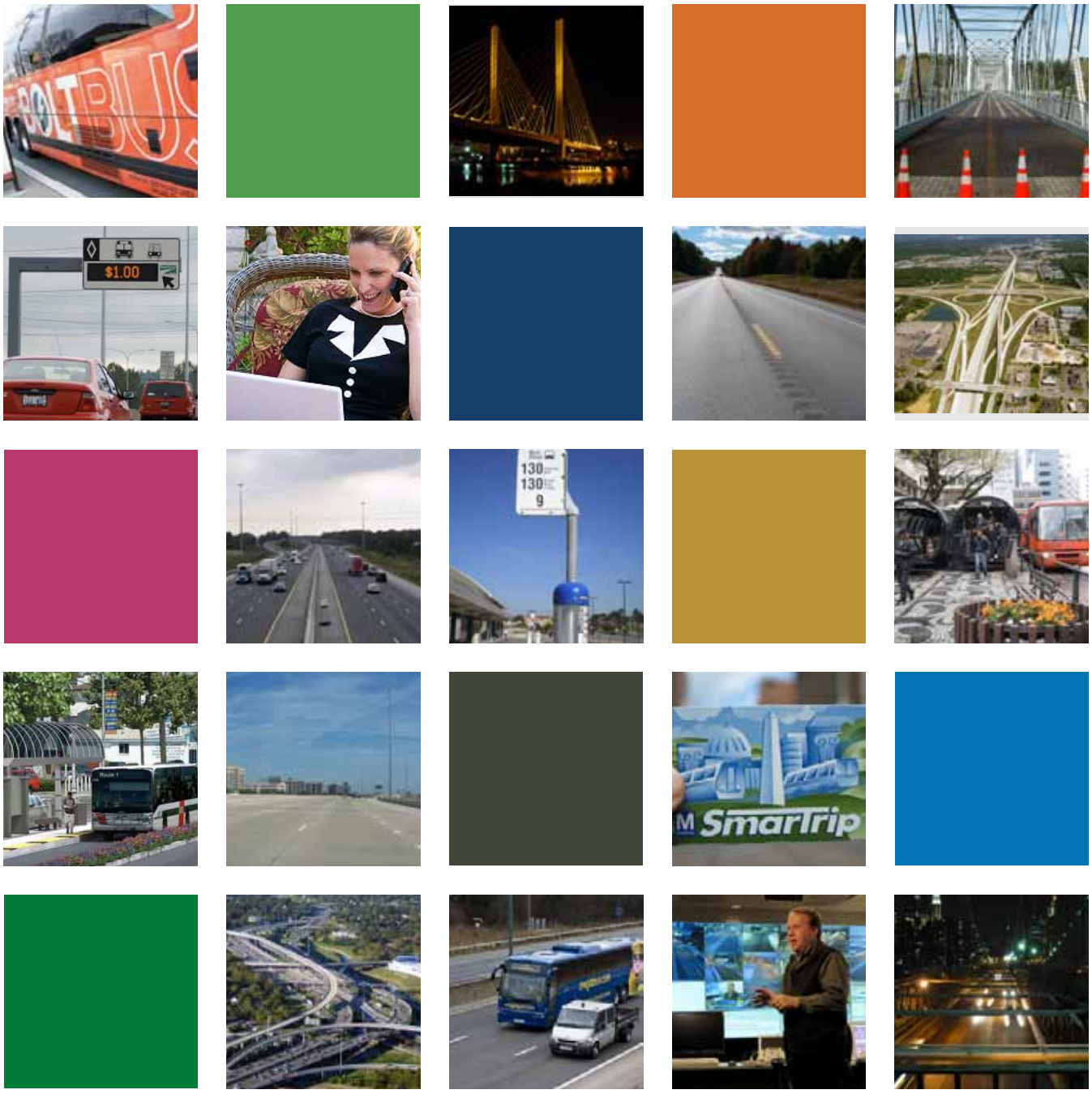

The Most for Our Money

Taxpayer Friendly Solutions for the Nation's Transportation Challenges

Reason

Transportation for America

TAXPAYERS FOR COMMONSENSE
MAKING GOVERNMENT WORK

The Most for Our Money

Taxpayer Friendly Solutions for the Nation's Transportation Challenges

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Executive Summary

In the 20th Century, the United States built some of the world's preeminent transportation systems, including a interstate highway network that's second to none. The challenge for the 21st century is to maintain this infrastructure while expanding our ability to efficiently move people and goods.

We face multiple challenges. Money is tight, as the gasoline tax we rely on to build and maintain our transportation network loses its earning power due to improved fuel efficiency and rising costs. Meanwhile, the nation's transportation needs are increasing, as many of our roads, bridges, and railways fall deeper into a state of disrepair. All of this is occuring in the context of trillion-dollar annual budget deficits and a $14 trillion national debt. There has never been a more critical time to do more with less.

This paper will introduce seven transportation tools – some big, some small – that can help improve our nation's transportation system at taxpayer-friendly costs.

This paper offers some of the latest ideas and innovations that can inform the process as Congress writes the next six-year transportation bill. We hope members of Congress will be inspired to encourage, promote, and develop these and other cost-effective transportation measures.

The Highway Trust Fund (HTF) – the account into which our federal gasoline tax dollars are deposited – is perilously underfunded. The HTF has required three infusions of general funds from the U.S. Treasury, amounting to $34 billion, to remain solvent. The gas tax has not increased since 1993 and is not indexed for inflation, so the purchasing power of the gas tax receipts has declined. In addition, high gasoline prices have led Americans to purchase more fuel efficient vehicles or drive fewer miles, which also means less money into the HTF.

The following strategies are not a panacea for the nation's transportation challenges, but they have relieved congestion and improved safety where they have been implemented. Their wider use will help spread these benefits across the nation.

In central Virginia, transportation planners presented a variety of scenarios to citizens to illustrate how future growth in the area would impact their transportation. These scenerios allowed citiznes to realize that encouraging future growth and development near existing infrastructure would reduce future congestion by more than 50 percent, at half the cost of other growth scenarios. This type of **scenario planning**, which resembles considerations made by the military and private corporations for decades, takes into consideration a broad range of concerns — from infrastructure costs to quality of life benefits — while ensuring that a community's transportation investments are made with both fiscal constraints and the desires of its citizens in mind.

Once planning is complete and communities are prepared to tackle their transportation challenges, many are finding that **high-occupancy toll (HOT) lanes** are cost effective and widely beneficial. HOT lanes allow single-occupant drivers to access high-occupancy vehicle (HOV) lanes for a fee. The fee is varied throughout the day to ensure that HOT lanes remain uncongested and move at a minimum speed. The tolls collected from users fund maintenance of the highway corridor and, in many cases also pay for express bus service that would not have otherwise been possible in the congested lanes. Meanwhile, drivers in the free non-HOT lanes experience reduced congestion and have the option to use the uncongested HOT lanes.

Often, the installation of HOT lanes allows for the introduction of **bus rapid transit (BRT)**, an express bus service that can be implemented at relatively low cost and provide riders with more comfort, faster travel times, and increased reliability compared to typical city transit bus service. BRT typically runs on separate rights-of-way or on congestion-free HOT or HOV lanes and uses modern buses that allow for boarding at multiple doors. Passengers usually gain access to the system through modern stations that collect fares in advance to increase efficiency and minimize time spent in the station. BRT can be used along primary corridors or to supplement existing transit service. It holds great promise for communities looking for cost-effective and efficient transportation solutions.

One important aspect that makes HOT lanes and BRT possible is the increasing development and deployment of transportation system technologies. Known as **Intelligent Transportation Systems (ITS)**, these tools allow a HOT lane user to pay their toll without ever slowing down or a BRT rider to pay a fare in advance. They also help optimize coordination of traffic signals or deliver messages to signboards telling transit riders when the next vehicle will arrive. Many of these systems can be implemented at minimal cost relative to the resulting benefits and have a tremendous impact on congestion and safety.

The nation's privately owned **intercity and motor coach bus services** account for more than 750 million passenger trips each year–more than the nation's airlines. They do so with an extremely low level of federal subsidy, making this form of transport a taxpayer's dream. Intercity buses provide transportation for many rural Americans and help move thousands of suburban dwellers into nearby cities and other job centers. They also play an increasingly important role in connecting densely populated urban centers, particularly in the Northeast and Midwest. Each intercity bus can keep as many as 55 cars off the nation's highways, playing an important part in reducing congestion and providing transportation choice for many Americans.

Telework, or telecommuting, is an increasingly popular choice for those wishing to avoid rush hour and work from their home or a nearby telework office. High-speed, reliable Internet access has reached most of the United States, making it possible for a number of employees to carry out their work responsibilities without the commute. When employers allow their employees to telework, it helps reduce the traffic load at the times of the day when congestion is at its worst, and it may have a beneficial effect on an entire region's transportation system.

Another way to reduce congestion on the nation's interstates and highways is to improve the **connectivity** of local roads to offer multiple routes, rather than forcing local traffic onto the interstates and other major highways. When local decisions have a major impact on nationally important transportation corridors, Congress can help ensure that state and local governments are making decisions that preserve the federal investment, alleviate vehicular congestion, and extend the capacity of the nation's interstates and highways.

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Finding ways to get the “biggest bang for the buck”

Once associated with private companies and the military, scenario planning is increasingly used by state and local policy-makers to make better transportation decisions. Scenario planning analyzes potential changes by considering a number of alternate futures and how transportation systems and communities would be impacted. Traditional planning, by contrast, is typically based on assumptions about the location and nature of future growth. Assumptions are often “straight line” extrapolations from the past. Yet, changes in economic activity, land use, demographics and other factors dramatically alter the future development of a community or region. Scenario planning has the potential to capture these dynamics and help a community determine the impact of different policies and decisions on how their community looks, grows, and operates in the future – and to consider which policies and decisions best meet their needs. This type of planning allows communities to understand the benefits and consequences of different decisions and target scarce federal funding towards transportation projects that have the greatest return on investment.

Scenario planning engages community members, public officials, and private industry leaders to create and assess a range of future alternatives for a state, region or city. This type of planning identifies factors, such as land use, demographic trends, economic activity, and transportation investments, and compares the impacts of different conditions on community goals and values. Scenarios create guiding principles for dealing with a variety of potential future conditions and provide the basis for considering varying policies.

Stakeholders compare different scenarios and ultimately create a shared vision for the future, based on what seems most likely to happen and how they want their communities to grow. Once a consensus is reached among stakeholders, policy makers set transportation priorities, recommendations and investments that work toward that shared vision.[1]

Since 2004, the Federal Highway Administration (FHWA) has been actively encouraging transportation scenario planning with analytical tools, peer workshops, and federal resource guides. Numerous regional governments and communities have utilized scenario planning in long-range transportation plans.[3] Furthermore, many communities have combined land use and transportation into scenario planning to create long-term comprehensive plans.[4] The Federal Highway Administrater (FHWA) has also identified "Next Generation" Scenario Planning, involving additional variables that could potentially impact transportation systems, such as technological developments, fuel prices, climate change, and future demographic shifts.

Transportation Benefits

Transportation scenario planning offers public agencies the ability to better identify potential approaches to addressing transportation challenges. By looking at a wide range of factors that affect the overall transportation system, multiple solutions may be discovered to solve a particular problem. From those identified solutions, the one that best matches the identified priorities of the community is chosen.

The scenario planning process typically involves the following elements:

→ Local governments, metropolitan planning organizations and regional councils of government facilitate the process from start to finish.

→ Baseline data is gathered, including the demand for existing transportation, land use and funding sources as it relates to the transportation system.

→ The public's goals, aspirations and values are gathered to insure a comprehensive framework depicts the area's long-term goals.

→ Scenarios – several "what if?" visions – of how the region may function in the future are developed.

→ Various computer analyses, simulations and other forecasting tools are used to analyze the impact of each scenario on a community's goals and values – including performance of the transportation network, cost of infrastructure, pollution and other factors. This is similar to current planning but with multiple scenarios considered.

→ Based on these scenarios, facilitators work with stakeholders to create a comprehensive vision, or "preferred scenario," of the region that will best meet the variability of predicted outcomes and the community's goals.

→ After a plan is adopted by policy makers, facilitators review plans, policies, and programs to ensure consistency with community goals and ultimately make changes to align priorities and investment needs outlined by the "preferred scenario."[2]

1. "FHWA Scenario Planning Guidebook." Federal Highway Administration. Setember 2010. http://www.fhwa.dot.gov/planning/scenplan/guidebook/

2. "New Trends in Transportation and Land Use Scenario Planning: Five Case Studies of Regional and Local Scenario Planning Efforts." Federal Highway Administration. April 2010. http://www.fhwa.dot.gov/planning/scenplan/ngscenplanrpt.htm

3. "Noteworthy Practices and Innovative Uses." Federal Highway Administration. http://www.fhwa.dot.gov/planning/scenplan/practices.htm

4. Bartholomew, Keith. "Integrating Land Use Issues into Transportation Planning: Scenario Planning." University of Utah. 2005. http://faculty.arch.utah.edu/bartholomew/SP_SummaryRpt_Web.pdf

Scenario planning allows all parties—industry, local residents, and regional authorities—to form one cohesive vision for their community. Traditional planning and forecasting models outline a future assuming that all factors, such as congestion, economic activity, and population growth, will happen exactly as predicted in local land use plans. In most states, these plans are modified several times throughout the year – sometimes quite significantly. In contrast, scenario planning allows stakeholders to evaluate new conditions that may take place and create a more desirable future. Compromise between stakeholders creates understanding and reduces the potential for opposition and disagreement when unexpected trends arise or new policies are adopted.

Scenario planning can integrate consideration of both land use and transportation, allowing for a more comprehensive and strategic approach to public investments and policies. By planning for both land use and transportation simultaneously, governing bodies are able to visualize where automobile congestion, gaps in transit, or high growth areas may compromise the overall transportation system. With this knowledge, localities can facilitate both land use and transportation without burdening the public with excessive delays or missed opportunities. As an example of this benefit, a region may find that directing future growth near areas with an under-utilized highway network reduces long-term congestion. By using scenario planning, the region's policy makers can find innovative ways to provide an efficient transportation system.

Taxpayer Benefits

A greater understanding of future congestion, growth, and funding needs for a city or region can help ensure that projects constructed with federal dollars are of the highest priority and will best serve the communities in which they are built into the future. Scenario planning helps prevent federal dollars from going to projects that are less valuable tomorrow when factors within a community have changed. Scenario planning helps identify those changing factors in advance, improving project prioritization.

The development of scenarios also helps citizens and elected officials understand the costs and other trade-offs of future decisions for their region. The Thomas Jefferson Planning District Commission in central Virginia, for instance, found that the scenario based on existing land-use plans would result in 44 percent of future travel being congested and require $1 billion in transportation investments, while another scenario with future growth concentrated near existing infrastructure and towns only required $500 million in transportation investments and resulted in just 20 percent of travel being congested. Once the various scenarios have been analyzed, the regional and local governments can modify public policies to target investments that generate the greatest return on investment. Scenario plans also demonstrate that certain investments may be unnecessary if regional policies are changed, ultimately reducing overall transportation costs.

Scenario planning means savings for Texans...

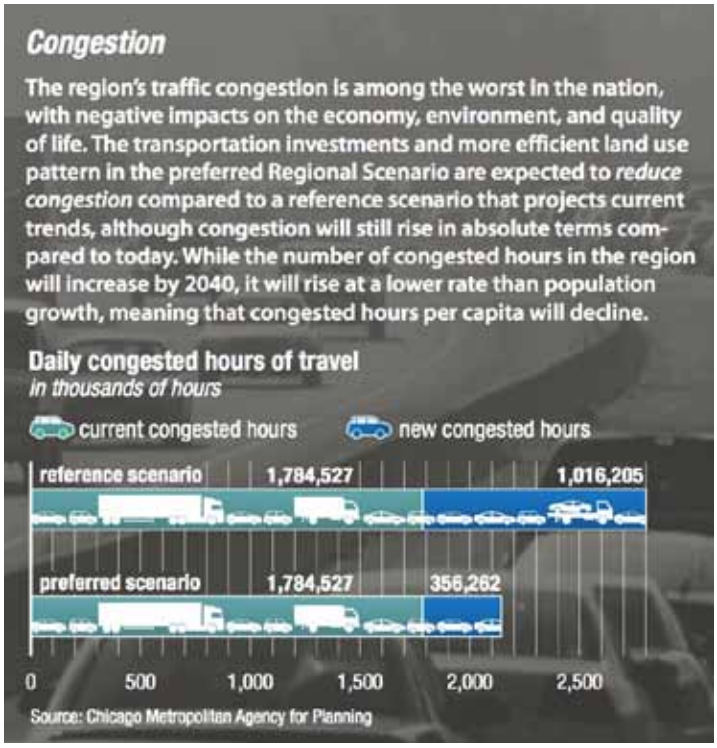
The City of Austin, Texas is utilizing scenario planning for its two-year comprehensive planning process. Initiated in August 2009, the 30-year plan utilized land use, transportation, environmental and economic indicators to create four scenarios in addition to a "Trend" Scenario. The "Trend Scenario" assumed no major shifts in development practices or plans, market forces, or transportation investments and found that infrastructure (roads, transit, schools, water, etc.) costs would total $19 billion over the next 30 years. Changing these indicators to favor alternate development and additional transportation options allowed the City of Austin to outline scenarios that produced billions in savings, reduced congestion within the community and continue to meet the transportation needs of its citizens into the future – while still accommodating the same amount of future growth. The city is now conducting community forums to create a "Preferred Scenario" that includes the community's vision based on a combination of the scenarios that have been developed.[5] With the potential for taxpayer savings, community members and decision-makers can develop a final scenario that is cost-effective and meets their needs.

Case Study

Chicago's GO TO 2040

By 2040, the Chicago metropolitan region will add nearly three million residents and two million jobs.[6] Without adequate planning, this growth will put major strains on the region's transportation system, resulting in overburdened highways, inadequate transit systems and financial shortfalls. To accommodate this growth and achieve a modern, well-functioning system of roads and public transport, the Chicago Metropolitan Agency for Planning (CMAP) adopted GO TO 2040 in 2010, a comprehensive regional plan to guide future development and growth. Extensive scenario planning was conducted before formulating recommendations for policy and investments.[7]

Scenarios were constructed based on meetings between stakeholders with a focus on transportation reinvestment, system preservation, and updated funding policies for the Chicago region. Each scenario's performance was tested using travel models and 250 regional indicators including land consumption, air quality, congestion, and environmental constraints. Indicators were varied to find scenarios with the greatest impacts on congestion, travel-time, quality of life, and other related factors.



After extensive analysis and public input, CMAP selected a preferred regional scenario that focused on strengthening the region's critical infrastructure, transportation financing mechanisms and intergovernmental cooperation. A key finding of GO TO 2040 indicate that federal and state gas taxes would not keep pace with much-needed transportation improvements for the Chicago region. To recoup these funding shortfalls, the plan seeks to improve investment prioritization with decisions based on

[5] "Scenario Indicators." City of Austin, Texas. http://www.imagineaustin.net/cfs3-indicators.htm

[6] See note 2.

[7] Ibid.

performance-driven criteria rather than traditional formula methods. This criteria also includes considering economic and quality-of-life factors beyond transportation, as well as getting the most out of the existing system before expanding the transportation network.

In addition to better investment prioritization, the preferred scenario highlighted new, innovative financing mechanisms and applied free-market, principles to the region's highway and transit systems. The plan offers congestion pricing as a method to alter travel behavior through pricing roadways based on the level on congestion. Variable-price parking is also recommended to reduce peak demand for parking. These strategies will not only reduce congestion for the Chicago region but also generate much-needed revenue for highway and transit investments. The preferred scenario also recognizes the need for private-sector involvement and revenue generated from property value increases (caused by nearby transportation investments) to finance future transportation projects.[8]

Transportation scenario planning offered CMAP an opportunity to identify several potential futures and critically evaluate each one based on comprehensive analysis, public input and existing factors. The final plan for 2040 outlines policy reforms that enhance the region's economy by setting clear priorities, improving efficiency of investments, and greater transparency of public decision making. These methods not only prioritize transportation projects but encourage innovative funding mechanisms that protect the region from federal and state funding shortfalls.

Conclusions

Scenario planning allows a multitude of stakeholders to create and assess a range of potential future alternatives for an area's transportation network. With several potential futures outlined by this process, public agencies—local, state, and federal—can better identify solutions to addressing the nation's most-pressing transportation problems while working toward a future agreed upon by a wide variety of stakeholders. By including all parties, including industry, local residents and regional authorities, scenario planning offers one cohesive vision for their community versus simply allowing the "status quo" to be the default option with tightened funding sources for transportation, scenario planning becomes an even more important tool as communities and regions seek to build, maintain, and expand critical infrastructure links. Localities can better prioritize and target federal funding to projects with the most benefit. Scenario planning offers the ability to find innovative methods to do more with less and prioritize investments. With a clearer picture for what the future may bring, localities can target transportation investments and policies for projects that will make the greatest improvements to an area's transportation system. This not only increases travel efficiency, but also avoids the potential misallocation of public financing on unnecessary, wasteful transportation projects.

8. "Regional Mobility."Chicago Metropolitan Agency for Planning (CMAP). http://www.cmap.illinois.gov/2040/regional-mobility

2

High-Occupancy Toll (HOT) Lanes:
Increasing capacity with roadway pricing

Demand for additional lane space on the nation's urban highways has grown steadily over the last two decades.[9] Drivers in metropolitan areas across the nation utilize freeways without regard to the amount of space actually available. This has become especially problematic during peak-period travel when demand for freeway space typically outpaces the road's actual capacity. Although simply expanding freeways could be a short-term solution, the federal government's means of funding highways — the federal gas tax — no longer generates enough money to expand — much less maintain — the freeway network.

Transportation economists have long argued that road pricing strategies are an effective and accurate way to assign the true cost of highway space to motorists, thus equalizing the supply and demand of a freeway facility for optimal traffic flow.[10] Only recently, with the advent of electronic tolling, have these pricing strategies become realized. By combining variable pricing with limited-access lanes, governments are embracing high-occupancy toll (HOT) lanes as a means to reduce congestion, improve service on existing freeways, and reduce the need for public financed expansion projects.

[9] David Schrank et. al. "Urban Mobility Report 2010." Texas Transportation Institute. December 2010. http://tti.tamu.edu/documents/mobility_report_2010.pdf

[10] Robin Lindsey. "Do Economists Reach A Conclusion on Road Pricing? The Intellectual History of an Idea." Econ Journal Watch: Volume 3, Number 2. May 2006. http://financecommission.dot.gov/Documents/Background%20Documents/Lindsey%20DoEconomists%20ROC%20on%20road%20pricing.pdf

HOT Lanes: An Overview

The term and concept of HOT lanes was first set forth in a 1993 policy study by Reason Foundation[11] and subsequently embraced by the Federal Highway Administration under its Value Pricing Pilot Program. HOT facilities vary in form and function across the United States but typically consist of the following elements:

- → HOT limited-access lanes are reserved for buses, other high occupancy vehicles and single-occupant vehicles that pay a toll.
- → The tolled lanes operate alongside existing general purpose lanes and provide users with a choice to remain in the free lanes or pay a toll for a faster and more reliable trip.
- → The number of vehicles using the HOT lanes is controlled through variable pricing so as to maintain free-flowing traffic at all times, including during peak travel times. For instance, the rate per mile may be $0.50 during heavy congestion on the general purpose lanes while only $0.10 during free-flow conditions.
- → Payment for HOT lanes is made via electronic toll collection; therefore, no stop-go is required upon entry or exit.
- → The occupancy rate for free or discounted passage varies by project — some allow high-occupancy vehicles (HOV-2 or HOV-3) to ride free, while others are free only to super-high occupancy vehicles like vanpools, buses, and Bus Rapid Transit (BRT) vehicles.

HOT Lanes on California's SR 91 speed commuters past congestion.

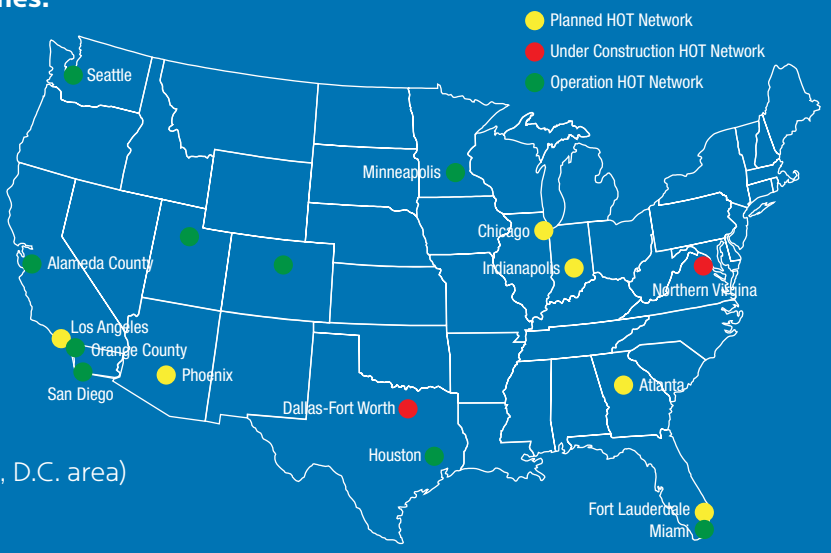
Electronic tolling technology reduces delay on SR 91's HOT lanes

[11] Gordon J. Fielding and Daniel B. Klein. "High Occupancy/Toll Lanes: Phasing in Congestion Pricing a Lane at a Time" Reason Foundation Policy Study No. 170. November 1993. http://reason.org/studies/show/high-occupancy-toll-lanes

HOT Lanes in Use Today

Cities and regions currently operating HOT lanes:

- San Diego
- Alameda County (San Francisco Bay Area)
- Houston
- Denver
- Salt Lake City
- Minneapolis
- Seattle
- Miami
- Orange County, California



HOT lanes under construction:

- I-495 and I-95 in northern Virginia (Washington, D.C. area)
- I-595 near Fort Lauderdale
- Multiple freeways in Dallas and Fort Worth.

HOT lane projects in the planning stages:

- Los Angeles has a number of HOT lane projects in the planning stages, including pilot projects currently being implemented by the Los Angeles County Metropolitan Transportation Authority (Metro) on the congested El Monte (I-10)[12] and Harbor (I-110) Freeways[13]. In addition, Metro has recommended HOT lanes for five other candidate freeways in Los Angeles County: I-105, I-405, SR 91, SR 57, and I-10 east of El Monte to the San Bernardino County line.

- The Orange County (California) Transportation Authority is studying HOT lanes for a portion of I-405; and the Riverside County Transportation Authority is implementing an extension of the existing 91 Express Lanes from the Orange County line eastward to I-15.

- The San Francisco area has included a 450 mile network of HOT lanes in the long-range transportation plan for its nine counties. An additional 350 miles of HOT lanes are also being discussed.

- Georgia DOT is moving forward with plans to add HOT lanes to I-75 and I-575 outside the I-285 Perimeter freeway in Atlanta. Called North by Northwest, this megaproject is intended to be the Atlanta area's first phase of a region-wide HOT lanes network. The local toll authority is also converting HOV lanes on I-85 to HOT lanes.

- HOV to HOT conversion plans are under way on all five of Houston's existing HOV lanes.

- Washington State DOT is planning a 40-mile Eastside Corridor that would convert existing HOV lanes and add new HOT lanes on I-405 and SR 167, as part of a nearly $2 billion upgrade of that corridor.

- HOT lanes have also been proposed in Chicago, Indianapolis, and Phoenix.

12. "Metro Express Lanes." Los Angeles County Metropolitan Transportation Authority (METRO). http://www.metro.net/projects/expresslanes/

13. "The Interstate 110 (Harbor Freeway/Transitway) High-Occupancy Toll Lanes Project: Final Environmental Impact Report/Environmental Assessment with Finding of No Significant Impact." State of California Department of Transportation. April 2010. http://www.dot.ca.gov/dist07/resources/envdocs/docs/110_HOT_EIREA-final.pdf

Transportation Benefits

The ability to access free-flowing freeway lanes offers: motorists "congestion insurance"—an alternative to gridlocked freeways for times when they really need it — to pick children up at daycare, keep an important appointment, or catch a flight. Unlike traditional freeway lanes, HOT lanes will not become congested over time. Variable pricing allows roadway managers to change the price to ensure sustainable, congestion-free travel. By using a price to discourage some people from traveling in peak hours, HOT lanes actually provide increased reliability for the transportation network.

One of the biggest advantages HOT lanes offer is choice. The addition of HOT lanes on a roadway may not solve the entire problem of congestion, but a driver on that roadway will now have the option of paying to enter the uncongested HOT lanes. In this way, a larger share of the cost of the HOT lanes is passed along to those who use them compared to free lanes.

Because HOT lanes operate uncongested at high speeds, even during the peak of rush hours, they provide a reliable, high-speed path for express bus service and Bus Rapid Transit. Variable pricing keeps HOT lanes uncongested and free-flowing, making them the virtual equivalent of exclusive busways, with similar speed and efficiency. Houston, Miami, Minneapolis, and San Diego are among the metro areas with new express bus service on HOT lanes.

HOT lane user rates are displayed on digital boards above a free-flowing HOT lane in Washington State.

Taxpayer Benefits

The addition of HOT lanes increases efficiency beyond what would be achieved by simply adding more free lanes. For instance, Orange County's HOT Lanes represent just one-third of SR 91's lanes but carry nearly half of all traffic during rush hour. In general, a free-flowing freeway lane can carry more cars per hour than a congested freeway lane — about 50 percent more. Since HOT lanes generate toll revenue that cover the lane's operating and maintenance costs, taxpayers receive the benefits of capacity improvements, and the money not spent on maintenance can fund other priorities.

Electronic tolling technology has become standard on HOT networks.

Traditional highway funding sources, such as fuel taxes and vehicle fees, are often insufficient to pay the costs of adding new lanes to urban freeways. Funds generated from HOT lanes can supplement traditional transportation user taxes to pay for the addition of electronic tolling equipment and in some cases to cover much of the capital costs of new HOT lanes (as on the SR 91 Express Lanes and the I-495 Capital Beltway HOT lanes).

The unique benefit HOT Lanes
HOT lanes offer congestion-free routes for emergency vehicles to reach the scene of accidents and the emergency room in significantly less time.

In highly congested corridors, dedicated revenue from tolling can also facilitate the use of public-private partnerships to finance, develop, construct and operate new HOT lanes. By partnering with the private sector to build HOT lanes, the public sector is not burdened with heavy, up-front investment or the potential for revenue shortfalls. The up-front capital is provided by the private sector, sometimes in tandem with the responsible public agency, and a properly structured contractual agreement can ensure that revenue shortfalls or lower than expected demand does not place unnecessary burdens on taxpayers.[14] States such as Florida, Texas and Virginia have found they are able to implement such projects more quickly than would be possible using traditional funding and were able to capitalize on private-sector technology, financing, engineering and innovation.

The Myth of "Lexus Lanes"

Public officials often express concern that only the wealthy will use HOT lanes, which opponents often refer to as "Lexus Lanes." Yet every state and metro area that has implemented HOT lanes finds that they are used by people of all income levels and that the public does not share this concern once they see HOT lanes in action. In May 2008, the Washington State Department of Transportation (WSDOT) converted the HOV lanes on SR 167 in the Seattle area to HOT lanes. The HOT lanes run north/south on SR 167 between Renton and Auburn for approximately 10 miles in each direction. The highway's two general purpose lanes in each direction remain toll-free and open to all traffic.

WSDOT conducted a baseline survey in 2005 prior to the HOV to HOT conversion. The survey found that more than half were concerned about unfairness to those with low incomes. However, three months after the HOT lanes opened in 2008, that dropped to just 19 percent. In May 2009, another survey was conducted to obtain demographic data of HOT lanes users. The majority of drivers were between 35 and 64 years old with household incomes of $50,000-$124,000. The percentage of drivers in the low-income bracket (those earning under $20,000) was proportional with the low-income population in the area. Statistics for other HOT lane projects are similar. For instance, on California's SR 91 HOT lanes, about one-quarter of the vehicles in the HOT lanes are driven by high-income individuals, whereas the remaining vehicles are driven by low- and middle-income individuals.[15]

Once implemented, HOT lanes benefit a broad cross-section of citizens that work or live nearby, not just those who pay to use the lanes. Helping to break down the "Lexus Lanes" myth is the benefit that all drivers receive when the new lanes open. Though the free lanes are not guaranteed to remain congestion-free, the addition of HOT lanes reduces congestion in the free lanes as well, improving traffic flow and reducing travel times. Even non-drivers benefit from HOT lanes, since the free-flowing lanes allow for implementing reliable express bus service, and often a share of the tolls paid by drivers can be used to pay for this service in the corridor.

[14] Present-Value-of-Revenue contracts are one such way this can be accomplished. See Engel, Eduardo et. al. "Public-Private Partnerships to Revamp U.S. Infrastructure." Brookings Institute. February 2011. http://www.brookings.edu/~/media/Files/rc/papers/2011/02_partnerships_engel_fischer_galetovic/02_partnerships_engel_fischer_galetovic_paper.pdf

[15] "Income-Based Equity Impacts of Congestion Pricing—A Primer." U.S. Federal Highway Administration. May 8 2009. http://ops.fhwa.dot.gov/publications/fhwahop08040/cp_prim5_04.htm

Case Study

Florida's I-95 Express Lanes

In early 2006, the U. S. Department of Transportation (U.S. DOT) announced a major initiative to reduce traffic congestion, known as the "Urban Partnership Agreement" (UPA) competition. This was a competitive grant program for metro areas to combat congestion by implementing four "T's": tolling, transit, technology, and telecommuting.

As one of four projects nationwide that received UPA funding, the 95 Express project consisted of converting the existing HOV express lanes to HOT lanes along 21 miles of the highly congested I-95 corridor, from I-395 in Miami-Dade County to north of I-595 in Broward County.

Utilizing the existing I-95 right-of-way, the Florida DOT (FDOT) created an additional lane in each direction (to be used as an HOT lane in addition to the HOV lane conversion) by reducing lane-width from 12 feet to 11 feet, narrowing the median width, and reducing the buffer separation between the regular lanes and the express lanes. The result was a revamped highway with four regular lanes and two express lanes in each direction.

To ensure that only legitimate employer-based ride-sharing vehicles could qualify for free passage, Florida adopted a registration requirement. Carpool eligibility to travel free in the Express Lanes went from unregistered HOV-2 to registered HOV-3, and hybrids were also included. Motorcycles, public transit vehicles, school buses, over-the-road coaches and emergency vehicles are permitted to use the lanes for free without registering.

All other vehicles (with the exception of large trucks) participating in the SunPass prepaid toll program are permitted to use the HOT Lanes for a toll that ranges from $0.25 to $6.25 (for the southern Phase 1 portion) in order to prevent overloading the lanes and to ensure average speeds of at least 45 mph. Variable toll pricing is used to maintain traffic in the express lanes at a target speed of approximately 50 mph or greater to maximize the flow rate. Access to the lanes has been restricted to specific entry and exit points using closely spaced delineator poles, whereas vehicles could previously merge in and out of the HOV lanes at will.

The project also emphasizes transit service improvements, which proved integral to the approval of their U.S. DOT application. The commitment to improving transit infrastructure and service with regional BRT helped gain support of the local Metropolitan Planning Organization and demonstrated a comprehensive and multi-modal vision of the corridor. New, express bus service now operates nonstop from a number of points in Broward County to Miami's Central Business District.

As evidence of the project's success, the improved mobility and reliability is estimated to have saved commuters nearly $9 million in delay savings during the first six months of the project.[16] With the addition of one new lane in each direction and the conversion of an HOV to HOT lane in each direction, the users of the corridor realized significant travel time benefits – the average travel speeds in the local lanes increased from below 20 mph to 41 mph in the first six months of operation while the average speeds in the express lanes increased from below 20 mph (previously an HOV lane) to 57 mph.[17] The 13-mile Phase II extension northward to Broward Boulevard is now underway and is expected to be completed by 2013.

Conclusions

Overburdened with congestion and unable to afford the expense of adding more lanes, local officials are embracing HOT lanes as an effective means to increase highway efficiency and reduce the need for more costly lane additions. From Seattle to Miami, HOT lanes are proven to increase vehicle throughput, maximize freeway capacity and generate much-needed revenue. In addition, variable tolling helps ensure that highway capacity is preserved – ensuring free-flowing traffic for time-sensitive trips, emergency vehicles and transit service.

[16] "ITS America Smart Solution Spotlight." ITS America. http://www.itsa.org/itsa/files/pdf/05-04-10%20Florida%2095%20Express%20Smart%20Solution%20Award.pdf

[17] Ibid

3

Bus-Rapid Transit (BRT):
A cost-effective rapid transit option

As a result of tighter transportation funding in recent years, localities and transit agencies have found the development and expansion of bus-rapid transit or “BRT”, systems as a cost-effective means to expand transit service and reduce congestion. BRT refers to bus service that provides faster, more efficient service than ordinary bus lines. Often this is achieved by making improvements to existing infrastructure, vehicles and scheduling. One of the greatest benefits of BRT systems is their high degree of flexibility and scalability, ranging from express buses running on local highways or city streets to more elaborate systems utilizing dedicated lanes, full-service stations, and other light rail-like features. In a political climate where “fiscal austerity” has become a political imperative, BRT is increasingly being used as a means to expand transit service, reduce congestion, and spur new development.

BRT: An Overview

The FTA's Transit Cooperative Research Program defines BRT as "a flexible, high performance rapid transit mode that combines a variety of physical, operating, and system elements into a permanently integrated system with a quality image and unique identity."[18] The following elements are found in a variety of BRT systems with each uniquely suited for its respective market, community, or corridor[19]:

- **Vehicles:** BRT utilizes rubber-tired vehicles that resemble a public transit buses. Vehicles are often higher in load capacity than traditional buses with the use of articulation, extended sections and multiple boarding doors. BRT features curb-side, level or elevated boarding depending on system requirements and may be powered by fossil-fuel, hybrid or electric propulsion. Many BRT vehicles in the United States include unique product branding and color schemes to attract potential riders.

- **Travel Path:** BRT often runs on an exclusive guideway or on HOV/HOT lanes,[20] but also operates in mixed-traffic conditions on freeways, highways, or city streets. Existing roadways can be retrofitted with bus-only lanes and dedicated pathways for increased speed and efficiency. Some systems include completely dedicated transit ways with no mixed traffic; automobiles are strictly forbidden and bike and pedestrian paths may be built alongside. Other cities have completely grade-separated systems with elevated and subterranean elements. Most systems include a mixture of these pathways, depending on operational requirements, spatial constraints and budgetary limitations.

- **Stations:** BRT stations vary widely in size, form, and function. Stations may range from simple street-side shelters to fully-integrated, fare-controlled intermodal centers with elevated platforms, station attendants, and real-time information signs. Station spacing more closely aligns to distances between rail stations yet can be as frequent as curbside bus stops.

- **Fare Collection:** Fares are paid while boarding through cash, coins, or pre-paid fare cards. More advanced systems offer off-bus fare collection where payment is collected before boarding or even entering a station – improving travel time by allowing passengers to board more quickly using all doors of a bus.

- **Operations and Service:** BRT operates in an integrated transit network along clearly distinguishable routes. These routes appear much like a typical subway map with many transit operators displaying little difference between BRT and rail lines. Service frequency is similar to other transit with differences between frequent peak service and less-frequent non-peak service hours. Riders find greater certainty of arrival due to signal prioritization, aid from intelligent transportation systems, and dedicated lanes. Real-time information signs also increase rider expectation of service, bringing greater certainty to bus travel.

How is BRT Being Used Now?

The last ten years have seen a large increase in BRT projects in the United States. Varying in size, scope, and technology, these systems are found everywhere from the densely populated Northeast to the sprawling Southwest.

[18] Herbert S. Levinson et al. "Bus Rapid Transit – Volume II: Implementation Guidelines." Transit Cooperative Research Program: Report 90. http://www.trb.org/publications/tcrp/tcrp_rpt_90v2.pdf

[19] Roderick B. Diaz (ed.) et al. "Characteristics of Bus Rapid Transit for Decision-Making." Federal Transit Administration. August 2004. http://www.fta.dot.gov/documents/CBRT.pdf

[20] Metro areas using HOT lanes to provide BRT service on uncongested lanes include Denver, Houston, Miami, Minneapolis, and San Diego.

Las Vegas completed a 7.5-mile limited stop BRT line along Las Vegas Boulevard North between downtown and Nellis Air Force Base in 2004.[21] Since Las Vegas Boulevard North is one of the nation's most congested arterials, the system increases travel reliability by operating along a 4.5-mile dedicated transit lane for a portion of the corridor and in mixed-traffic elsewhere. Vehicles feature high peak carrying capacity, enhanced operational capabilities and traffic signal priority technology. Station enclosures protect passengers from direct sunlight and feature elevated platforms for level boarding.

In the Northeast, the Boston area's Massachusetts Bay Transit Authority completed work on the Silver Line BRT project in 2008.[22] As one of the nation's more complex systems, the Silver Line operates from Boston's Dudley Square to Logan Airport. The route includes segments of exclusive bus lanes on surface streets to a subway-like tunnel beneath Boston's waterfront district. Vehicles feature low floors, high capacity passenger loads and dual-mode propulsion.

The Twin Cities Metropolitan Area is constructing a BRT network in conjunction with dynamically-priced high-occupancy toll (HOT) lanes on I-35 West.[23] In partnership with the Federal Transit Administration (FTA), the Minnesota Department of Transportation and the Twin Cities Metropolitan Council is purchasing new transit vehicles, building two new BRT stations, and implementing BRT priority technology at intersections with traffic signals. Additionally, the partnership will construct double-lane contra-flow bus lanes in Downtown Minneapolis along with wider sidewalks, improved passenger waiting areas and enhanced lighting and landscaping. The system will eventually serve downtown Minneapolis, multiple communities to the south, the Bloomington Strip, Mall of America Minneapolis/St. Paul International Airport, and the University of Minnesota.

As these projects demonstrate, BRT has found application in a wide variety of urban and suburban markets. These markets not only build a new transportation connection, but do so with considerable benefits and savings to taxpayers.

Extensive BRT systems throughout the world provide examples for the United States.

[21] Eugene J. Kim et al. "Las Vegas Metropolitan Area Express (MAX) BRT Demonstration Project Evaluation." National Bus Rapid Transit Institute. August 2005. http://www.nbrti.org/media/evaluations/Las_vegas_final_report.pdf

[22] "Boston Silver Line Washington Street Bus Rapid Transit (BRT Demonstration Project Evaluation." Federal Transit Administration. September 2005. http://www.nbrti.org/media/evaluations/Boston_Silver_Line_final_report.pdf

[23] "Minneapolis Urban Partnership Agreement." Federal Highway Administration. http://www.upa.dot.gov/agreements/minneapolis.htm

Transportation Benefits

BRT is proven to attract new ridership to public transport, resulting in reduced congestion, increased roadway capacity, fewer emissions and less reliance on foreign fuels. Miami's US-1 corridor increased ridership of the bus system from 7,000 daily trips to over 15,000 per day when replaced with BRT.[26] BRT on Los Angeles' Wilshire-Whittier and Ventura Blvd. corridors has resulted in significant increases in ridership.[27] An estimated one-third of Los Angeles' BRT riders are new to transit.[28]

BRT systems decrease travel time compared to regular bus service. By operating in exclusive right-of-ways, buses move at an average speed of 30 miles per hour or higher with travel time savings as high as 55 percent.[29] Furthermore, the use of exclusive running ways, level boarding and off-board fare collection reduces the chance for delay and allows for greater service reliability. Increasing reliability and reducing travel time connects communities with a higher degree of certainty and further encourages ridership.

When accompanied by transit-supportive land-use policies, BRT systems encourage compact, pedestrian friendly developments.[30] This increases a community's tax base, encourages more transit ridership, and spurs economic development. Cleveland's nine-mile BRT line along Euclid Avenue, a main downtown thoroughfare, is a great example. This project spurred more than $4 billion worth of actual and planned investment.[31] Similarly, Boston's new Silver Line BRT has attracted nearly $600 million of new real estate development.[32]

Taxpayer Benefits

Providing new transit in urban areas is critical for continued growth and a functioning transportation network. Bus Rapid Transit systems can be implemented at a low cost by retrofitting existing infrastructure with enhancements to improve the speed and reliability of bus service.

BRT is a cost-effective investment for local governments. The three most frequent types of BRT—(1) use of buses on exclusive busways, (2) buses sharing high-occupancy vehicle (HOV) or HOT lanes with other vehicles, and (3) improved bus service on city arterial streets — can all be designed to work within existing right-of-ways and road systems. A study from the U.S. Government Accountability Office (GAO) found that BRT systems usually have average capital costs of $17 million per mile for busways, $11.4 million per mile for buses on high occupancy vehicle lanes and $861,000 per mile for buses on city streets (adjusted to 2010 dollars),[24] possibly making BRT more cost-effective for a community's budget than new highway lanes or rail lines.

Furthermore, BRT systems can be built incrementally as demand picks up beyond the system's initial services or as funding allows. BRT can also be used in conjunction with a rail system, to provide service where densities may be too low for rail but that could benefit from bus service to access the rail line. Because a relatively low amount of capital investment is required to add additional routes and stations, transit agencies find greater certainty and relative ease in BRT expansion.[25]

24. "Bus Rapid Transit Shows Promise." United States General Accounting Office. September 2001. http://www.gao.gov/new.items/d01984.pdf

25. John Niles and Lisa Callaghan Jerram. "From Buses to BRT: Case Studies of Incremental BRT Projects in North America." Mineta Transportation Institute. June 2010. http://transweb.sjsu.edu/project/2704.html

26. Sam Zimmerman. "Overview: What is BRT?" BRT Information Clearinghouse. 2003. http://path.berkeley.edu/informationclearinghouse/planning/overview.html

27. Ibid.

28. Herbert S. Levinson et al., "Bus Rapid Transit -– Volume I: Case Studies in Bus Rapid Transit." Transit Cooperative Research Program. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_90v1s.pdf

29. "BRT Update: An Overview of Bus Rapid Transit in the United States." Mass Transit Magazine. May 2007. http://www.masstransitmag.com/print/Mass-Transit/BRT-Update/1$3363

30. "Bus Rapid Transit and Transit Oriented Development: Case Studies on Transit Oriented Development Around Bus Rapid Transit Systems in North America and Australia." Breakthrough Technologies Institute. April 2008. http://www.reconnectingamerica.org/public/download/brt_tod_report

31. Ibid.

32. William Kaplowitz. "Bus Rapid Transit: A Powerful Real Estate Development Tool." December 2005. http://www.umich.edu/~econdev/brt/index.html

Pittsburgh experienced $225 million in new construction and tremendous growth around the Martin Luther King Jr. East Busway.[33] Furthermore, a report examining attitudes toward transit-orientated development around BRT found private developers in various cities were generally positive about investing near BRT and characterized BRT as having a positive impact on property values.[34]

BRT is also shown to be the most flexible form of rapid transit. In addition to operating on busways and HOV/HOT lanes, portions of BRT systems operate on existing roadways and highways. This creates a more efficient use of infrastructure since vehicles are not limited to a guideway. BRT can also expand transit service to communities where the population level does not warrant rail service investment and can provide feeder service to existing rail systems.

Case Studies

New York's 34th Street Transitway

Ridership on New York City's subway system has increased by 60 percent over the last 20 years.[35] Severe overcrowding is a reality on most of the city's rail lines, yet the New York Metropolitan Transit Agency (MTA) lacks the resources to dramatically expand the system.

In 2004, the MTA, New York City, and the NY Department of Transportation conducted studies of BRT as a means to expand transit use, improve travel time and reduce congestion on the city's subway lines without requiring the large capital investment that is necessary for rail expansion. Two BRT lines have been operating since 2008, known as the MTA's Select Bus Service (SBS). These lines have experienced a 30 percent increase in ridership and an average travel time savings of approximately 19 percent.[36] SBS lines feature transit-signal priority, off-board fare collection and dedicated runningways. With the introduction of an off-board fare payment system, the amount of time the bus is stopped for boarding was reduced more than 20 percent, and delays at traffic signals and for traffic congestion have also fallen significantly. Furthermore, the bus operates under a service plan very similar to rail, with designated lines, maps to describe exact station locations and comparable frequencies. New buses covering the routes are articulated for increased capacity and uniquely branded to attract riders.

A planned BRT route along Manhattan's clogged 34th Street provides a strong example of BRT's ability to serve the nation's most urbanized corridors.[37] Running through the heart of the city, 34th Street is a two-mile link from the East Ferry to 12th Avenue that transverses the width of Manhattan. Over 100 buses per day service this route, and MTA reports over 17,000 daily riders in addition to 16,000 express bus riders. Excessively slow bus speeds, pedestrian congestion, and projected population growth on the corridor has prompted MTA to implement a fully exclusive SBS system from the FDR Ferry Terminal to 12th Avenue. The MTA estimates the new BRT line will improve travel time significantly with better reliability and increased pedestrian safety. MTA predicts the new line will open in 2012 and serve both the new Hudson Yards Development and the city's future Moynihan Transportation Complex.

33. Ibid.

34. See note 30.

35. Robert Sullivan. "Subway on the Street." New Yorker Magazine. July 4, 2010. http://nymag.com/news/features/67027/

36. Ibid.

37. "34th Street Select Bus Service." City of New York. 2011. http://www.nyc.gov/html/brt/html/next/34th_transit.shtml

Eugene, Oregon's Emerald Express (EMX)

Several thousand miles to the west, Eugene, Oregon is experiencing success with its BRT system as well.[38] This medium-size city of 154,620 doesn't exactly measure up to the hustle and bustle of New York City, yet in the mid 1990's the city was looking to upgrade its existing bus infrastructure and improve travel times.[39] Furthermore, the city was experiencing worsening congestion and could not afford the cost associated with light rail transit. With no new taxes available for transportation improvements, Eugene's transit provider "LTD" initiated construction on a pilot BRT corridor from downtown Eugene to Springfield, Oregon.

Eugene's EMX system provides level boarding from station to vehicle.

Opened in 2007, the line was built for an average of $6.25 million per mile. Featuring ten stations at half-mile intervals, the line operates about 60 percent in dedicated running-ways and the rest in mixed traffic. Stations include shelters and raised boarding platforms similar in appearance to a streetcar station. LTD branded the system as the Emerald Express (EMX) and each 63-foot articulated bus can carry about around 90 passengers. Service operates at 10-minute peak and 20-minute non-peak headways.

Even in this mostly suburban environment, LTD reports a 46 percent increase in ridership from the corridor's previous bus service. LTD also increased frequency on traditional bus service due to increasing ridership with connections to EMX. More recently, LTD opened an extension from the existing Green Line eight miles northward to one of the area's largest hospitals. LTD hopes to eventually extend the system, for a total build of 64 miles on all of the area's major roadways.[40,41]

Conclusions

BRT has proven to be an effective and efficient option for rapid transit in places as large as New York City and in smaller markets such as Eugene, Oregon. BRT projects generally deliver increased ridership levels, reduced travel time, high customer satisfaction, development potential, as well as an expanded public transit system.

In addition to the project financing from local and state resources, the Federal Transit Administration actively encourages the development of BRT systems through its Small Starts competitive grant program. The last few decades saw a growing criticism from transit planners, localities, and transit agencies that the federal government was favoring rail transit over BRT. Enacted under the surface transportation reauthorization in 2005, the Small Starts grant program provides capital funds for major transit investment projects at the local level.[42] Projects must be either a fixed guideway for at least 50 percent of the project length or be a corridor-based bus project with the following minimum elements: substantial transit stations, signal priority/pre-emption, low floor/level boarding vehicles, special branding of service frequent service, and service offered at least 14 hours per day – all components of a BRT system. Applicants to the program are evaluated based on local land use, cost effectiveness, local financial commitments and a variety of other local factors for enhanced project selection.

Changes made at the federal level will increase the chance of BRT implementation and make more efficient use of taxpayer dollars in extending the viability of our transportation system. The advantages of BRT make it an increasingly attractive transit option. As the nation grapples with increasing auto congestion, greater patronage of transit and escalating project costs, BRT provides a reasonable rapid mode of transit at a potentially lower cost than other major transportation investments.

38. "Eugene, Oregon EmX." Bus Rapid Transit Policy Center. September 2007. http://www.gobrt.org/Eugene.html

39. Risa S. Proehl."2008 Oregon Population Report."Portland State University: Population Research Service. March 2009. http://www.pdx.edu/sites/www.pdx.edu.prc/files/media_assets/PopRpt08c.pdf

40. "EMX FAQ: What is BRT?" Lane Transit District. 2011. http://www.ltd.org/search/showresult.html?versionthread=6d517154d17fc3e09be84a0ee196bd7b

41. "About EMX." Our Money Our Transit...Public Solutions for Public Transit. 2011. http://ourmoneyourtransit.com/about_emx.php

42. "Small Starts Fact Sheet." Federal Transit Administration. March 2011. http://www.fta.dot.gov/documents/Small_Starts_Fact_Sheet_Mar_20(2).doc

4

Intelligent Transportation Systems (ITS):
Using Technology to Increase Capacity

During the last three decades, congestion in the nation's urbanized areas has dramatically worsened.[43] At the same time, the federal government's primary transportation financing mechanism — the gasoline tax — no longer brings in sufficient revenues to cover the costs of ongoing maintenance, much less expansion of the existing transportation network.[44] As a result, local and state governments are increasingly turning to less expensive options than capacity expansion. One such approach is the increased deployment of Intelligent Transportation Systems (ITS) to improve network efficiency, squeeze capacity out of existing transportation systems and save taxpayer dollars.

[43] "Highway Congestion and Federal Policy." Congressional Budget Office. March 2009. http://www.cbo.gov/ftpdocs/97xx/doc9750/Chapter1.5.1.shtml

[44] "Highway Trust Fund: Overview of Highway Trust Fund Estimates." General Accountability Office. April 2006. http://www.gao.gov/new.items/d06572t.pdf

ITS: An overview

Although the term "intelligent transportation systems" may convey the idea of automated freeways and self-driving automobiles, ITS is more simply the application of existing, cost-effective technologies to a variety of transportation systems for an overall improvement in efficiency, safety, capacity, and user experience. From ramp meters on Los Angeles' freeways to "Charliecards" on Boston's subway, ITS technologies help improve the efficiency of the existing transportation system. Adding "intelligence" improves network flow, reduces delay, offers real-time information to travelers, makes payment of tolls or fares more convenient, and customizes individual travel needs beyond transit schedules, construction activity, and other transportation-related interruptions.

ITS includes an array of technologies and applications to improve a region's or community's transportation system.[45] These offer real-time data to drivers and transit users about congestion, weather conditions, construction activity, and upcoming changes to transportation networks. Transportation data is collected, aggregated and translated by private and public entities then displayed to a user through various technologies, like television broadcasts, highway advisory radio, web-based alerts and mobile devices. Travelers utilize this information to choose the best travel route based on congestion, weather conditions, or the number of transfers.

More complex ITS systems typically rely on highly advanced traffic management centers to improve traffic flow and ease congestion through control devices such as optimized traffic signals, highway ramp metering, electronic tolling, dynamic message signs and weigh-in-motion truck scales. Traffic signal optimization detects waiting vehicles and changes the signal or dynamically times upcoming signals. Ramp meters manage traffic by controlling the rate at which vehicles enter a freeway during peak periods. Electronic tolling, also known as "open-road tolling", charges tolls to an internal vehicle transponder and eliminates the need to stop and pay at a toll plaza. Dynamic message signs inform travelers about upcoming delays, construction or lane closures so they plan accordingly or find alternate routes. Electronic "weigh-in-motion" inspection systems allow trucks to be automatically weighed and validated without the need to stop at an inspection station.

Across the United States, ITS has also expanded to other, non-conventional transportation areas such as car-sharing programs, smart phone traffic applications and peak-period transit discounts.

- Portland, Oregon has reduced gridlock and lowered automobile emissions with traffic signal optimization.[46]
- Ramp meters have improved highway flows in Minneapolis since the early 1990s.
- Washington DC's Metro rail system eases travel and offers a fare discount for travelers using the "SmarTrip" electronic fare payment system.
- Rhode Island's ITS program provides New England drivers with real-time roadway conditions through dynamic message signs and web-accessible highway cameras.
- Conversion to electronic, open-road tolling on the Florida Turnpike has cut traffic accidents at toll plazas by more than half.[47]

45. Stephen Ezell. "Intelligent Transportation Systems." January 2010. http://www.itif.org/files/2010-1-27-ITS_Leadership.pdf

46. Ibid.

47. "Florida Turnpike going to cashless system; accidents have taken their toll." Palm Beach Post News. October 26, 2009. http://www.palmbeachpost.com/news/state/florida-turnpike-going-to-cashless-system-accidents-have-28257.html

Public transportation systems also find value in ITS. Arrival and departure information is increasingly displayed at transit stations on dynamic message signs to enhance the attractiveness and expected timeliness of transit. Transit agencies are using electronic fare systems that expedite system entry and exit and allow users to pre-pay fares. Automatic vehicle information systems report transit vehicles' exact location and offer transport managers a real-time view of all operations in the transit network. If problems arise, managers re-route vehicles or inform riders immediately of an upcoming delay. Roadway traffic signals have also been prioritized for buses to reduce travel time and improve reliability, enhancing the attractiveness of bus service.

These existing technologies provide transportation networks the ability to collect and disseminate system information in addition to moving goods, people and services. With this type of data, policy-makers, transport managers, travelers and other actors in the network make better informed decisions regarding what route to take, which mode to use, when to travel and the true cost of transportation.

Transportation Benefits

ITS implementation has the potential to increase public safety, reduce travel delay, encourage economic activity and mitigate harm to the environment. A 2005 GAO study found that ITS reduced delays by 9 percent in 85 urban areas across the United States. U.S. traffic light optimization programs have reduced delay between 10 to 40 percent while improving trip times and curtailing fuel consumption.[48] Achieving "freeflow traffic conditions" — the primary goal of traffic signal optimization and ramp meters—in eight U.S. cities would boost their economies by an estimated $135.7 billion and generate close to $9 billion in new tax revenues.[49]

Implementation of ITS also has safety and environmental benefits. Dynamic message signs warning of upcoming accidents have reduced crashes in San Antonio, Texas.[50] Open road tolling at six plazas in Florida has reduced crash rates by 58 percent since late 2007.[51] Minneapolis' ramp meters have reduced crashes by at least 30 percent.[52] Furthermore, ramp metering, weigh-in-motion inspection stations and traffic light optimization have reduced emissions and fuel consumption as a result of improved traffic flow.[53] Oregon's automatic truck weighing systems reduced emissions by as much as two-thirds when trucks stayed at highway speed.[54]

Highway ramp meters and traffic light optimization improve a roadway network's traffic flow and reduce congestion.

48. "Intelligent Transportation Systems for Traffic Signal Control." United States Department of Transportation. January 2007. http://ntl.bts.gov/lib/jpodocs/brochure/14321_files/a1019-tsc_digital_n3.pdf

49. David T. Hartgen and M. Gregory Fields. "Gridlock and Growth: The Effect of Traffic Congestion on Regional Economic Performance." Reason Foundation Policy Study 371. 2009. http://reason.org/files/ps371_growth_gridlock_cities_full_study.pdf

50. Research and Innovative Technology Administration. http://www.itscosts.its.dot.gov/its/benecost.nsf/ID/70D42E82546A95BC8525733A006D4ECA?OpenDocument&Query=BApp

51. See note 47.

52. "Ramp Meters." Washington State Department of Transportation. http://www.wsdot.wa.gov/Traffic/Congestion/rampmeters/

53. "Smart Mobility for a 21st Century America: Strategies for Maximizing Technology to Minimize Congestion, Reduce Emissions and Increase Efficiency." Transportation for America. October 2010. http://t4america.org/wp-content/uploads/2010/10/ITS-White-Paper-100710-FINAL.pdf

54. Oregon Department of Transportation. http://www.oregon.gov/ODOT/MCT/GREEN.shtml

Taxpayer Benefits

ITS technologies help better manage existing highways and interstates and better utilize capacity. Traffic management with ITS has shown to increase freeway capacity by 17 to 25 percent and decrease travel times by 16 to 62 percent.[55] The resulting increase in capacity may reduce the need to finance and build additional lanes. Public financing that may have been allocated to more expensive capacity enhancements can instead be spent on other transportation priorities.

ITS Technology is typically monitored from a regional traffic control center such as this one in Houston, Texas.

Furthermore, numerous benefit-cost studies show the public is receiving far greater return on investment with ITS-related technologies compared to conventional roadway projects. An estimated 9 to 1 average benefit-cost ratio follows ITS system-operation improvements versus 2.7 to 1 for highway capacity additions.[56] Looking deeper into ITS's various system components demonstrates even higher benefit-cost ratios: traffic light synchronization projects across Texas shows a benefit-cost ratio of 62-to-1,[57] with reductions in delay, fuel consumptionand vehicular stops and Broward County, Florida's traffic operations management system offers a 14-to-1 benefit-cost ratio in reduced travel time, fuel consumption and accidents.[58]

Case Studies

The LINX Project

At the heart of the American West lies the Yellowstone-Teton Region. Sparsely populated, yet widely visited for its natural beauty and national parks, the 27-county region faces challenges to personal mobility. As the resident population ages and visitors congest area roadways and the region finds itself with limited transportation options, lack of coordination between transit systems and extensive distances between population centers. Residents, tourists and business travelers visiting the region require an automobile or face haphazard, "do-it-yourself" travel planning between private and public transit operators. These trips typically include long connection times and excessive travel times.

With a $200,000 grant from the Idaho Department of Transportation, the Yellowstone Business Partnership has embarked on developing a fully-integrated, intelligent transportation system to manage a multi-state system under a co-op business model.[59] The system's ultimate goal is to overlay the region's public and private transportation services—mainly bus and taxi providers—into an online trip planner for locals and visitors. Under the system, transportation providers will connect to LINXComm, a communication network that tracks the location, availability and scheduling of all vehicles. Riders visit the website, look up schedules, plan and reserve trips, make payment, print tickets and track on-time status. The fully integrated system will offer a potential rider all travel options, reduce transit connection times, present the true cost of travel and provide a reliable alternative to the automobile.

55. "Highway Traffic Operations and Freeway Management: State-of-the-Practice." Federal Highway Administration. March 2003. http://ops.fhwa.dot.gov/freewaymgmt/publications/documents/FreewayManagementSOPV.7.2.1.pdf

56. "Intelligent Transportation Systems." Council of State Governments. May 2010. http://knowledgecenter.csg.org/drupal/content/intelligent-transportation-systems

57. "Investment Opportunities for Managing Transportation Performance through Technology." U.S. Department of Transportation, Intelligent Transportation Systems Joint Program Office. January 16 2009. http://www.its.dot.gov/press/pdf/transportation_tech.pdf

58. See note 56.

59. "Concept of Operations: A Yellowstone-Teton Regional Transportation System." Yellowstone Business Partnership. December 2008. http://www.yellowstonebusiness.org/datafiles/Concept_of_Operations_1-20-09.pdf

Although the system is not yet complete, 60 public and private transportation providers have joined the LINX co-op and the system is expected to go online in 2011. The Yellowstone Business Partnership hopes the new LINX system will bolster economic viability, reduce traffic on the region's roadways, and provide more efficient transportation alternatives for the area's three million annual visitors.

Atlanta's Smart Corridor

Travelling northwest from downtown Atlanta, the US 41/Cobb Parkway Corridor is one the state's most heavily congested roadways. Additionally, the roadway serves as a major transit corridor and funnels thousands of bus riders throughout the Atlanta region each weekday. To better manage traffic and transit along the corridor and reduce travel time, the cities of Atlanta and Marietta, Cobb County, the Georgia Regional Transit Authority, the Georgia Department of Transportation, and FHWAimplemented a cross-jurisdictional traffic signal upgrade.[60]

Officially known as the Atlanta Smart Corridor (ASC) Project, 29 intersections were upgraded to calculate real-time vehicle counts under an adaptive traffic signal control system. Using vehicle counts, the system selects an appropriate cycle time for each intersection and optimizes each signal to maximize the traffic throughput. Buses are offered green light extension or early green signal through transit signal priority technology. Operation of the entire corridor is coordinated by the Cobb County Traffic Control Center.

Since the project's completion in June 2010, vehicle travel time has declined by nearly one-quarter and delay by 40 percent.[61] Automobile emissions were reduced and fuel consumption cut by one-third.[62] As a demonstration of the project's cost effectiveness, the ACS system found a benefit-cost ratio between 23- and 28-to-1.[63]

Conclusions

As Congress grapples with increasing congestion and limited federal financing, governments are now utilizing ITS to extract more capacity from their existing infrastructure. These technologies—from simple overhead dynamic signs to complex, highly-integrated traffic light optimization systems — reduce congestion, improve safety, increase traffic throughput and encourage economic development, without the need for costly roadway expansion.

From the sparsely populated Yellowstone-Teton Region to the nation's dense metropolitan centers, the benefits of ITS are being realized across the country. As benefit-cost analyses have demonstrated, both the travelling public and taxpayers stand to benefit enormously from ITS implementation.

60. "Atlanta Smart Corridor - Project Fact Sheet." Georgia Regional Transportation Authority. http://www.itsga.org/Knowledgebase/Atlanta%20Smart%20Corridor%20Project%20Fact%20Sheet.pdf

61. "Atlanta Smart Corridor - Project Evaluation Report." Georgia Regional Transportation Authority and TransCore. June 30, 2010. http://www.grta.org/ASC_Evaluation.pdf

62. Ibid.

63. Ibid.

5

Intercity Buses:
Connecting communities with taxpayer-friendly transportation

A new breed of intercity bus service is quickly reshaping travel choices between the nation's population centers. Long a work-horse of the transportation system, intercity bus travel is positioned to be more important than ever in the future. With curbside operators and traditional carriers now offering amenities such as on-board Wi-Fi, reserved seating and express schedules, intercity bus travel was the fastest growing mode of transportation in 2010.[64] With a reinvigorated bus industry adding new cities and departures weekly, the United States has the potential to expand urban and rural travel options that cost taxpayers little or nothing.

[64] Joseph P. Schwieterman and Lauren Fischer. "The Intercity Bus: America's Fastest Growing Transportation Mode." Chaddick Institute for Metropolitan Development. December 20, 2010. http://las.depaul.edu/chaddick/docs/Docs/2010_Intercity_Bus_Study_12-29.pdf

Intercity Buses: An Overview

Prior to 1960, intercity buses ferried millions of travelers to every corner of the U.S. and served both long- and short-distance travel markets. With locations from small villages to large metropolitan centers, hundreds of bus terminals boasted a considerable number of departures and arrivals that exceeded both airlines and railroad arrivals and departures.[65] By the mid 1960s, increasing ownership of private automobiles, construction of the nation's Interstate highways and the decline of the nation's urban centers placed privately-held bus service on the chopping block for many communities. Bus traffic declined by 100 million passengers from the mid-1960s to 1990.[66] As passenger counts and ticket revenue fell during this period, service rapidly deteriorated, routes were cut and public perceptions became tarnished. Though the industry was deregulated and the nation was experiencing significant growth in intercity travel, service cuts continued into the early 21st century.

By 2006, a renaissance of intercity bus service was underway across the country, particularly in the Northeast and Midwest.[67] Increasing airline fees, airport security hassles, growing highway congestion, high fuel costs, redevelopment of the nation's city centers, and a younger generation attacted to bus travel caused scheduled departures to increase by 7 percent in 2006-07.[68] Additionally, the American Bus Association (ABA) found that nationwide ridership grew from 631 million passengers to 751 million from 2005 to 2007.[69] Corridors once dominated by planes, trains, and automobiles saw most of this growth captured by the emergence of new, low-cost bus operators. With names like BoltBus, MegaBus and Washington Deluxe, these providers offer online ticketing, express scheduling, curbside boarding and enhanced onboard amenities such as Wi-Fi, reserved seating, and individual power outlets. Additionally, increased competition and innovative marketing has pushed some curbside carriers to advertise fares as low as $1.00 making for considerable savings over other modes of transportation. Traditional carriers such as Greyhound have followed suit with fleet overhauls, competitive schedules and lower fares.

Prior to 1960, buses ferried millions of travelers to every corner of the nation.

A plethora of curbside intercity bus operators now offer service between Northeast, Midwest and some Southern cities.

65. Joseph P. Schwieterman, et. al. "The Return of the Intercity Bus: The Decline and Recovery of Scheduled Service to American Cities, 1960 - 2007." Chaddick Institute for Metropolitan Development. December 24, 2007. http://condor.depaul.edu/chaddick/Intercity%20Bus%20Study.pdf

66. Ibid.

67. Tonya Alanez. "Greyhound Cuts Mean Fewer Stops on Its Route." Los Angeles Times. April 18, 2005. http://articles.latimes.com/2005/apr/18/local/me-greyhound18

68. See note 66.

69. Robert Damuth. "The Economic Impacts and Social Benefits of the U.S. Motorcoach Industry: Binding the Nation Together by Providing Diverse and Affordable Services to Everyone." Nathan Associates. December 2008. http://www.buses.org/files/Report08.pdf

State governments and the federal government have also facilitated demand over the last decade by providing taxpayer-supported connections between cities and rural communities. Realizing that many rural communities are underserved by transportation options and require connections to urban areas, states established rural intercity bus programs to provide operational support for service to small cities. Grants made by state policy makers are used to cover fare box deficits, purchase new equipment or expand frequencies on rural routes. The Federal Transit Administration's Section 5311 Program supplements these costs with formula-based grants allocated among the states. States are required to use 15 percent of their annual apportionment under this program to support intercity bus service, unless the Governor certifies that the needs of the state are adequately met by existing bus service. Furthermore, the program only subsidizes up to 50 percent of the operational loss to a carrier to ensure the cost-effectiveness of particular routes. Maryland, Tennessee and Washington all utilize Section 5311 to help maintain robust rural intercity bus programs.

The number of scheduled departures continues to increase, with a 6 percent growth rate in 2010.[70] This makes intercity bus transportation the fastest growing mode of transportation for three straight years, increasing faster than both rail and air. Curbside-only operators accounted for 21 percent of this growth in hubs located primarily in large metropolitan markets such as Chicago, New York, and Washington, DC.[71] Curbside service has even expanded to smaller markets such as Kansas City, Missouri and Knoxville, Tennessee. Although most of the growth has occurred in dense, transit-accessible cities, even the automobile-oriented South has seen the emergence of new low-cost services in Florida and Georgia. As the U.S. economy continues to rebound continued growth is expected.

Transportation Benefits

Intercity bus service provides considerable benefits for the traveling public. Once the last resort for many Americans, intercity buses are quickly becoming a viable alternative to airlines, trains, and even private vehicles. Increasing redundancy in the overall transportation system increases system efficiency and provides Americans with increased travel options. For instance, in 2007, bus service prevented more than 63 million hours of delay and $1.2 billion in congestion costs.[72]

Intercity buses also serve markets not serviced by other modes. Intercity bus service was accessible to 63.1 million – or 78 percent – of rural residents in 2010, the highest of all transportation modes.[73] In addition, 9.3 million rural Americans had access only to intercity bus and no other mode.[74] Though the number of rural residents serviced by intercity bus is actually in decline, intercity buses do fill an important gap in transportation service in rural communities. Christiansburg, Virginia, a town of about 17,000 at the foothills of the Appalachian Mountains, has no rail or air service. Private operator Megabus provides the rural to urban link, offering three daily departures to both Knoxville, Tennessee and Washington, DC, tying small-town Christiansburg to national economic centers.

70. See note 65.

71. Ibid.

72. David Schrank and Tim Lomax. "Mobility Benefits from Motorcoach Service." Texas Transportation Institute. December 2009. http://www.buses.org/files/Mobility%20Study%20-%20TTI.pdf

73. BTS defines accessible as: "... 25 miles from a non- or small-hub airport, bus station, ferry terminal, or rail station providing intercity service and as 75 miles from a medium- or large-hub airport."
"The U.S. Rural Population and Scheduled Intercity Transportation in 2010: A Five-Year Decline in Transportation Access." United States Department of Transportation. February 2011. http://www.bts.gov/publications/scheduled_intercity_transportation_and_the_us_rural_population/2010/pdf/entire.pdf

74. Ibid.

Bus travel also saves energy and benefits the environment. In 2010 alone, intercity buses reduced nationwide fuel consumption by as much as 11 million gallons[75] as each bus achieves an average of 184.4 passenger miles per gallon of fuel.[76] In addition, intercity buses mitigated carbon emissions by 249 million pounds.[77] On average, motor coaches emit just 0.17 pound of carbon dioxide per passenger-mile, less than one-sixth of such pollution emitted by a single occupant vehicle.[78] These benefits both remove harmful emissions from the air and reduce the our dependence on fossil fuels.

Taxpayer Benefits

Extending the viability of the United State's transportation system in a cost-efficient manner has become crucial, in recent years due to budget shortfalls at all levels of government. Buses receive far less subsidies compared to many other forms of transportation. For instance, from 2002-2009, buses received $0.10 in federal subsidies per passenger trip and just a fraction of a cent in subsidies per passenger mile ($0.0005).[79] With only a small cost to federal taxpayers, compared to other modes, both private and taxpayer-supported intercity bus operators provide increased mobility on existing highway networks and mitigate the need for costly airport and rail expansion projects. Each bus has the potential to remove 55 vehicles from a roadway. When used in tandem with other transportation demand solutions, intercity buses increase highway efficiency and greater traffic throughput without lane additions or other expensive improvements.[80]

Case Study

Indiana's Intercity Bus Partnership[81]

In 2005, a series of nationwide service cuts and corporate restructuring left many rural communities without connections to large cities. This was especially true for small- and medium-sized Indiana cities which lost multiple routes to Indianapolis. Even though some rural service remained, residents embarking on a trip to Indianapolis now required connections in either Chicago or Detroit. Travel time to Indianapolis that originally took two or three hours took upwards of five or six.

Citing the need to enhance rural opportunity, encourage economic growth and facilitate greater quality of life, the Indiana Department of Transportation partnered with Miller Trailways and Greyhound Lines to create "Hoosier Ride." Initiated in January 2010, Hoosier Ride includes five regional routes traversing more than thirty communities across Indiana, Michigan, and Kentucky. Each route is scheduled to meet with existing thruway connections for a seamless transportation network. By partnering with Greyhound and Trailways—both nation-wide intercity bus operators — Indiana insured connections to over 2,300 destinations throughout the United States and Canada.

Operating expenditures for Hoosier Ride are offset by the continued support of the Indiana Department of Transportation, federal funding matches and ticket revenue generated on the Hoosier Ride system. Funding provided by the people of Indiana offers an economical, fuel efficient travel option that is both flexible for the existing roadway network and adaptable to the changing travel needs, senior citizens and those who don't drive.

75. See note 65.

76. "Comparison of Energy Use & CO2 Emissions From Different Transportation Modes." American Bus Association. May 2007. http://www.buses.org/files/ComparativeEnergy.pdf

77. See note 65.

78. "Getting There Greener: The Guide to Your Lower-Carbon Vacation." Union of Concerned Scientists. December 2008. http://www.ucsusa.org/assets/documents/clean_vehicles/greentravel_report.pdf

79. See note 70.

80. The typical number of seats on an inter-city passenger bus.

81. "State Believes Bus Partnership Could Help Economy." Inside Indiana Business. April 2010. http://www.insideindianabusiness.com/newsitem.asp?ID=41007

Conclusions

Once considered a last resort for many, intercity buses are now the fastest growing form of transportation in the United States. Travelers are flocking to buses, especially on routes between large urban centers.

New curbside operators offer online reservations, non-stop schedules, and enhanced on-board amenities. Traditional bus carriers have also made changes to increase competition, enhance the customer experience, and improve the public's image of bus travel. Outside of urbanized, curbside-only corridors, states are now offering funds to support rural-to-urban bus connections as a means to connect population centers and expand affordable travel.

Bus travel extends the capacity of the existing highway system, provides network redundancy, increases consumer choices and reduces congestion. In doing so, bus travel saves energy, promotes environmental stewardship, and reduces our dependence on foreign oil with little to no cost to taxpayers.

Megabus is one of many curbside-only operators offering affordable, non-stop intercity bus service.

6

Teleworking:
Reducing commuter impacts on congested transportation systems

Between the hours of six and nine every weekday morning and four to seven every weekday evening, an enormous migration occurs: the daily commute. From coast to coast, millions of commuters crowd the nation's freeways, trains and buses. Yearly peak delay for the average commuter was 34 hours in 2009, up from 14 hours in 1982.[82] This has serious implications for retaining the nation's economic competitiveness and travel efficiency. However, there is an option that allows workers to escape the grind of the commute while improving travel time, reducing air pollution and lessening the impact of traffic.

82. See note 9.

Teleworking: An Overview

Teleworking, or telecommuting, means working at any location other than your central worksite. A telework program gives employees and managers the option of working off-site on a full-time, part-time or temporary basis. Staff may choose to work from home offices, telework centers or satellite offices. Some will require nothing more than a phone or internet line, while others involve a full home office setup and a written contract between employee and employer as to how the terms of teleworking are arranged.

Telecommuting benefits both the employee and employer. For the employee, telework increases job satisfaction, provides for a better work/life balance and allows for savings on clothing, gasoline and automobile costs. For the employer, telework provides savings on office space, increased productivity due to improved employee morale, and the ability to work in bad weather or other unexpected circumstances. Research shows that teleworking yields increase in employee productivity and decreases in employee turnover and absenteeism.[83,84]

Teleworking is limited, however. Certain jobs are not suited to telecommuting, including many administrative support positions, facility management and hospital jobs, among others. There is also a bias among employers that must be overcome, as some employers feel employees are less accessible and productive when working remotely. Some employees themselves may not enjoy teleworking.

Transportation Benefits

Telecommuting has been slowly gaining in popularity, and though data is imperfect, approximately 2 percent of workers can be classified as teleworkers. Though this is a small share of the overall workforce, a small reduction in peak travel trips may have a large effect on overall congestion. Since workers who live further from the workplace are likely to be more attracted to teleworking,[85] the transportation benefits may be even greater as the trips avoided are typically longer than the average peak hour trip.

Surprisingly little research has been done in this area, however, so it is impossible to say how permanent the changes might be if a larger share of workers telecommute in the future. There is some speculation that telework may actually cause a decentralization of living arrangements (sprawl) and increased number of trips (by workers who would otherwise do errands on their way home from work, for example), in addition to a reduction in peak-travel trips. While the overall effects on congestion are likely to be positive, it is difficult to say how much an impact teleworking will have.

Telecommuting also has the potential to reduce the transportation system's impact on the environment. Fewer cars on the road and employees in the office mean less dependency on gasoline, reduced emissions, and lower electricity costs.

83. "Case Study: Telecommuting." EECS Instructional and Electronics Support, University of California-Berkeley. http://inst.eecs.berkeley.edu/~eecsba1/sp97/reports/eecsba1d/report/telecommute.html

84. "The Telework Advantage." Virginia Department of Rail and Public Transportation. 2011. http://www.teleworkva.org/go/what-is-telework/benefits/

85. Jennifer M. Virive and Nancy DeLay. "Measuring Telework ROI: Metrics Based on the Employee Life Cycle." 2006. http://www.telecommutingadvantage.com/pdfs/news_and_research/Measuring_Telework_ROI___Metrics_Based_on_the_Employee_Life_Cycle%5B1%5D.pdf

Taxpayer Benefits

Though its overall impact is unclear, the recent increase in telecommuting will help reduce congestion, and therefore potentially reduce the need for costly capacity additions. As more states realize the benefits of telework and create their own incentives (see Georgia Case Study below), the reduction in traffic will surely benefit federally funded highways and interstates, but cost the federal government little or nothing. In addition, the federal government's increased attention on teleworking (see Federal Government Case Study below) is expected to save $850 million each year in direct expenses, and increase productivity by billions of dollars. Telework also increases employee productivity and decreases both turnover and absenteeism, all of which will make the federal workforce more efficient.[86]

Case Studies

Federal Government

On December 9, 2010, President Obama signed into law the *Telework Enhancement Act of 2010*,[87] designed to increase teleworking among federal employees. Under this legislation, federal agencies will establish a telework policy, determine which employees are eligible to telework, and notify employees of their eligibility. Federal employees will enter into written telework agreements detailing work arrangements and will receive telework training. Under the Act, teleworkers and non-teleworkers must be treated equally when it comes to performance appraisals, work requirements, promotions, and other management issues. Each agency must designate a Telework Managing Officer, and must incorporate telework into its continuity of operations plan.

The Telework Research Network estimates that if the eligible federal workers who want to telecommute do so once a week, agencies would increase productivity by over $4.6 billion each year and save $850 million in annual real estate, electricity and related costs[88] Furthermore, the nation would save nearly six million barrels of oil and reduce greenhouse gas emissions by one million tons per year. Encouraging teleworking among federal employees also enables agencies to continue functioning during emergencies.

Companies are realizing that telework strategies save money in real estate and boost productivity as well as add to employee satisfaction, recruitment, and retention.

Georgia

Georgia established the "Work Away Program," a statewide policy on teleworking, in 2003 and enhanced it in 2007.[89] As a result, some 300,000 workers in the greater Atlanta area telework at least once each week.[90] Georgia's telework program is considered effective because it encompasses a solid and realistic set of performance metrics. These include surveys of both managers and employees, and monthly reports for all program areas showing the number of teleworkers per agency, environmental savings and monthly commute miles saved.[91]

86. "The Telework Advantage." Virginia Department of Rail and Public Transportation. http://www.teleworkva.org/go/what-is-telework/benefits/

87. "H.R.1722 -- Telework Enhancement Act of 2010." http://thomas.loc.gov/cgi-bin/query/z?c111:H.R.1722.ENR:

88. Kate Lister. "Telework Improvements Act Gets Second Chance." July 2010. http://www.workshifting.com/2010/07/the-telework-improvements-act-hr.html

89. "Governor Perdue Unveils Telework Initiative to Address Traffic Woes." Office of the Governor. September 2003. http://www.georgia.gov/00/press/detail/0,2668,78006749_91290006_91679969,00.html

90. "Georgia Telework Week Demonstrates Business Benefits to Employers." Telework Exchange. December 2010. http://www.teleworkexchange.com/teleworker-12-10h.asp

91. "The Perfect Storm: Driving Telework in State and Local Agencies." Telework Exchange. Available: http://www.teleworkexchange.com/pdfs/Telework-Exchange-TANDBERG-Whitepaper.pdf

Georgia has accomplished the Governor's goals of setting a positive "example by doing." Agencies and managers apprehensive about teleworking were shown that through proper management of the program, telework is an effective business strategy. The positive effects of the initiative have mirrored those the program had hoped: increased employee productivity; enhanced employee morale and job satisfaction; commuter and environmental savings; and employee retention.

The state's telework program also helped lay the foundation for the passage of its Telework Tax Credit (Ga. Code 48-7-29.11). Georgia is the first state in the nation to offer employers a tax credit for teleworking. Businesses that pay Georgia income taxes in 2009 are eligible for the tax credit.

As the private sector and the federal government embrace the benefits of telework, state and local agencies have the opportunity to learn from their successes, adopting best practices and reaping the many benefits of telework. Telework programs provide state and local employees tangible value, including a productive work environment, resulting in better job performance, improved morale, and job satisfaction. Further, high gas prices and fuel concerns, disaster recovery preparation, recruitment and retention, and "green" initiatives are driving unprecedented interest in and demand for telework.

Conclusions

New technologies, including laptops, broadband connectivity, PDAs, video conferencing, and other mobile solutions, make teleworking more feasible than ever and enable employees to remain connected in home offices or in the field, while saving on transportation costs and time spent in transit. Small reductions in traffic volume — achieved by teleworking — significantly increase travel speeds and improve traffic conditions. A 5 percent reduction in traffic volumes on a highway lane that carries 2,000 vehicles per hour increases travel speed by as much as 20 miles per hour.[92] Teleworking has the potential to realize these efficiencies, reduce congestion, and mitigate transportation impacts on the environment. Furthermore, less travel on the roadways and improved worker productivity — especially among government employees — saves taxpayer money and reduces the need for expensive roadway capacity improvements. Although teleworking represents only a small percentage of the workforce, robust telework policies and procedures can encourage and ensure program success.

[92.] Todd Litman. "Smart Congestion Reductions II: Reevaluating The Role Of Public Transit For Improving Urban Transportation." Victoria Transportation Policy Institute. March 2011. http://www.vtpi.org/cong_relief11.pdf

7

Local Street Connectivity

Protecting investments in major corridors with increased local connectivity

Our nation's federal highways and interstates are becoming increasingly choked by congestion, in part a result of local traffic. Local street connectivity can be essential in the effort to preserve these routes of critical importance, extend their viability, and maximize to the extent possible the capacity of existing infrastructure. Reducing local traffic on key long-distance routes will help increase efficiency, lower maintenance costs and reduce the need for publically-financed capacity improvements.

Local Street Connectivity: An Overview

Street connectivity is defined as a system of streets with multiple routes designed to serve the same destinations from home, work, recreation or other activities.[97] A highly connected street network provides various access points to an area from arterials, collector streets, local roadways, as well as from surrounding urban development or future growth areas. Increasing local street connectivity will help remove local traffic from arterials, thoroughfares and collectors, and ultimately enhances the overall capacity of the transportation network.[98]

Much of America's urban development is characterized by grid-like street patterns still apparent in the nation's urban centers and historic neighborhoods. Post-war growth gave rise to suburban-style development, which included a broader and more diverse hierarchy of streets (local, collector, arterial and highway), cul-de-sacs and dead-ends. As the interstate highways developed and connected outlaying areas to city-centers, local traffic on this hierarchical street system became increasingly concentrated along regional and federally-financed corridors. Many automobile trips from home to school, shopping and other locations took advantage of these regional connectors due to limited options, joining trucks and other important movements on the nation's principal roadways. In some cases, simply traveling to the local grocery store might require driving onto a U.S. highway or Interstate even when the grocery store is relatively close to one's home.

In recent decades, congestion has worsened in many urban areas across the nation as the number of highway lane miles has not kept pace with increases in vehicle miles traveled.[93] This is especially true for the urban Interstate Highway System, as the majority of U.S. vehicle miles traveled occur on these federally-financed corridors — corridors that are ostensibly for interstate commerce, freight movement and national defense.[94] The vitality of these key long-distance corridors is being undermined by the growth of local traffic and the lack of connectivity among neighborhoods and activity centers. In many metropolitan areas, key long-distance travel routes carry a significant amount of local traffic.

As these corridors become increasingly congested, air quality worsens, travel times increase, and the cost of capacity improvements skyrocket.[95] Simply expanding the number of lanes or redesigning these long-distance corridors reinforces the use of these corridors by local traffic and does not solve a major source of the problem – namely the limited number of options for local traffic. Indeed, perhaps the single most neglected part of the regional transportation network is the need for more local roads as well as collectors and boulevards to create better neighborhood connectivity and reinforce a grid pattern.[96]

93. See note 43.

94. "2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance." United States Department of Transportation. 2009. http://www.fhwa.dot.gov/policy/2008cpr/es.htm#c1

95. "Surface Transportation Congestion: Policy and Issues." Congressional Research Service. February 6 2008. http://assets.opencrs.com/rpts/RL33995_20080206.pdf

96. See the discussion in Sam Staley and Adrian Moore, Mobility First: A New Vision for Transportation in a Globally Competitive 21st Century (Lanham, MD: Rowman and Littlefield, 2008), specifically Chapter 5 and Chapter 7 on "The Missing Link."

97. "4.8.4. Model Street Connectivity Standards Ordinance." Commonwealth of Kentucky. 2007. http://congestion.kytc.ky.gov/connectivity/WSDOT%20Connectivity%20Model%20Ordinance.pdf

98. "Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation." United States Department of Transportation. September 1 2005. http://ops.fhwa.dot.gov/congestion_report/chapter4.htm

Transportation Benefits

By internalizing local traffic to more direct neighborhood routes, trips to the store, school or other neighborhood activities can experience considerable time savings. For example, existing suburban development typically requires residents take long, circuitous routes to reach a local grocery store or other neighborhood destination– most begin their journey on a neighborhood street, join a collector, enter and then exit an arterial highway to complete even minor shopping tasks. Improved connectivity of the street network would reduce travel times and distances traveled. Improving connections between locations can improve fuel efficiency and lessen the cost burden of operating a motor vehicle. Often, improving connectivity can be as simple as adding a sidewalk or ensuring connections between neighborhoods. Additionally, increased street connectivity has been shown to encourage walking, bicycling, and use of other transportation alternatives between destinations that were once considered distant.[99] This further reduces unnecessary fuel usage and automobile congestion.[100]

Taxpayer Benefits

The dispersion of traffic between all available routes — neighborhood, collector, arterials, and highways—may make expensive capacity improvements to federal interstate corridors unnecessary. One study in the Journal of the American Planning Association found that improving local street networks helps reduce vehicle miles traveled and greenhouse gas emissions.[101] Increasing connectivity of the street network will help improve the efficiency of the transportation network, allowing limited federal funds to be prioritized for pressing transportation needs. Furthermore, with less local traffic on overburdened roadways, reduced wear and tear may prolong the life of many critical infrastructure links. The costs associated with maintaining roadways have grown considerably over the last few years and measures to extend their livespan may reduce the burden of public expenditure.[102]

Increasing congestion on major roadways can be offset by improved local roadway connections

99. Jennifer Dill. "Measuring Network Connectivity for Bicycling and Walking." Portland State University. Transportation Research Board Annual Meeting. 2004. http://www.enhancements.org/download/trb/trb2004/TRB2004-001550.pdf

100. Gil Tal et al. "Network Connectivity." University of California – Davis. May 10, 2010. http://www.des.ucdavis.edu/faculty/handy/TTP220/NETWORK_CONNECTIVITY_5_10.pdf

101. Reid Ewing and Cervero, Robert. "Travel and the Built Environment." Journal of the American Planning Association. May 11, 2010.

102. "Highway Construction Cost Increases and Competition Issues." U.S. Department of Transportation. June 11, 2009. http://www.fhwa.dot.gov/programadmin/contracts/price.cfm

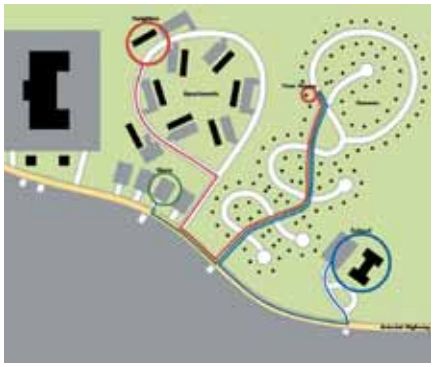
Case Study

Virginia's "SSAR" Requirements

Many governing bodies across the United States have encouraged the preservation of federal highway investments through state and local connectivity ordinances. Virginia adopted the "Secondary Street Acceptance Requirements" (SSAR), one of the nation's most comprehensive connectivity plans, in 2009 to help ensure that streets accepted for perpetual public maintenance provide adequate public benefit.[103]

Virginia is unique in that most of its roadways — both local and long-distance — are maintained by the Virginia Department of Transportation (VDOT). This includes roadways originally built by private developers that meet the state's "public benefit" requirements (street width, storm drainage guidelines, design standards, and pedestrian accommodations). On the contrary, most state DOTs only operate and maintain state designated roadways, not local, county and intermediate roadways as found in Virginia's transportation system. Citing the need for increased connectivity to reduce the burden on regional roadways, Virginia legislators unanimously passed legislation requiring the adoption of new standards for street connectivity.

As more fully described by the state legislation, all new development in Virginia must now meet minimum connectivity ratios to be accepted and maintained by VDOT. Finding that a "one size [requirement] does not fit all," the state developed tiered standards for connectivity. Streets in a development located within the state's "compact" areas—where the highest levels of development are planned to occur— requires a connectivity index (see cahrt on next page) of at least 1.6. Areas designated as "suburban" require a 1.4 connectivity index. Areas designated as "rural" have no such requirements. The new provisions also require stub outs, which are road segments that join the development's road network to surrounding development or undeveloped parcels abutting the property.



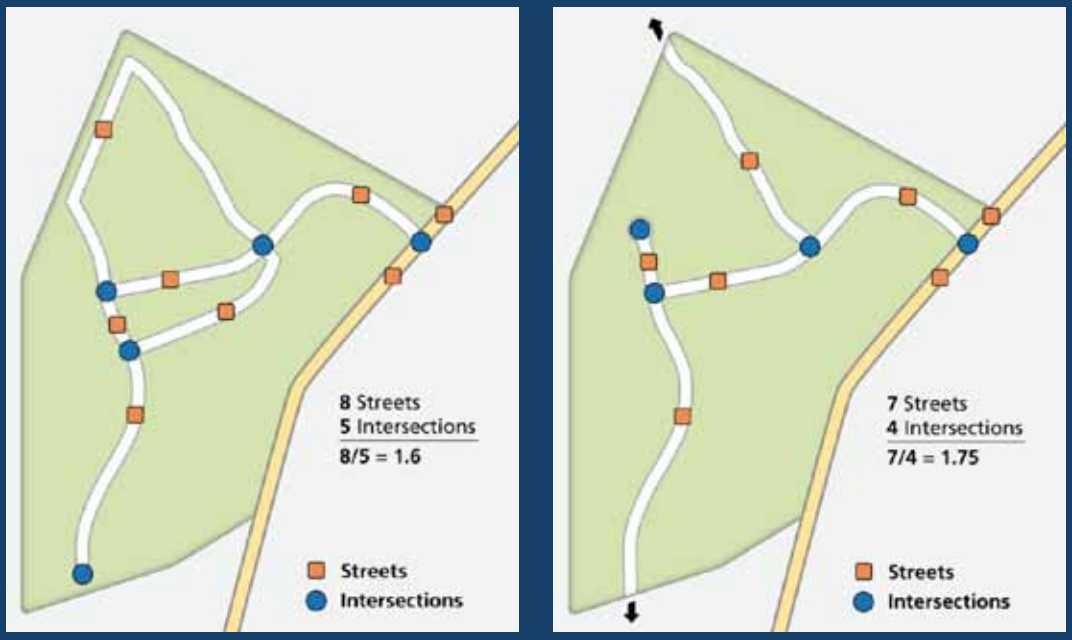
A limited number of connected streets force local drivers onto major roadways.

[103] "Secondary Street Acceptance Requirements." Virginia Department of Transportation. March 2009. http://virginiadot.org/projects/resources/SSAR_GuidanceDoc_4.3.09.pdf

To encourage local connectivity, VDOT assesses financial consequences if a local government approves a development that is not connected to an existing stub out. In these situations, VDOT will automatically add the missing connection as a "priority expenditure" from improvement funds for the locality's secondary highways plan, thereby reducing funding for other local priorities. This encourages local governments to require that the developer fund and construct a connection. VDOT maintains that providing these missing links is far more cost effective and sustainable than relying on costly highway capacity additions.

Localities across the nation – Cary, North Carolina; Franklin, Tennessee; Austin, Texas; and Portland, Oregon – have amended city ordinances with street connectivity requirements to reduce congestion and improve mobility. In addition, the state of Delaware has adopted standards similar to those in Virginia.

Communities measure connectivity through "Connectivity Index" calculations.[104,105]



$$\text{Connectivity Index} = \left[\frac{\text{\# of Street Segments}}{\text{\# of Intersections}}\right]$$

These calculations are typically based on the number of street segments (The street section between two intersections) divided by the number of intersections or terminuses in a proposed development's street plan. The index calculation produces a ratio indication either low or high connectivity. Ordinances requiring street connectivity usually set a minimum index ratio and require stub out streets for future connections. Providing access to abutting property, these stub outs serve existing, planned, or potential development. Connectivity is also encouraged by requiring multiple connections to frontage, collector, and local roadways. Localities may also vary connectivity requirements between different geographic areas based on populations or development density.

[104] Carlos A. Alba and Edward Beimborn "Analysis of the Effects of Local Street Connectivity on Arterial Traffic." Transportation Research Board Annual Meeting. 2005. www.uwm.edu/Dept/CUTS//lu/conn.pdf.

[105] See note 97.

[106] "Tool Name: Street Connectivity Planning and Ordinances." Lancaster County Planning Commission. February 9, 2010. http://www.co.lancaster.pa.us/toolbox/cwp/view.asp?a=3&Q=632579&PM=1

Conclusion

As traffic congestion has continued growing on the nation's highway system, federal investments in major corridors are at risk due to increased local traffic. Former and existing development practices have created disconnected street networks that which push local traffic onto overly burdened interstate highways and other federally financed corridors. Growing congestion is hindering our ability to facilitate interstate commerce and travel. Development guidelines that incorporate local street connectivity hold great potential for U.S. travelers and taxpayers in alleviating congestion and extending the efficiency of our federally-financed highway system. Local and state governments are actively promoting increased connectivity through ordinances and updated roadway regulations. By dispersing local traffic to more connected streets, states and regions will increase the efficiency of their transportation networks, lower maintenance costs and reduce the need to widen key long-distance corridors.

Graphic Citations

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p15 top: Creative Commons Flickr photo by user WSDOT http://www.flickr.com/photos/wsdot/4986563115/
p15 bottom: WikiMedia Commons photo http://commons.wikimedia.org/wiki/File:Electronic_Toll_Equipment_in_Ontario.jpg

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p22 Select Bus Service graphics from the New York City Department of Transportation
http://www.nyc.gov/html/brt/html/next/routes.shtml and http://www.nyc.gov/html/brt/html/current/routes.shtml

p23 Lane Transit District: http://www.ltd.org/search/showresult.html?versionthread=3b9be45d217346b9ee737fce42959970

p26 (top) WikiMedia Commons photos http://commons.wikimedia.org/wiki/File:Ramp_meter_from_Miller_Park_Way_to_I-94_east_in_Milwaukee.jpg (top) and http://commons.wikimedia.org/wiki/File:Traffic_Signal.jpg (bottom)

p27 WikiMedia Commons photo http://commons.wikimedia.org/wiki/File:Houstontranstar.jpg

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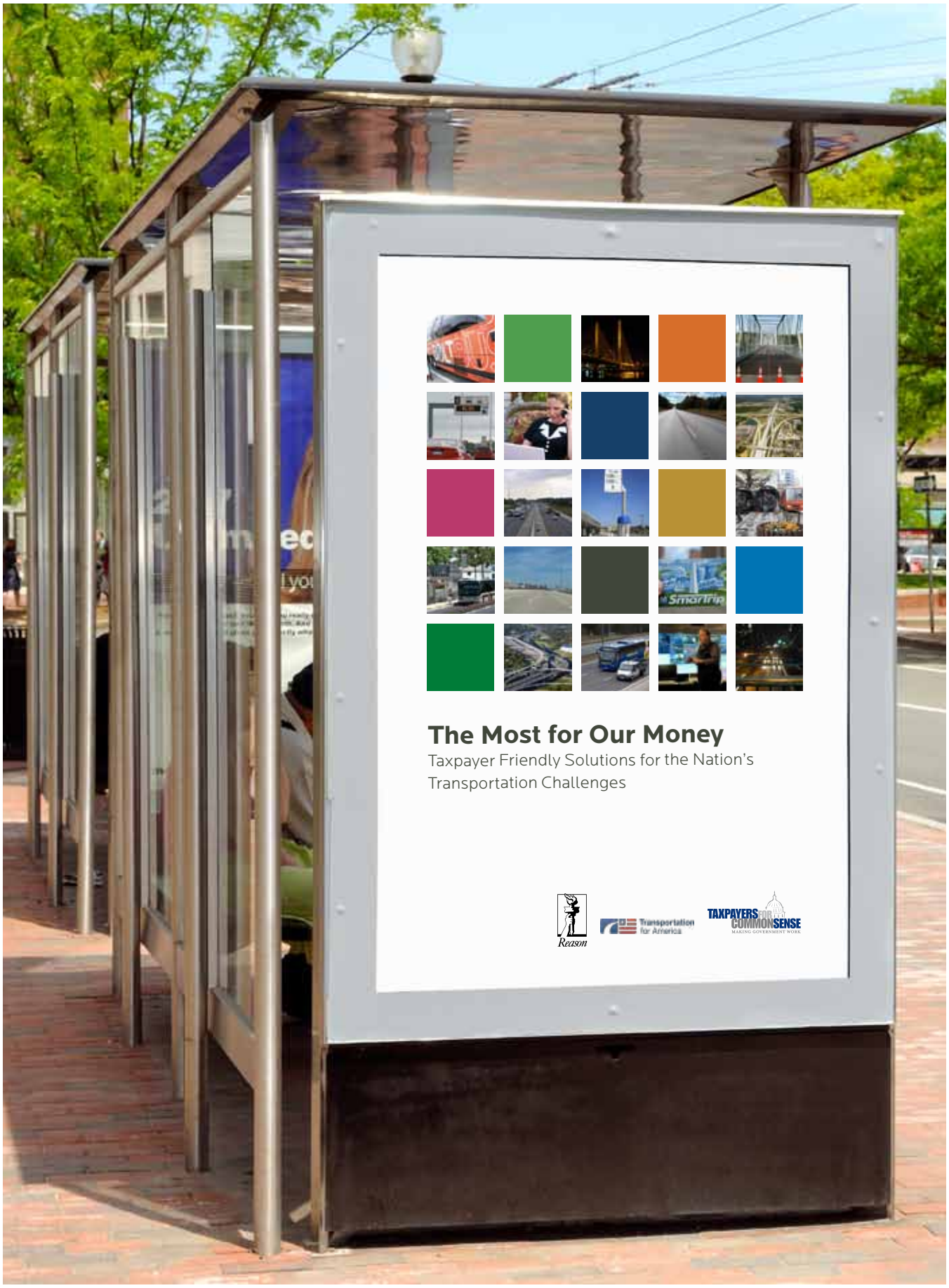
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