased congestion and VMT that stem from increased automobile use and single-occupancy trips. As Peppard said, “the future can’t run on autopilot.” We need to act now to put in place policies that influence travel behaviors, working toward a future with AV trips that are shared rides in shared vehicles. This will take additional education and outreach, collaboration, and engagement with federal, state, and local planning processes.

Above | Colin Peppard presented a conceptual diagram of what chain of events might lead to widespread AV adoption, and how public transit providers might participate in and facilitate it.

What Can Californians Expect from the \$64B High Speed Rail Project?



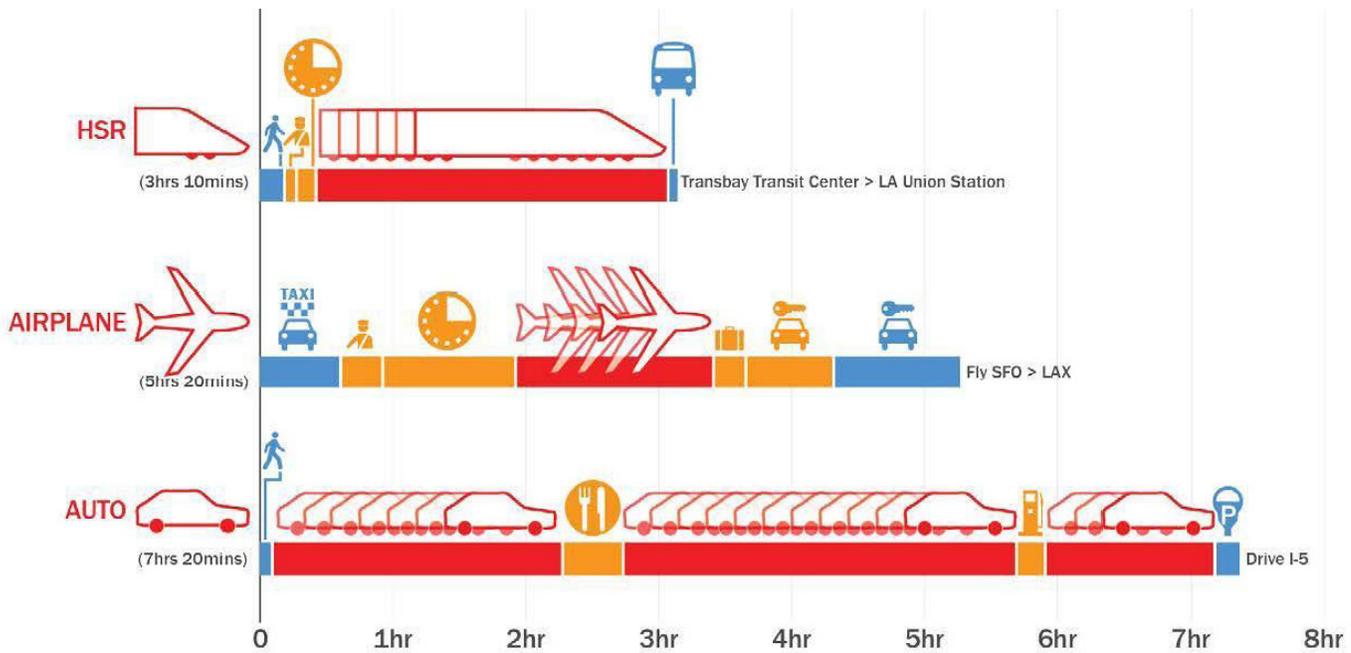
California's High-Speed Rail system isn't just the biggest transportation project happening in the state right now, it's the biggest public-works project ever in the history of California. Monday night's panel, moderated by UCLA Prof. Emeritus Martin Wachs, convened experts to discuss what Californians can expect from this huge undertaking in the years ahead.

Wachs began the panel by stressing just how much of a work in progress High Speed Rail is. The overall estimated price tag is \$64 billion, and \$40 billion of that amount is still uncommitted. In order to save money, the system is being built from the middle out, meaning it won't serve either of the

state's two main cities for some time. Above all, Wachs noted, "the rules about expending the funds that we have are forcing, in the short run, decisions which are very complex and which are shaping the project in the long run."

As an example of this, Wachs pointed to the legislative mandate that travel time between Los Angeles and San Francisco be less than 2 hours 40 minutes. Achieving this goal would require an exclusive, high-quality right of way, which will seriously increase the cost of the project. Moreover, private-sector companies have so far been unwilling to accept the high risk level associated with this project. Lou Thompson, a transportation consultant, elaborated on the role of the private sector. He pointed out that high-speed rail funding is currently coming from a variety of public sources, including money from the 2009 federal stimulus package and Cap and Trade revenue. Eventually these funds will run out—and whether private investors will fill the gap largely depends on if the High-Speed Rail Authority can make credible forecasts about ridership and costs.

Deike Peters of Soka University and Eric Eidlin of the Federal Transit Administration focused their presentations on the design and land-use aspects of High Speed Rail. Peters pointed out that transit, in and of itself, rarely has an effect on development patterns. Instead, what's important is good urban design, and integrating



Above | A chart from Eric Eidlin's presentation comparing travel times and procedures for a trip from the San Francisco Ferry Building to LA's Grand Central Market, and illustrating that high-speed rail could be a competitive option.

transit infrastructure with the surrounding neighborhoods. She said that California's High-Speed Rail alignment would need to be considered as both a route and a place in order to change how Californians travel for the better. Moreover, she said, good station design could not make up for a lack of good urban planning surrounding the station itself—something many European cities have found out the hard way. Eidlin also cited examples from Europe, including the popular Paris-Lyon route, as proof that locating major transit facilities in central cities can help maximize economic development and mobility. Like Peters, though, he stressed the need to view the infrastructure contextually. A major high-speed rail hub that doesn't have strong physical and modal connections to local transit, he said, is likely to fail at changing travel habits.

During the question-and-answer session, when Wachs asked the panelists a question about the fiscal future of the project, Thompson opined that even with all the money at stake here, it was important to look at High-Speed Rail outside the framework



of a pure "fiscal" project. "They are not financially viable in Europe and they won't be here," he said. In evaluating whether High-Speed Rail is worth the risk, Californians would need to weigh all the benefits and costs—financial, cultural, and environmental—and decide whether this new train system is the right choice for the state's future.

Above | A slide from Deike Peters' presentation shows the design and mobility innovations surrounding Rotterdam Centraal Station in the Netherlands.



Local Heroes: Strategies for More Sustainably Financed Communities

When federal and state funding sources are uncertain, local governments often find themselves responsible for closing the gap.

The final panel of the conference drew together four experts who discussed how local governments can find innovative new ways to finance transportation. An important

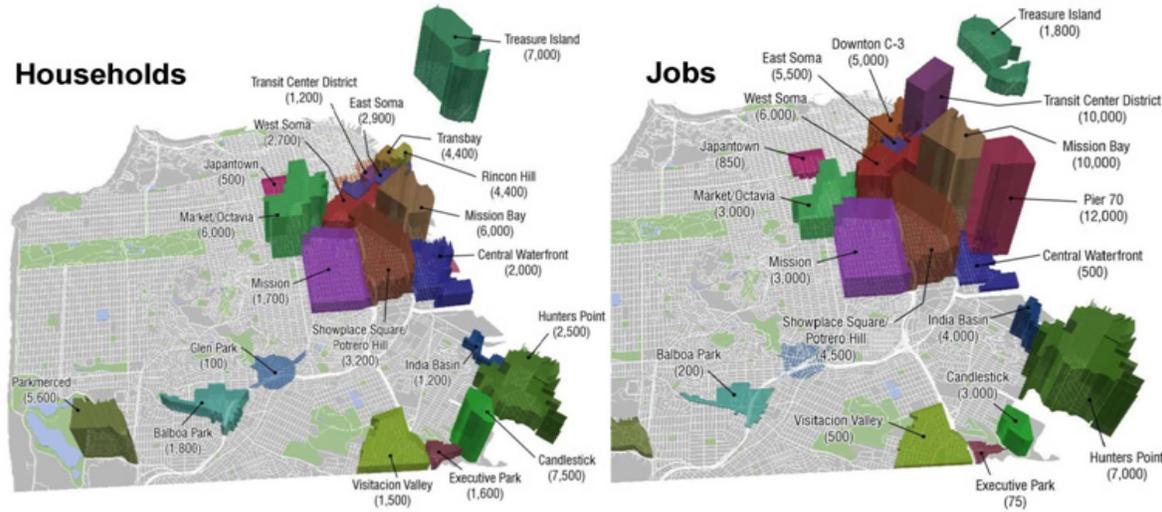
lesson from all four cities—Seattle, Columbus, San Francisco, and Los Angeles—was the need to align funding sources with local political realities. Genessee Adkins of the Seattle DOT pointed out that the Puget Sound region, with its progressive political culture, has often gone directly to voters to request dedicated transit levies. The tax plans that succeeded spread costs and benefits equally

A map from Viktoriya Wise's presentation illustrating where households and jobs are expected to grow in the coming years in San Francisco. She argued that developer impact fees are an important way to fund capital projects like bus rapid transit.

HOW DO WE GROW SUSTAINABLY?

By 2040: **100,000+** new households
190,000+ new jobs

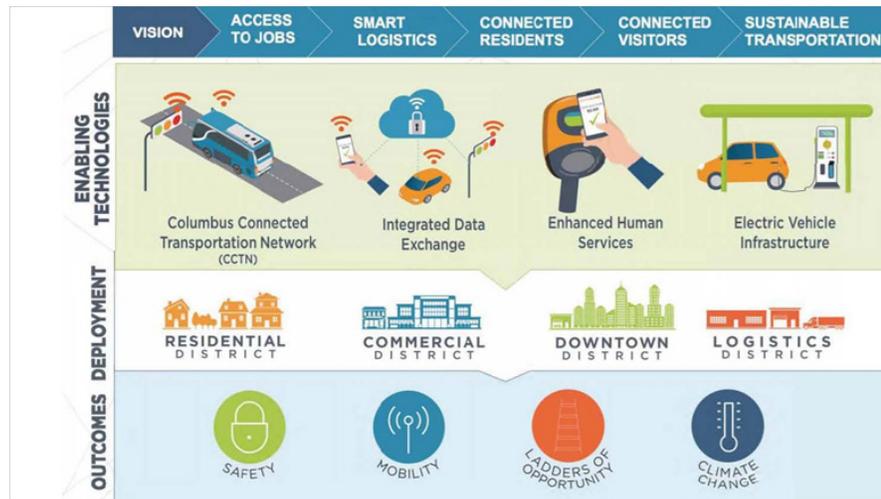
40% of housing projections already in pipeline



among the city and suburbs, even if they didn't always reflect the priorities of transit planners themselves.

Likewise, in Columbus, Paul Moore of Nelson\Nygaard told the story of a car-centric city that recently won the federal Smart Cities Challenge, and had to decide how to leverage this funding in a way that would meet residents' everyday needs. After realizing rail transit was not an immediate priority for Columbus residents, city leaders chose to focus on developing new technology that would (among other things) smooth commutes, encourage carpooling, and make real-time data available to all.

Impact fees for new developments are a popular way for cities to raise transportation funding, but they are not without their own complications. Viktoriya Wise from San Francisco MUNI and Mott Smith, a nonprofit housing developer in Los Angeles, disagreed over whether impact fees are sustainable in the long term. In a city like San Francisco, with huge population and job growth and a transit system bursting at the seams, Wise pointed out that impact fees had become a necessary way to fund new capital projects like BRT, along with regulatory changes that lay the groundwork for long-transit sustainability. In Los Angeles, with its severe housing shortage, Smith countered that any increase to the cost of development would end up increasing the overall cost of living. Land-value

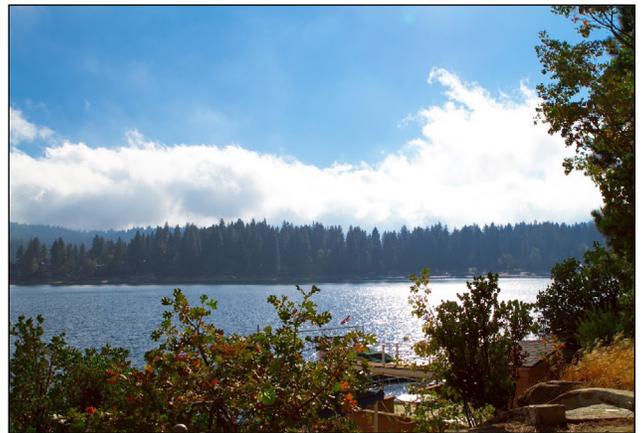


The goals and components of the City of Columbus' successfully funded Smart Cities program, as presented by Paul Moore.

capture is a time-honored way for municipalities to raise money for transit, but Smith also pointed out that many popular financing mechanisms are holdovers from a time when urban planning was designed to facilitate new-growth suburbs. Planning for a future of urban infill, he said, means rethinking the entire relationship land use and transportation—something that will be politically difficult but necessary in the years ahead.

SPEAKER LIST

TOPIC	SPEAKER & ORGANIZATION
A Brave New World: Transitioning to New Funding Environments	Susan Binder <i>Cambridge Systematics</i> Dr. Michael Manville <i>UCLA Institute of Transportation Studies</i> Dr. Joseph Schank <i>LA Metro</i>
Capacity without concrete: making transportation projects financially sustainable and cost-effective through pricing, policy, and technology	Patty Rubstello <i>Washington State Department of Transportation</i> Dr. Martin Wachs <i>UCLA Institute of Transportation Studies</i> Dr. Eric Sundquist <i>State Smart Transportation Initiative</i>
What to do when the well runs dry: Cap and Trade and the implications of stop-and-go transportation funding	Dr. J.R. De Shazo <i>UCLA Luskin Center for Innovation</i> Anne Mayer <i>Riverside County Transportation Commission</i> Richard Bloom <i>California State Assembly</i>
Sustainable Ports: Financially Green and Environmentally Green	John Young <i>American Association of Port Authorities</i> Rick Cameron <i>Port of Long Beach</i> Dr. Matt Barth <i>UC Riverside</i>
Getting more bang-for-the-buck from public transit investments	Dr. Steve Polzin <i>University of South Florida</i> Kurt Luhrsen <i>Houston METRO</i> Emily Castor <i>Lyft</i>
Ready or not: Autonomous and connected vehicle planning and policy	Randy Iwasaki <i>Contra Costa Transportation Authority</i> Stephen Boyd <i>Peleton Technologies</i> Dr. Joan Walker <i>UC Berkeley Institute of Transportation Studies</i>
From budget line to train line : How high-speed rail is faring in California	Lou Thompson <i>Thompson, Galenson, & Associates</i> Dr. Deike Peters <i>Soka University</i> Eric Eidlin <i>Federal Transit Administration</i>
Local Heroes: Strategies for more sustainably financed communities	Genesee Adkins <i>Seattle Department of Transportation</i> Paul Moore <i>Nelson/Nygaard</i> Viktoriya Wise <i>SF Municipal Transportation Agency</i> Mott Smith <i>Civic Enterprise</i>
Concluding reflections and group discussion	Therese McMillan <i>LA Metro</i> Dr. Brian Taylor <i>UCLA Institute of Transportation Studies</i>



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