

# ***TRANSPORTATION RESEARCH DIGEST***

*SEPTEMBER 2009*

ARIZONA TRANSPORTATION INSTITUTE

*e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)*

The contents of the *Transportation Research Digest* reflect the views of the authors who are responsible for the facts and the accuracy of the data presented. The contents do not necessarily reflect the official views or policies of the Institute

# ***TRANSPORTATION RESEARCH DIGEST***

## ***ARIZONA TRANSPORTATION INSTITUTE***

*e-mail* [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

TO: TRANSPORTATION PROFESSIONALS, MANAGERS, & POLICY MAKERS

FROM: ARIZONA TRANSPORTATION INSTITUTE

The volume of information on transportation issues, policies, technologies, and related topics is huge. Not even the most well-read professional can keep up with everything that might be useful to know. The *Transportation Research Digest* series is designed to expedite the transmission of information by condensing and summarizing significant documents. Busy professionals or managers may quickly obtain the gist of new developments and determine whether they need to see the full document.

The *Transportation Research Digest* is not meant to present definitive resolutions of scientific or policy controversies, but contributions to the pursuit of knowledge and the debate of issues. The intent is to be comprehensive rather than conclusive on the multitude of issues and topics of concern to those working in the field of transportation. Readers are encouraged to obtain the original document summarized in the *Transportation Research Digest* and subject the content to their own judgment.

Transportation professionals who would like to recommend documents to be summarized or submit summaries to be considered for inclusion in this publication are invited to do so. To recommend a document please send a copy (or information indicating how a copy can be obtained) of the research report to be summarized. To be considered, the report must meet the following requirements: (1) it is transportation related, (2) it is no more than two years old, (3) there is enough information in the report to warrant a two page summary. To write a summary, insure that the document being summarized meets the above requirements. The summary should be submitted in an electronic format. This summary should be in the 500 to 800 word range and may include tables and/or simple graphics—all of which must fit within the *Transportation Research Digest's* two-page format. Submissions are subject to editing for clarity and length. We do not guarantee that all submissions will be published.

If you would like to obtain the full report upon which a *Transportation Research Digest* summary is based you have several options. Check your local university library. You may want to contact the publisher using the contact information appearing in the *Transportation Research Digest*. Some of the documents are free for the asking. Others can be purchased.

There is a database listing of all the previously published *Transportation Research Digests* that we have on file (back to 1984). Copies of the list or of portions of the list selected by topic or mode can be provided on request. You may also access the database via the internet at

*Transportation Research Digests* from December 1995 to November 2003 are available on request.

A “Topic” code in the Table of Contents will help readers more quickly identify items of interest. The topic codes are explained in the table below.

<u>Code</u>	<u>Topic</u>	<u>Code</u>	<u>Topic</u>
ADM	Administration	PLAN	Planning
AIRP	Airports	PRIV	Privatization
AVIA	Aviation	RAIL	Railroads
BIKE	Bicycles	RDSO	Roadside
CON	Construction	ROW	Right-of-Way
ECON	Economics	SAFE	Safety
ENV	Environment	STR	Structures
FIN	Finance	TECH	Technology
INOV	Innovations	TOLL	Toll Roads
MAIN	Maintenance	TRAN	Transit
MISC	Miscellaneous	TRF	Traffic
MVD	Motor Vehicle Dept	TRK	Trucking
PAVE	Pavement	VEH	Vehicles

Requests or inquiries may be made via e-mail ([jsemmens@cox.net](mailto:jsemmens@cox.net)).

Thank you.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

### **TABLE OF CONTENTS**

<b><u>Topic</u></b>	<b><u>Title</u></b>	<b><u>Pages</u></b>
ECON/ cars & poverty	<b><i>The Car, Immigrants and Poverty: Implications for Immigrant Earnings and Job Access</i></b> by William A.V. Clark and Wenfei Winnie Wang (University of California Transportation Center, 2614 Dwight Way, 2 <sup>nd</sup> Floor, Berkeley, CA 94720-1782; <a href="http://www.uctc.net/papers/859.pdf">http://www.uctc.net/papers/859.pdf</a> ) (Sep 2008). Low-income populations rely primarily on the car and thus the calls for more transit, are out of sync with reality.	7-8
ENV/ global warming	<b><i>ULI Moving Cooler Report: Greenhouse Gases, Exaggerations and Misdirections</i></b> by Alan Pisarski (NewGeography.com; <a href="http://www.newgeography.com/content/00932-uli-moving-cooler-report-greenhouse-gases-exaggerations-and-misdirections">http://www.newgeography.com/content/00932-uli-moving-cooler-report-greenhouse-gases-exaggerations-and-misdirections</a> ) (Aug 2009). High-cost elaborate schemes to reshape urban living are favored.	9-10
FIN/ public- private partners	<b><i>Public Sector Decision Making for Public-Private Partnerships, NCHRP Synthesis 391</i></b> by Jeffrey N. Buxbaum & Iris N. Ortiz (Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001; (202) 334-3213; <a href="http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_391.pdf">http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_391.pdf</a> ) (2009). This synthesis examines how to properly evaluate the benefits and risks associated with allowing the private sector to have a greater role in the financing and development of highway infrastructure	11-12
PLAN/ federal oversight	<b><i>Options Exist to Enhance Transportation Planning Capacity and Federal Oversight</i></b> (Government Accountability Office, 441 G St., NW, Washington, DC 20548; <a href="http://www.gao.gov/new.items/d09868.pdf">http://www.gao.gov/new.items/d09868.pdf</a> ; Phillip R. Herr at (202) 512-2834 or <a href="mailto:herrp@gao.gov">herrp@gao.gov</a> ) (Sep 2009). FHWA oversight is focused on procedural rules rather than effectiveness of the MPOs.	13-14
PLAN/ land use	<b><i>Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?</i></b> by Robert Cervero and Michael Duncan (University of California Transportation Center, 2614 Dwight Way, 2 <sup>nd</sup> Floor, Berkeley, CA 94720-1782; <a href="http://www.uctc.net/papers/825.pdf">http://www.uctc.net/papers/825.pdf</a> ) (Winter 2008). Plentiful jobs within four miles of home significantly reduce VMT and VHT for work trips.	15-16
PRIV/ SAFE	<b><i>The Privatization of Roads and Highways</i></b> by Walter Block (Ludwig von Mises Institute, 518 West Magnolia Avenue, Auburn, Alabama 36832; <a href="http://mises.org/store/Privatization-of-Roads-and-Highways-P581.aspx">http://mises.org/store/Privatization-of-Roads-and-Highways-P581.aspx</a> ) (2009). Government ownership and operation of roads is inefficient and unsafe.	17-18

SAFE/ emer evac	<b><i>Transportation’s Role in Emergency Evacuation and Reentry, NCHRP Synthesis 394</i></b> by Brian Wolshon (Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001; (202) 334-3213; <a href="http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_392.pdf">http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_392.pdf</a> ) (2009). The goal of this study was to document transportation’s role in emergency evacuation and reentry.	19-20
TRAN/ riders	<b><i>Nature and/or Nurture? Analyzing the Determinants of Transit Ridership Across US Urbanized Areas</i></b> by Brian D. Taylor, Douglas Miller, Hiroyuki Iseki & Camille Fink (University of California Transportation Center, 2614 Dwight Way, 2 <sup>nd</sup> Floor, Berkeley, CA 94720-1782; <a href="http://www.uctc.net/papers/869.pdf">http://www.uctc.net/papers/869.pdf</a> ) (Jun 2008). Most of the variation in transit ridership among urbanized areas can be explained by factors outside of the control of public transit systems.	21-22
TRAN/ global warming	<b><i>Testimony of Randal O’Toole Cato Institute Before the Senate Banking Committee, Subcommittee on Housing, Transportation and Community Development</i></b> ( <a href="http://ti.org/O’TooleTestimony7-7-09.pdf">http://ti.org/O’TooleTestimony7-7-09.pdf</a> ) (July 9, 2009). Transit cannot play a significant role in saving energy or preventing climate change.	23-24
TRF/ congest	<b><i>Gridlock and Growth: The Effect of Traffic Congestion on Regional Economic Performance</i></b> by David T. Hartgen and M. Gregory Fields (Reason Foundation, 3415 S. Sepulveda Blvd., Suite 400, Los Angeles, CA 90034; <a href="http://reason.org/files/ps371_growth_gridlock_cities_full_study.pdf">http://reason.org/files/ps371_growth_gridlock_cities_full_study.pdf</a> ; phone: 310/391-2245) (August 2009). Reducing congestion would boost Gross Regional product by 6 to 30% if targeted at suburbs, malls, and universities.	25-26

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*The Car, Immigrants and Poverty: Implications for Immigrant Earnings and Job Access* by William A.V. Clark and Wenfei Winnie Wang (University of California Transportation Center, 2614 Dwight Way, 2<sup>nd</sup> Floor, Berkeley, CA 94720-1782; <http://www.uctc.net/papers/859.pdf>) (Sep 2008)

### **Highlights**

- ❑ Low-income populations rely primarily on the car and thus the calls for more transit, are out of sync with reality.
- ❑ Only 10% of foreign born Hispanics use public transportation to get to work.
- ❑ More walk to work than take public transit.
- ❑ Access to a car improves wages by 50%.

The ongoing debate about public transportation versus the car as means of job access is a central component of understanding the access of low income and new immigrant populations. The general tendency to come down on the side of the increased advantages of car ownership and use for improved access and increased wages is confirmed in this study, as in several recent studies of the welfare population. It is clear in this study as in the other research that low-income populations overcome the work residence separation by the car and thus the calls for more transit, especially for inner city populations need to be tempered with the reality of our modern transportation systems. .

The findings show that although public transportation use has a bearing on employment, especially for immigrants, its effect is minimal. On the contrary, the car plays a much more important role in aiding low income populations in accessing work and increasing their income. Nearly three quarters of the native and foreign born Hispanic fulltime workers use the car as their means of transportation to work. These numbers stay

high even for the poverty population, where almost 60 percent use the car for the journey to work. While the foreign born Hispanic population is close to eight times more likely to use public transportation than the native born, the actual proportion using public transportation is less than 10%. Other modes, primarily chauffeured, car pooling and walking account for higher proportions than public transportation. The data for the poverty population shows a similar pattern. The car also doubles the chances of being employed for the Hispanic population in general and increases the chances 1.4 times for the foreign born population. For the Hispanic population, both native and foreign born, the car significantly increases wages, by fifty percent.

There is no question that households continue to struggle with the commute, especially low-income households who even if they have a car are concerned about reliability and public transportation may be an important back-up for such households. The discussions of congestion, and the surveys that document the increasing problems surrounding the daily commute, are only the surface manifestation of one of the continuing crises of residential responses in large urban areas. The research from this paper shows that low-income populations are using the car and are more likely to use the car than public transportation. Public modes may be an important backup but it is the car which is critical in having a job and in having higher wages in Los Angeles County.

At the same time the research suggests a hidden problem in the turn to automobile use by low income and foreign born populations. While we have only aggregate data on insurance use by geographic area the aggregated data for Los Angeles County shows that many of these low income and poor car owners and users are minimizing their costs by not insuring their cars. The implications for overall car use costs and the costs to other car users are obvious. The costs of commuting

without insurance can only be measured by accident and other measures of social costs. Until we have those data we cannot compute the real costs and benefits of car use versus public transportation. That the foreign born and undocumented population is an increasing proportion of the large California metropolitan areas makes further research on car use and its relationship to alternative transportation uses even more relevant.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

**ULI Moving Cooler Report: Greenhouse Gases, Exaggerations and Misdirections** by Alan Pisarski (NewGeography.com; <http://www.newgeography.com/content/00932-uli-moving-cooler-report-greenhouse-gases-exaggerations-and-misdirections>) (Aug 2009)

### **Highlights**

- ❑ Low cost options receive short shrift.
- ❑ High-cost elaborate schemes to reshape urban living are favored.
- ❑ The analysis is opaque rather than transparent.

This is a report meant to be waved rather than read. It understates the prospect of gaining the full potential of greater energy efficiency from the vehicle fleet – the only way to justify the wholesale reorganization of society. In fact, if the vehicle/fuel assumptions had been as comparably optimistic as the land use assumptions, with a robust and honest assessment of fuel and vehicle technological development opportunities, one wonders whether this report would be worth doing at all.

We have been here before. In the struggle to improve air quality, it turned out that the solution was not so much changing people's behavior as it was technological – largely the improvement of fuel and vehicle technology. In the 1970s we were told we could not have cleaner air and automobiles; yet in fact that's exactly what happened, without having to heed a sermon about our need to repent and change our suburban, car-driving ways. Some people just have a penchant for telling others how to live.

Maybe the saddest part of it all, the authors appear not to take global warming or energy security very seriously at all. Rather these public concerns are just a convenient hook, the cause *du jour*, on which to hang their favorite solutions. If global warming and

energy security matters; then early action is clearly called for, particularly given the cumulative nature of GHG gases. But somehow the things easily done and carrying with them little in the way of disruption or public costs – carpooling, telecommuting, dispersed work – are largely written off. Such immediate, low-cost actions as highway operations strategies including better traffic signalization, improved traveler information and accident response systems receive little emphasis.

Overall, the treatment of costs and benefits will leave readers gasping:

- Travel times don't get counted – so shifting from a 15 minute car trip to an hour on transit or walking has no penalty.
- Transit subsidies don't get counted – so doubling subsidies to increase ridership has only benefits.
- Every possible pricing strategy is invoked – congestion pricing, cordon pricing, on-street parking fees, extreme fuel prices – in order to get people out of cars, and then the loss of their cars is counted as a benefit.

At the same time the benefits and the costs involved are so corrupted to be meaningless. It will take weeks for analysts to tease out what really was done in the way of assumptions to create winners and losers. And there is no effort to tally all the costs exacted on the average household, or the typical business or even governments for that matter.

The costs would add up to a permanent recession.

As we work our way through the recession, workers will be willing to travel farther and farther to find the right job – or any job. With continuing increased specialization in our society larger and larger market sheds for jobs and for workers, quality transportation will be critical to our national productivity. This is the work that transportation does and it is totally dismissed by this report. It can not be addressed adequately by rail or transit even with a complete radical reorganization of work and society.

In order to further bolster their ineffective case the proponents use a tool called “bundles” in which packages of actions are assembled for their “synergistic” qualities and either given a boost or cut based on the assertion that some things work well together. How this was done is not explained. So land use plans, which will take 30 years to come to fruition, are coupled with carbon pricing policies in a sort of horse and rabbit stew, that help make density solutions seem effective.

Those who see the solution of so many of our present ills by cramming people into

ever higher densities miss the point. Residential density is one of the most fundamental choices households make. Changing residential densities to make transit work better is the smallest tail wagging the biggest dog. It puts planning dogma ahead of the most basic human needs and rights.

It is clear that most people, excepting a small but often very loud minority, opt for lower density living when income permits. As the society changes and choice patterns evolve, the marketplace must be ready to respond with development that is both responsive to household choices and to the demands of environmental needs. Any public policies that inhibit a market trend toward higher densities must be addressed. But the market place must be the final arbiter in a free society. People do not live “efficiently” in order to optimize some imposed societal goal, certainly not commuting.

The serious work that needs to be done in this area still awaits an independent and credible group to undertake this work. It can't come soon enough.

# TRANSPORTATION RESEARCH DIGEST

## ARIZONA TRANSPORTATION INSTITUTE

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*Public Sector Decision Making for Public–Private Partnerships*, NCHRP Synthesis 391 by Jeffrey N. Buxbaum & Iris N. Ortiz (Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001; (202) 334-3213; [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_391.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_391.pdf)) (2009)

### Highlights

- This synthesis examines how to properly evaluate the benefits and risks associated with allowing the private sector to have a greater role in the financing and development of highway infrastructure.

### *How might governments decide whether or not to pursue a public–private partnership (PPP)?*

PPPs encompass a variety of project delivery options, with varying levels of private sector participation, based on risk transferred. A PPP is not a one-size-fits-all solution, and the decision to use one of the many PPP types or traditional approaches could consider and incorporate:

- *Valuation of alternative approaches.* There is a need for a process to analyze the differences between public versus private delivery that can be well understood by decision makers. To accomplish this, there is a need for personnel with skills including value engineering, business modeling, risk transfer assessment, capital budgeting, traditional financial problem-solving methodology, and performance auditing.
- *Appropriate risk transfer.* The transfer and sharing of project risks is considered by many as one of the main benefits of PPPs. In a PPP, risk could be allocated to the party that can best manage such risk and, in some instances, there are risks to be shared by

- both partners. Contract terms can be used to accomplish the transfer of risks.
- *Transparency and public participation.* PPP agreements are complicated, and there have been criticisms over deals being rushed through without the public or its elected officials understanding the implications. The lack of transparency in the PPP process has been voiced as one of the main concerns, and it is mentioned as an important issue by both supporters and opponents of PPPs. Once a PPP model is identified for a specific project, this could be followed by an exercise in educating and informing both the public and elected officials.
- *Unavoidable complexity of the transactions.* States are motivated to find creative solutions, and they are interested in obtaining results quickly. However, the PPP process is complex, from the valuation and procurement process through the duration of the partnership. There is a high level of expertise required when pursuing a PPP.

### *How might the public interest be protected?*

A PPP allows a much larger role for the private sector, from bundling design and construction in one contract (design-build), to long-term operations and maintenance of existing or new facilities (concessions). Some PPPs include equity contributions from the private partner and may also transfer toll

collection and rate setting responsibilities to the private sector. When transferring these responsibilities it is important to ensure that the private sector has the proper motivations to protect the public interest, while allowing investors to meet a return on the investment that is in line with the risk they take.

Most of the concerns about PPPs can be managed through contract terms. Although recent contracts have addressed many of the issues that have caused concerns in the past, unforeseen situations may arise. That is, when the strength and flexibility of the contract is tested, and clauses that allow for contract termination or buyout are important.

A PPP may also be monitored over its sometimes long lifetime to ensure that the private sector meets safety, maintenance, and other standards specified by contract. When valuing the decision to pursue a PPP, the public sector may account for the additional cost of performance monitoring by qualified, independent public sector/DOT staff.

***Misperceptions about PPPs can be a distraction from the real issues.***

Many public concerns are rooted in past transactions, even though more recent approaches have learned from the past and resolved the issues in contracts. Some negative perceptions about PPPs have lingered over time. Also, inadequate public information and openness in the process may lead to mistrust. Project sponsors might communicate with citizens and decision makers in an effort to build trust and to educate the public about some of the misperceptions related to PPPs and how they have been addressed, such as:

- Non-compete clauses are always part of PPPs with a long-term lease component. In reality, after the experience with

strict non-compete clauses in the 91 Express Lanes PPP in California, most PPP deals have included “limited-compete” clauses.

- A PPP is a synonym for tolls and with that toll increases are inevitable, resulting in windfall profits. Limiting schedules for toll levels can be and have been written into PPP agreements. In addition, there are several types of PPPs that do not require the implementation of tolls (e.g., design-build, maintenance contracts, and agreements with availability payments/shadow tolls). Furthermore, direct user fees (i.e., tolls) are not the only way that the private sector can be compensated. The PPP debate, specifically related to long-term concessions paid through tolls, is caught in the middle of a debate about tolling policy. Tolling policy and use of revenue is an important public responsibility that can be clearly articulated in contracts.
- The public sector loses total control of the facility. Under a PPP agreement, the public sector never loses ownership of the facility; however, some responsibilities are transferred to the private sector. The extent to which these responsibilities are transferred is defined by contract. Well-crafted agreements, along with monitoring and enforcement of contract terms, can ensure that the public interests are protected.

An open process helps build trust and support, as long as project sponsors can demonstrate that decisions are being made with the public interest in mind.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

*e-mail* [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

***Options Exist to Enhance Transportation Planning Capacity and Federal Oversight*** (Government Accountability Office, 441 G St., NW, Washington, DC 20548; <http://www.gao.gov/new.items/d09868.pdf>; Phillip R. Herr at (202) 512-2834 or [herrp@gao.gov](mailto:herrp@gao.gov)) (Sep 2009)

### **Highlights**

- Most MPOs receive the majority of their planning funds from federal sources.
- Most MPOs say more money and staff are needed for them to properly do their job.
- FHWA oversight is focused on procedural rules rather than effectiveness of the MPOs.

### **Why GAO Did This Study**

Metropolitan planning organizations (MPO) are responsible for transportation planning in metropolitan areas; however, little is known about what has been achieved by the planning efforts. This congressionally requested report describes (1) the characteristics and responsibilities of MPOs, (2) the challenges that MPOs face in carrying out their responsibilities, (3) how the U.S. Department of Transportation (DOT) provides oversight for MPOs and the extent to which this improves transportation planning, and (4) the options that have been proposed to enhance transportation planning.

To address these objectives, the Government Accountability Office (GAO) surveyed all 381 MPOs (with an 86 percent response rate) and conducted case studies of eight metropolitan areas and conducted a survey of program managers.

### **What GAO Found**

MPOs vary greatly in terms of capacity and responsibilities. Some MPOs are supported by one or two staff, while others have over 100 staff. While half of MPOs represent

populations of less than 200,000, some represent millions. MPOs are typically housed within a regional planning council or a city or county government agency, but also may operate as independent agencies. Most MPOs receive the majority of their planning funds from federal sources, but also receive funds from other sources such as states or localities. The technical capacity of MPOs also varies significantly, both in terms of the type of model used to develop travel demand forecasts and the number of staff available to perform such forecasts. Some MPOs have acquired additional responsibilities, such as project implementation, beyond federal requirements.

MPOs cited many challenges, primarily related to funding and staffing, authority, and technical capacity. About 85 percent of all MPOs cited the lack of transportation planning funding as a challenge to transportation planning. About half of survey respondents stated that the lack of flexibility for using federal planning funds inhibits them from conducting comprehensive transportation planning. Staffing constraints, such as limited number of staff and lack of trained staff, also impact MPOs' ability to conduct transportation planning. Finally, according to our survey and interviews, some MPOs lack the technical capacity and data necessary to conduct the type of complex transportation modeling required to meet their planning needs.

DOT's Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) work together to oversee MPOs, but

given the process-oriented approach of the oversight, it is difficult to determine whether their oversight is improving transportation planning. MPOs representing more than 200,000 in population are subject to federal certification reviews. The certification reviews focus on procedural compliance with planning requirements, not transportation outcomes. MPOs generally view this federal process as pro forma in nature and place a greater value on informal assistance provided by both federal and state governments.

Several proposals have been developed by government and industry associations that could address some of the resource, authority, and technical challenges facing MPOs. For example,

- allowing the use of transportation planning funds for more activities could better meet the needs of some metropolitan areas;
- varying MPOs' planning requirements and authority or changing the legal definition of MPOs could address varying capacity and planning needs;

- increasing federal investment in modeling and data gathering could improve the technical capability of MPOs and bring a greater degree of reliability and consistency across MPOs to travel demand forecasting; and
- making the planning process more performance-based could allow FTA and FHWA to better assess MPOs' progress in achieving specific results.

### **What GAO Recommends**

GAO suggests that Congress consider making MPO transportation planning more performance based by, for example, identifying specific transportation outcomes for transportation planning and charging DOT with assessing MPOs' progress in achieving these outcomes in the certification review process. GAO also recommends, among other things, that DOT develop a strategy to improve data gathering and modeling at the MPO level. DOT agreed to consider the report's recommendations.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

***Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?*** by Robert Cervero and Michael Duncan (University of California Transportation Center, 2614 Dwight Way, 2<sup>nd</sup> Floor, Berkeley, CA 94720-1782; <http://www.uctc.net/papers/825.pdf>) (Winter 2008)

### **Highlights**

- ❑ Linking jobs and housing holds significant potential to reduce VMT and VHT.
- ❑ Balanced, mixed-use growth, reduces total travel.
- ❑ Plentiful jobs within four miles of home significantly reduce VMT and VHT for work trips.

This article focuses on whether jobs-housing balance or locating retail and services close to residential areas yields greater travel-reducing benefits. Using 2000 travel-diary data from the San Francisco Bay Area, we match job accessibility to the work-tour vehicle-miles of travel (VMT) of individual commuters and retail-service accessibility to the shopping-tour VMT of individual shoppers. In addition to studying the effects on VMT, the analysis also examines effects on vehicle-hours traveled (VHT), since lost time imposes large costs to both individuals and society.

Notwithstanding the many obstacles to jobs-housing balance, there is little ambiguity in our findings: Linking jobs and housing holds significant potential to reduce VMT and VHT. These results do not support the thesis (which would pertain mainly to nonwork travel) that enhanced accessibility increases travel by reducing the cost per trip. A study by Krizek found that people moving to mixed-use neighborhoods with better access to retail employment made more tours following the move, but also had lower daily VMT (consistent with our findings) and made fewer stops per tour. Although the models were not

presented in this article, the authors found positive correlations between accessibility (across all distance rings) and numbers of tours and trip links (for all purposes), using the BATS database.

However, because both work- and shopping-based tours made by those living in accessible locations tend to be shorter, the association between accessibility and the VMT and VHT of tours was negative. In sum, high accessibility, and by extension, balanced, mixed-use growth, reduces total travel, both in distance and in time spent traveling. In the context of the larger debate over the effect land use has on travel, the results are unequivocal: Plentiful jobs within four miles of home significantly reduce VMT and VHT for work trips. That is, jobs-housing balance matters.

This study's results are consistent with findings from a recent national study that examined the influences of seven dimensions of land use in 1990 on subsequent changes in commute times in 2000 for a sample of 50 large U.S. urban areas. That study found that housing-job proximity was the only built-environment variable negatively and significantly associated with commute time. A mixed-use factor as well as several density variables were positively associated with journey-to-work times, though these relationships were not statistically significant. Thus, study suggests that achieving jobs-housing balance is one of the most important ways land-use planning can contribute to reducing motorized travel.

These findings should not be interpreted to mean that siting retail and services near residences is inconsequential from a transportation standpoint or not worth pursuing. There are many sound reasons for encouraging mixed-use development. After all, transportation is a means to an end, whether getting to work, purchasing groceries, or visiting a friend. Still, since cities and regions like metropolitan Portland, OR, set VMT containment policies, and most large metropolitan areas suffer serious air-quality problems that are exacerbated by factors like rising VMT and VHT, the findings in this article give credence to using jobs-housing balance as a smart-growth strategy, and help

define a spatial context for setting balanced-growth targets. And, of course, there is no reason that a community or region should not pursue both jobs/housing balance and housing-retail-service mixing. The VMT and VHT reduction elasticities for both policies were well above zero. Because many retail and service trips are linked to work tours, pursuing both strategies could very well yield synergistic benefits in many settings. For example, placing shops and services near workplaces and at neighborhood gateways could induce trip-chaining and more efficient automobile travel. Jobs/housing balance and mixed-use development are complementary, not substitute, land-use strategies.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

*e-mail* [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*The Privatization of Roads and Highways* by Walter Block (Ludwig von Mises Institute, 518 West Magnolia Avenue, Auburn, Alabama 36832; <http://mises.org/store/Privatization-of-Roads-and-Highways-P581.aspx>) (2009)

### **Highlights**

- ❑ Government ownership and operation of roads is inefficient and unsafe.
- ❑ The author demonstrates the superior results that could be achieved by privatizing roads.

In this book, author Walter Block advocates the complete, total and full privatization of "all roads, streets, highways, byways, avenues and other vehicular thoroughfares. This is so far off the radar of public policy analysis and apart from the concerns of politicians, pundits, and commentators, that few people will take it seriously.

A key element of Block's case is that government ownership and operation of roads is a major cause of the majority of the 40,000 people who die on the nation's roadways every year. Block rejects the oft made contention that the actual cause of highway fatalities is speed, drunkenness, vehicle malfunction, driver error, etc. These are only proximate causes. The ultimate cause of our dying like flies in traffic accidents is that those who own and manage these assets supposedly in the name of the public--the various roads bureaucrats--cannot manage their way out of the proverbial paper bag. It is they and they alone who are responsible for this carnage.

This does not mean that were thoroughfares placed in private hands that the death toll would be zero. It would not. But, at least, every time the life of someone was tragically snuffed out, someone in a position to ameliorate these dangerous conditions would

lose money, and this tends, wonderfully, to focus the minds of the owners. This is why we do not have similar problems with bananas, baskets, and bicycles, and the myriad of other goods and services supplied to us by a (relatively) free enterprise system.

If the highways were now commercial ventures as once in our history they were, and upward of 40,000 people were killed on them annually, they would be holding Senate hearings on the matter. Blamed would be "capitalism," "markets," "greed," i.e., the usual suspects. But it is the public authorities who are responsible for this slaughter of the innocents.

Is there anything of a practical nature that can be done to solve the problem in the short run? Probably not. But do not give up hope. Right before the decline and fall of communism in Russia and Eastern Europe, there were few who thought this scourge would soon be removed.

Another benefit of the present book is that it attempts to demonstrate the viability, efficaciousness, and, morality, of the private enterprise system, addressing a difficult case in point. If we can establish that private property and the profit motive can function even in "hard cases" such as roads, the better we can make the overall case on behalf of free enterprise.

The book is organized according to the following plan. The basic theory of privatization, specifically as applied to roadways, is put forth. The case on behalf of commercializing this sector of the economy is made on the basis of improving road safety and

decreasing traffic congestion. Next, this theory is applied to a whole host of related issues, such as automobile insurance, holding parades on public streets, and immigration. Our present institutional arrangements are socialistic. Then, we assume as a given the goal of privatizing traffic arteries, and instead focus on the very complex process of getting to there from here: what are the problems of transition, how would

the authorities move from a situation under their control to market determination, etc.? The next part of the book is given over to dealing with objections to the foregoing. Critiques are launched at several commentators, including Gordon Tullock, Lawrence White, Herbert Mohring, and Robert Poole. This book concludes with an interview of the author conducted by several Canadian libertarians.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*Transportation's Role in Emergency Evacuation and Reentry, NCHRP Synthesis 392* by Brian Wolshon (Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001; (202) 334-3213; [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_392.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_392.pdf)) (2009)

### **Highlights**

- The goal of this study was to document transportation's role in emergency evacuation and reentry.

Over the past decade, interest in and awareness of the topic evacuation has grown enormously. This has led to a wealth of new information on the role of transportation in emergency evacuation practice, planning, and research. First-of-their-kind plans for transit-based evacuations, regional contraflow, and emergency traffic simulation have all come into being within the last half decade. In many areas, evacuation plans also now include modes such as rail, air, and maritime.

A recent study of evacuations showed that between 1990 and 2003, the 230 evacuations involved 1,000 or more evacuees. The most common hazard for which evacuations were necessary during this period was wildfires, followed by floods, fixed-site hazardous material releases, railroad accidents, and hurricanes. Interestingly, the great majority (75%) of these events required an evacuation of 5,000 or fewer people and only 14 of the 230 (6%) involved more than 100,000 evacuees. It is these major events, however, that most often capture media attention and cause the most concern.

The goal of this study was to document transportation's role in emergency evacuation and reentry by summarizing aspects of its planning, control, and research as well as highlighting effective and innovative practices. With a better knowledge and understanding of

the characteristics and operational requirements, costs, and benefits associated with evacuations large and small, it is hoped that they can be carried out more safely and effectively in the future.

The review of practice showed that transportation plays an active role in supporting and assisting in evacuations. Transportation personnel are involved before, during, and after evacuations by managing and maintaining transportation systems, including traffic control, monitoring, planning, and management. After an evacuation, these personnel are involved in managing debris removal and signal restoration for reentry and in the monitoring and inspection of critical infrastructure. Most important, transportation professionals bring expert knowledge and a situational awareness of transportation systems into an emergency response. In states with large rural areas and populations, departments of transportation (DOTs) are often one of the few, if not only, state agencies with staff, equipment, and communication assets in remote areas that can be used to evacuate people to safety.

Among the best-defined and well-developed roles of transportation in evacuations are in the areas of direction and control of highway networks. This is not surprising because these are areas in which transportation agencies are the most knowledgeable, experienced, and best equipped to support. One high-profile and effective recent innovation has been the development of contraflow for "all lanes out" mass evacuations. In areas with the

need to evacuate dispersed populations, the role played by transportation is to keep evacuees and decision makers informed about which routes are open and which routes could be used as alternates.

Contrary to commonly held views, transportation agencies responding to the practice survey did not convey an overwhelming feeling that their resources were overcommitted or inadequate to carry out a large-scale evacuation. The majority of transportation agencies also indicated they had adequate communication capabilities to fulfill their role. The survey did, however, suggest that the greatest needs were for more financial and staff resources dedicated to plan for and manage evacuations. From a coordination perspective, the survey suggested that barriers or obstacles to coordination continue to exist across transportation agencies at various levels and jurisdictions and between transportation and other government agencies involved in the process, most notably law enforcement and emergency management. A positive finding of the survey was the extent to which transportation agencies are included in evacuation planning and preparedness exercises. All but three of the transportation agencies surveyed indicated involvement in their jurisdiction's evacuation exercises. Much of this is thought to be the direct result of changed and new philosophies since Hurricane Katrina.

Somewhat disappointing was the continued low level of planning by transportation agencies for the evacuation of dependent and special needs populations. The survey showed that only about half of the transportation agencies surveyed currently have accommodations for these populations. The

literature review did show, however, that the importance of this issue has been recognized and that several reports have identified and documented the gaps in practice as well as the needs to be addressed in the coming years.

Communications during evacuations was another area of continuing improvement. Communication now appears to be looked upon within a wider context of a multi-information flow and data exchange in which details flow between agencies, evacuees, and remote data acquisition devices. The practice review showed that transportation-related communication takes place during all phases of evacuations and encompasses en-route guidance as well as public information, awareness, education, and outreach campaigns. Information is also conveyed using a wide variety of media, including television, radio, print, newspaper, Internet, regular mail, e-mail, phone (reverse 911), variable message signing, and highway advisory radio.

Among the needs and gaps in knowledge and practice is a lack of formal planning for post event reentry of evacuees and mass repopulation of impacted areas. Currently, the role of transportation in the reentry process is oriented toward the inspection of critical infrastructure; the immediate (and longer-term) repair of damaged roads, control systems, bridges, and so on; debris removal and the reopening of roads; and, to a limited extent, the coordination and use of buses for the return of assisted evacuees to their places of origin. Another unaddressed gap is the impact of highway work zones during evacuation. Construction activities on evacuation routes have been an issue during several past evacuations and will result in future evacuation problems if not addressed.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*Nature and/or Nurture? Analyzing the Determinants of Transit Ridership Across US Urbanized Areas* by Brian D. Taylor, Douglas Miller, Hiroyuki Iseki & Camille Fink (University of California Transportation Center, 2614 Dwight Way, 2<sup>nd</sup> Floor, Berkeley, CA 94720-1782; <http://www.uctc.net/papers/869.pdf>) (Jun 2008)

### **Highlights**

- Transit use varies dramatically across metropolitan areas.
- Most of the variation in transit ridership among urbanized areas can be explained by factors outside of the control of public transit systems.
- About 26% of the observed variance in per capita transit patronage across US urbanized areas is explained by variations in service frequency and fare levels.

Most previous aggregate analyses of the factors influencing transit ridership have examined one or just a few systems, have not included many of the external, control variables thought to influence transit use, and have not addressed the simultaneous relationship between transit service supply and transit patronage demand. This study has attempted to address each of these shortcomings in the previous research by (1) conducting a cross-sectional analysis of transit use in 265 urbanized areas, (2) testing dozens of variables measuring transit system characteristics, auto/highway system characteristics, regional geography, metropolitan economy, and population characteristics, and (3) constructing two-stage simultaneous equation regression models to account for simultaneity between transit supply and demand.

Aggregate analyses like these clearly have limitations. While using urbanized areas, rather than individual transit systems, as the unit of analysis allowed the authors to consider

the collective efforts of multiple transit agencies in urban areas and to include and test a wide array of regional, economic, and demographic variables on aggregate transit ridership, such a relatively coarse unit of analysis does not allow for meaningful evaluation of a wide array of factors – such as personal safety, schedule reliability, and parking availability and costs – thought to significantly influence transit use. Further, aggregating to the urbanized area allows for between-group comparisons, but ignores the significant within group variation in transit service and use in nearly every record in the sample. This is particularly important for public transit because the transit use varies dramatically across metropolitan areas; in many areas, a substantial share of transit ridership is concentrated on just a few lines in and around the core of central cities, with far lower levels of patronage elsewhere. Such variation is not captured in this analysis.

The enormous variation in the size, character, population, and transit use among the 265 US urbanized areas analyzed led to substantial variance in most of the variables tested, which is an advantage of the cross-sectional models employed here. However, the analysis necessarily assumes that the factors influencing transit use operate somewhat consistently across urbanized areas, which may not be the case. For example, fare and service elasticities that do not distinguish among modes or between the short- and long-run. The difference between short- and long-run

elasticities can be examined using time-series data with lagged specifications.

Even if such data were available, however, given the generally gradual evolution of factors thought to influence transit patronage in urban areas, it is quite possible that time-series data over relatively short periods of time will not have sufficient variance in many of the variables tested in the models. One common problem with lag models is inadequate variance in the variables tests. And, as noted in the literature review above, while time-series data for individual agencies or areas are easier to come by, the results are unlikely to be generalizable.

Further, a common problem with cross-sectional models is underspecification. Underspecification bias in cross-sectional analyses is reduced when a sufficient number of variables thought to explain different aspects of the observed variance in a dependent variable are tested. As such, the authors tried in this analysis to develop a clear causal model and to test a wide array of variables that are believed to influence different aspects of the variance in transit patronage.

Such limitations notwithstanding, most of the variation in transit ridership among urbanized areas – in both absolute and relative terms – can be explained by factors outside of the control of public transit systems: (1) regional geography (specifically, area of

urbanization, population, population density, and regional location in the US), (2) metropolitan economy (specifically, personal/household income), (3) population characteristics (specifically, the percent college students, recent immigrants, and Democratic voters in the population), and (4) auto/highway system characteristics (specifically, the percent carless households and non-transit/non-SOV trips, including commuting via carpools, walking, biking, etc.).

While the nature of an urbanized area clearly goes a very long way toward explaining the overall level of transit use in an urbanized area, transit policies – measured here in terms of service frequency and fare levels – do make a significant difference as well. The observed range in both fares and service frequency could account for at least a doubling (or halving) of transit use in an urbanized area. Controlling for the fact that public transit use is strongly correlated with urbanized area size, about 26% of the observed variance in per capita transit patronage across US urbanized areas is explained in the models presented here by variations in service frequency and fare levels. The observed influence of these two principal components of transit service is consistent with both the literature and intuition: frequent service draws passengers and high fares drive them away.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

*Testimony of Randal O'Toole Cato Institute Before the Senate Banking Committee, Subcommittee on Housing, Transportation and Community Development* (<http://ti.org/O'TooleTestimony7-7-09.pdf>) (July 9, 2009)

### **Highlights**

- ❑ Transit cannot play a significant role in saving energy or preventing climate change.
- ❑ To make transit more environmentally friendly, we need to completely redesign our transit systems.
- ❑ Recommended measures: traffic signal coordination & congestion pricing.

The history of the last four decades shows that transit cannot and will not play a significant role in saving energy or preventing climate change. Forty years ago, American cities were choked with air pollution, so Congress passed the Clean Air Act of 1970 and created the Environmental Protection Agency (EPA) to administer the law. The EPA adopted two strategies to reduce pollution. First, it required automakers to make cars that polluted less. Second, it also encouraged cities to promote transit and adopt other policies aimed at getting people to drive less.

Today, we know what worked and what did not. Automotive air pollution has declined by at least two-thirds since 1970. This entire decline was due to technological changes in automobiles. Far from responding to transit investments by reducing driving and taking transit more, Americans today drive far more than they did in 1970.

Transit subsidies have historically had only a trivial effect on ridership. Between 1987 and 2007, annual subsidies in real dollars grew by 68%. Yet annual ridership grew by only 18%. While capital subsidies are sketchy before

1987, operating subsidies increased by 1240% since 1970. Yet ridership grew by only 45%.

More importantly, despite total real subsidies of well over three-quarters of a trillion dollars since 1970, *per-capita* transit ridership and passenger miles actually declined. *Per-capita* transit travel declined more-or-less steadily from 1970 through 1995. Although *per-capita* transit usage has grown a little since 1995, it remains below 1988, and far below 1970, levels. Moreover, while *per-capita* transit travel was declining, *per capita* urban driving grew by 120%. Transit carried more than 4% of urban travel in 1970; but it fell below 2% in 1990 and now stands at 1.6%.

Transit's poor performance is symptomatic of government-subsidized transit systems. Transit agencies that typically get three-quarters of their funds from taxpayers and only a quarter from transit users are politically obligated to run transit throughout their taxing districts no matter how few people want to use transit. The result is that the average transit vehicle, whether bus, light rail, subway, or commuter-rail car, runs an average of only one-sixth full.

Far from being short of funds, transit agencies have too much money, which they spend in the wrong places. Instead of providing economical transportation to users, they spend it on urban monuments such as light-rail and streetcar lines whose transportation value is negligibly different from buses. Agencies often go heavily into debt building these lines and are also obligated to huge operations and maintenance costs. Almost inevitably, they

suffer budget crises that force them to significantly curtail service.

On a passenger-mile basis, transit buses typically consume as much energy and emit as much CO<sub>2</sub> per passenger mile as SUVs. By comparison, private bus companies have an incentive to fill as many seats as possible, so they typically operate half to two-thirds full and consume little more than 10% as much energy per passenger mile as public transit buses. Between Boston and Washington, for example, at least 14 bus companies carry more passengers each day than Amtrak and do so using less than half as much energy and emitting about half as much greenhouse gases.

To make transit more environmentally friendly, we need to completely redesign our transit systems. This means either privatizing transit systems or, at the least, operating them entirely out of user fees rather than subsidies. If states feel the need to support people who have no access to automobiles, they can give such people transportation vouchers that they can use on any public conveyances.

At the same time, we can significantly reduce greenhouse gas emissions from automobiles without engaging in futile efforts to try to get people to stop driving. The Texas Transportation Institute says urban congestion wastes nearly 3 billion gallons of fuel each

year. Simple, low-cost techniques to relieve this congestion can do far more to reduce greenhouse gas emissions than investing more in a failed transit model.

One such technique is traffic signal coordination. A small investment in signal coordination can do more to reduce greenhouse gas emissions than billions invested in transit. For example, San Jose recently coordinated signals at 223 intersections, which reduced emissions by 4,200 tons per year at a cost of about \$7 per ton. When the savings to motorists are counted, the project actually saved \$200 per ton of reduced emissions. Yet the Federal Highway Administration estimates that three-quarters of the nation's traffic signals are obsolete or have no coordination at all.

Congestion pricing on existing HOV lanes and all new urban highways will also significantly reduce congestion. Looking to the future, accelerated investments in vehicle-to-vehicle and vehicle-to-infrastructure communications can greatly reduce congestion and increase personal mobility while saving energy and greenhouse gas emissions.

In short, instead of a futile effort to change American lifestyles, we simply need to make the form of transportation used most by Americans (as well as most Europeans and Japanese) even more efficient than it is today.

# **TRANSPORTATION RESEARCH DIGEST**

## **ARIZONA TRANSPORTATION INSTITUTE**

e-mail [jsemmens@cox.net](mailto:jsemmens@cox.net)

SEPTEMBER 2009

***Gridlock and Growth: The Effect of Traffic Congestion on Regional Economic Performance*** by David T. Hartgen and M. Gregory Fields (Reason Foundation, 3415 S. Sepulveda Blvd., Suite 400, Los Angeles, CA 90034; [http://reason.org/files/ps371\\_growth\\_gridlock\\_cities\\_full\\_study.pdf](http://reason.org/files/ps371_growth_gridlock_cities_full_study.pdf); phone: 310/391-2245) (August 2009)

### **Highlights**

- Reducing congestion would boost Gross Regional product by 6 to 30% if targeted at suburbs, malls, and universities.
- The economic gains would be 4 to 10% if targeted at CBDs.

The economic performance of cities has fascinated economists and regional scientists for centuries. The role of transportation in creating and maintaining easy and quick access to metropolitan areas and regional economic performance has been studied extensively, particularly in the past 30 years. The most recent efforts have attempted to tie regional performance to accessibility, congestion and transportation system performance. However, varying definitions of “access” and “performance” have confounded the research. A related problem is the exclusive attention to access to the central business district while ignoring other locations.

This report investigates how accessibility impacts the economic performance of large U.S. urban regions. The eight regions selected for this study are Charlotte, Salt Lake City, Seattle, Denver, San Francisco, Detroit, Dallas and Atlanta. Accessibility is defined as the number or percentage of jobs or residents within a given drive time from a point, measuring drive time via the available highway networks of the regions. Five major destinations, or “key points” for each region were identified: the central business district (CBD), major mall,

large suburb, university and airport, and correlated the accessibility to these points with regional productivity, defined as gross regional product per worker. The researchers then quantified how much current and future traffic congestion (extrapolated for the year 2030) and total congestion relief would affect the economic productivity of each region. Specifically, the study addresses four key questions:

- How accessible are various points in urban regions?
- How will the accessibility of these points change in the future?
- What effect will removing congestion have on accessibility?
- How would improving accessibility affect the economic performance of the region?

The study found that the CBD is generally the most accessible place in each region, with typically 30 to 60% of jobs and 25 to 50% of residents within 25 minutes of downtown under current congested conditions. Other key points have typically one-third to one-half the percentage of CBD jobs or residents within 25 minutes. The research determined that in the future, rising traffic congestion and rapid suburban growth together mean that key points in most regions will become relatively less accessible than they are now. The reduction in access is typically 1 to 10%. But removal of congestion would increase the access to key points by 2 to 30%.

allowing most regions to reverse the expected decline in access and making these key points relatively more accessible as the region grows.

The study also finds that a 10% decrease in CBD accessibility would decrease regional productivity by about 1%, about the same as observed in Europe and Korea in previous studies. But it also suggests that regional economies might be more dependent on access to suburbs, malls and universities than on access to downtowns. Not only are models of productivity somewhat stronger for these sites, but access to them has a stronger effect on regional productivity.

In the cities studied, reducing congestion would boost Gross Regional Product by 6 to 30% if targeted at suburbs, malls, and universities. The economic gains would be 4 to 10% if targeted at CBDs, and just 2 to 8% if targeted at airports. Free-flowing traffic conditions around these key areas would increase regional productivity, which in turn would increase tax revenues. Smart infrastructure investments that produce free-flowing road conditions will more than pay for themselves in future years by boosting the region's economy. The study concludes that the focus of transportation plans on CBD access may be misplaced, as regions grow and other locations become relatively more congested. It suggests a re-thinking of plans to improve access through congestion reduction particularly in non-CBD locations.

## **Recommendations**

*Pay more attention to the accessibility of other locations, not just CBDs.* Improving accessibility to other key points in the region may provide overlooked opportunities to

improve regional performance at a fraction of the cost of improving CBD access.

*Improve accessibility in other locations.* Suburbs, malls and universities, in particular, showed more potential for access improvement and more impact on regional productivity.

*Remove bottlenecks throughout regions.* Relatively modest expenditures spent on removal of bottlenecks in a road system can have substantial impact on accessibility, particularly if congestion is relatively concentrated geographically. These locations should be the first to be explored for improvement.

*Add capacity in the rims of cities.* Our findings suggest that investment in suburban accessibility is likely to be productivity-gaining. Not only is access likely to improve more per dollar invested than in the CBD, but future growth is likely to be higher.

*Conduct an accessibility assessment for each city.* From a planning perspective accessibility studies are a convenient way of understanding the impact of congestion removal, and of comparing alternate treatments. They are under-used in transportation planning, however, because until recently they were difficult to undertake. New software has made the task easier.

*Reconsider arguments against sprawl.* This study suggests that an overlooked benefit of congestion reduction is the ability to improve accessibility. This finding dents the planning wisdom that higher density will yield greater productivity and is therefore preferable. Adding the benefits of greater access may be sufficient to tip arguments in favor of greater, not less, highway access.