

ISSUE PAPER

Global Solutions for Transportation Efficiency

Introduction

Congestion is a severe problem that is only going to get worse in the coming years. The 2007 Urban Mobility Report, prepared by the Texas Transportation Institute, concludes that traffic congestion deprives the national economy of \$78 billion every year through 4.2 billion wasted hours and 2.9 billion gallons of fuel. Congestion lowers productivity, increases air pollution, and aggravates residents. With the nation's population expected to increase by around 150 million over the next fifty years and existing infrastructure vastly under-funded, local governments must experiment with transportation innovations being implemented around the globe.

This paper describes some of the solutions that municipal governments have enacted in order to solve their transit woes.

Mass Transit

When it comes to municipal transportation solutions, mass transit options are frequently the most visible. Large public transportation projects move people and goods cheaply and efficiently. Paradoxically, most of these systems are expensive and complicated. Each system must be carefully designed to fit the individual city's needs. This section focuses on unique approaches to bus and light rail systems.

Los Angeles, California: When an abandoned railroad line in the nearby San Fernando Valley was obtained by the Los Angeles Metro transit agency, a light rail system was deemed too economically and politically costly. Instead, the Metro system, previously comprised only of light rail, designed a Bus Rapid Transit (BRT) system which opened in October 2005. The Orange Line BRT acts as an extension of the area's Metro system, connecting the San Fernando Valley to the rail line (the Red Line) at the North Hollywood stop. The Orange Line features a two-lane, 14-mile dedicated busway with a stop approximately every mile. Buses are fueled by compressed natural gas and can accommodate 57 passengers. Riders waiting at stations are treated to real-time bus arrival updates. Many stations also feature bicycle lockers and free parking spots. "Loop detectors" have been installed at every stoplight to give Orange Line buses priority. Rubberized asphalt, sound walls, and special tailpipes were installed to minimize the noise impact to neighboring communities. The bus/light rail hybrid system has achieved increased ridership and satisfaction with a cost-efficient alternative. For more information, see the report at the bottom of the Transit Coalition's webpage at: http://thetransitcoalition.us/TTC_BRT_Orange.htm.

Santiago, Chile: *Transantiago*, the Chilean city's Integrated Public Transport System, experienced widespread problems after its implementation. Nonetheless, Santiago's experience is instructive.

This attempt to revamp the area's transportation was focused on integrating the various levels of public transportation: buses, subway, and taxis. However, the program was implemented before enough bus lanes had been constructed. Only a fraction of the prepaid fare card's charging stations were functional, bus routes were not linked to customer demand, and the bus fleet management center was shut down. Bus operator contracts did not allow for extra compensation based on passengers, and the fines for noncompliance were trivial, so it was not in the operators' best interests to pick up more people.

Santiago's citizenry was quite upset with the congestion that caused total traffic time to more than double. Subsequently, the transport minister in charge of overseeing the program has been replaced. Bus contracts have been renegotiated, allowing for more buses and better bus routes. More prepaid smart card stations are operational.

Nonetheless, troubles still remain, and it is now clear that *Transantiago* should not have been implemented until its basic infrastructure had been finished. See the World Resources Institute reports on *Transantiago* at:

http://embarq.wri.org/documentupload/Correa_Transantiago_short.pdf and
http://embarq.wri.org/documentupload/Willumsen_Transantiago_short.pdf.

Morgantown, West Virginia: The community of Morgantown, home to the West Virginia University (WVU) campus, is three decades ahead of the world when it comes to mass transit alternatives. Established in 1975, the personal rapid transit (PRT) system travels to five different stops across town and on the university's two campuses. Reminiscent of a monorail, the small cars on the PRT rail can only hold eight seated passengers. The system is powered by clean electric motors and the ride is smooth, averaging 14 miles per hour. At first, passengers were forced to stop at every station. The system has since been designed to allow for users to skip other stations and go directly to their final destination. Morgantown's PRT system is largely funded through student tuitions, so WVU students can simply swipe their student cards to activate the PRT car; others must pay a nominal fee of fifty cents. A detailed story on the West Virginia University PRT system is available at:
<http://www.progressiveengineer.com/PEWebBackissues2002/PEWeb%2024%20Mar%2002-2/PRT.htm>.

Heathrow Airport, London, England: Heathrow Airport is experimenting with the next generation of PRT technology. Tracks are currently being constructed to accommodate eighteen vehicles, each capable of seating four people. These electrically-powered vehicles are embedded with laser sensors and are about 50% more energy efficient than standard buses. The Heathrow Airport PRT is being billed as a "driverless taxi" that will shuttle passengers between the parking lot and a terminal. Authorities even claim that the PRT system allows for quicker, more flexible transportation than personal vehicles. The current model is slated to launch in 2009 in conjunction with the opening of the new airport terminal. If the trial run goes well, Heathrow Airport may expand its PRT system to every terminal. An article on these "driverless pods" is available at: http://news.bbc.co.uk/2/hi/uk_news/7148731.stm.

Traffic Flow

Stop signs, large intersections, and traffic lights can lend a sense of organization to a city grid, but they can also slow vehicles to a crawl. Traffic flow experts are currently using state-of-the-art technology to take full advantage of a city's infrastructure in order to fight congestion.

Portland, Oregon: In 2004, the city of Portland sought a method to decrease traffic, fuel consumption, and carbon emissions. Traffic engineers synchronized 135 intersections on just 16 streets within the city, resulting in more efficient traffic conditions. By coordinating the length of green lights with existing traffic flow, the city decreased the amount of time cars spend idling and accelerating. Signal timing is altered depending on the location and time in order to ease congestion. The goal is to allow cars moving at the right speed to be able to go from intersection to intersection without having to stop at a red light.

This process has resulted in an estimated savings of 1.75 million gallons of gas and 15,460 tons of carbon dioxide emissions each year. The project, with an initial funding of \$533,000, saves residents approximately \$4.13 million every year in gas money. Each intersection costs between \$1,000 and \$3,000 to be calibrated. Traffic light optimization cannot be performed as accurately if signal priority systems are in use for municipal vehicles and buses, so a certain amount of prioritization must take place. This example was featured as a New York City 2007 Climate Summit case study and is available at: http://www.nyclimatesummit.com/casestudies/transportation/trans_portland.html.

Bakersfield, California: One of several jurisdictions in California to experiment with bicycle "loop detectors," Bakersfield has installed the devices at intersections across the city. If a bicyclist pauses on top of the loop detector, the stoplight should turn green faster. Inductive loops, the latest version of these detectors, are more sensitive and are triggered by a break in the magnetic field. Road markings show where bicyclists must stop in order for the stoplight to react. A common problem is that signs or markings have been confusing or nonexistent. Bakersfield has advertised its bicycle detection program very well, including online directions aimed at bicyclists. It also has installed video detectors at some intersections. Signal priority is most commonly used today for emergency vehicles and buses. Based on local priorities, such technology may be applied to efforts to increase bicycle use. Bakersfield's online directions are available at: http://www.ci.bakersfield.ca.us/cityservices/pubwrks/trafficeng/pdf/bike_loop_info.pdf.

London, England: When Mayor Ken Livingston began moving towards a congestion pricing policy in London's downtown area, several interest groups arose in protest. Since the program's successful implementation, however, motorist groups, business interests, newspapers, and politicians have gradually come to support the idea. Congestion pricing has since expanded into the city's West End.

Cars entering the downtown area between 7 AM and 6:30 PM on weekdays must pay a toll of 8 Euros (approximately \$11.85). Drivers can pay at various retail outlets, payment machines, through the Internet, or by text messaging with their cell phone. Residents who live downtown receive a substantial discount, and motorcycles, alternative energy vehicles, licensed taxis, buses, emergency vehicles, and disabled drivers are all exempt. The city installed a network of video cameras with optical character recognition software to capture and record license plates in order to compare the plate numbers to the list of paid vehicles.

As a result of the program, peak period congestion has decreased by 30 percent while bus ridership has increased by 14 percent. Average traffic speeds in the area have increased between 8 and 13 miles per hour. The revenue from tolls and fees is reinvested in the city's infrastructure. Possibly most significant is the large degree of public satisfaction with the congestion pricing system. While many cities will not be able to enact such a policy (London's residents have a low rate of personal vehicle use), major cities dealing with severe downtown congestion now have an established program to follow. A report on the city's congestion pricing is available at: <http://www.vtpi.org/london.pdf>.

Stockholm, Sweden: Swedes are taking advantage of the high rate of cell phone use in their capital city by utilizing the latest mobile technology to make parking easier for residents. Drivers can now search for available parking spots using GPS technology on their cell phones. After parking, they call a number, enter in the parking meter's number, and are charged to their cell phone account. If the meter is in danger of expiring, the driver will get a warning via text message. This all-electronic method of parking also is simple for parking attendants, who simply need to wave a device to see if the parked car is logged in. Residents no longer need to worry about carrying around pocket change. For more information about this program, go to: <http://www.washingtonpost.com/wp-dyn/content/article/2008/02/02/AR2008020200043.html>.

Traffic Calming

Proponents of traffic calming have recommended a variety of counterintuitive policies: design streets to slow down cars in order to decrease commute time, replace stoplights with roundabouts to ease traffic flow, and remove traffic signs to increase safety. Yet multiple evaluations of traffic calming techniques have shown that the integrated traffic and increased confusion inherent in these strategies has resulted in lower accident rates and more continuous movement.

Chattanooga, Tennessee: Roundabouts have existed in various forms for centuries. Modern roundabouts, on the other hand, are a 20th century invention, and only came to the United States in 1990. Cities across America are now experimenting with modern roundabouts, replacing inefficient and dangerous intersections. Modern roundabouts ease traffic concerns by forcing a slow but continuous flow of vehicles. Two recent roundabouts in Chattanooga are expected to decrease congestion in the area by 35 percent. Entrances into the roundabouts are diverted to the right, forcing cars to slow down but allowing them to enter easily. Instead of stoplights, traffic must yield to those

vehicles already in the roundabout. The end result reduces idling and accelerating, improving gas mileage and easing congestion.

Roundabouts eliminate three particularly common and devastating forms of accidents: left-turn, right-angle, and head-on collisions. By traveling at lower speeds (typically 15 to 25 miles per hour) and approaching more cautiously, drivers are also acting safer. Despite the initial learning curve, roundabouts have been found to lower intersection accident rates by 80 percent. Additionally, roundabouts offer municipal governments a great opportunity to improve the aesthetics of their roads through landscaping. Many roundabouts are outfitted with fountains and parks in the center. Lastly, roundabouts can help relieve governments' budgetary issues since they are cheaper to build and maintain than traditional intersections with stoplights. The example from Chattanooga is detailed in this article at: <http://www.neel-schaffer.com/news.aspx?id=332>.

Drachten, Netherlands: The Dutch traffic engineer Hans Monderman pioneered the “shared space” model of integrating vehicle traffic, cyclist, and pedestrian movement. Therefore, it is not surprising that the Dutch city of Drachten is being hailed as an international model of innovative transportation. Twelve of the original fifteen stoplights were removed, streets and curbs were repaved, and roadside trees were installed.

One busy intersection in particular is being examined. Nicknamed the “Laweiplein,” the four-way intersection was transformed into a square with a roundabout. The stoplights were removed and cyclists and pedestrians were given priority over motorists. Sidewalks were lowered and paved to create one seamless surface at the square. Water fountains, the height of whose water jets correspond to the number of cars in the intersection, were designed to calm motorists and improve the square's decor. Traffic moving through the intersection flows slowly but continuously; one study found that 81 percent of motorists and 97 percent of cyclists were able to move through the roundabout without having to stop. Traffic flow increased while simultaneously cutting accident rates in half. An article highlighting the city's success in restructuring its streets is available at: <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2006/11/04/ntraffic04.xml>, while a study on the Laweiplein is available at: http://www.hamilton-baillie.co.uk/papers/Lawe_plein.pdf.

West Palm Beach, Florida: Although city thoroughfares can transport a large number of motorized traffic, they typically cut through valuable real estate and discourage foot traffic vital to local businesses. West Palm Beach has transformed several major streets into narrow two-way roads without lane dividers. This tactic has diminished both the speed of traffic and the number of accidents. By extending sidewalks into the street, planners slow down vehicles while giving the pedestrian more authority. Along with improving transportation, shared space tactics in West Palm Beach have increased development by attracting businesses to areas where more foot traffic is present. With a new city center created and two thoroughfares successfully remodeled, Clematis Street has seen its property rates more than double. Shops and restaurants are flocking to this downtown neighborhood now. A history of the shared space movement is available at: <http://www.wired.com/wired/archive/12.12/traffic.html>.

Vehicle Sharing

Several cities have attempted to enact vehicle sharing programs. Unfortunately, in many cases theft and vandalism have plagued these concepts. Yet recent technological and design innovations are allowing local governments to establish vehicle renting programs that take cars off the road, help the environment, and complement existing mass transit options.

La Rochelle, France: This French port city has had a car sharing agreement in place since 1999. The *Liselec* initiative placed fifty electric vehicles at seven stations around the city. Stations were chosen based on the amount of traffic to the destination. The service costs 5.50 Euros a month, and users can choose between a flat rate and a combined hourly/mileage rate. Residents do not have to worry about gas or parking fees when they drive their *Liselec* vehicle, making the program more cost-effective for many citizens. La Rochelle's program is detailed at: <http://www.tve.org/ho/doc.cfm?aid=745>.

Philadelphia, Pennsylvania: Faced with a budget crisis, Philadelphia revolutionized its passenger vehicle fleet system. Teaming up with PhillyCarShare, a local nonprofit, the city replaced 330 vehicles with hybrid cars, available to the community after regular work hours. Philadelphia was able to cut maintenance, fuel, and parking costs while taking existing cars off the roads and providing a valuable service for its residents. In addition to the initial money retrieved from car auctions, the city claims to save approximately \$1.7 million per year. Philadelphia's program was so successful that other American cities, notably Berkeley, California, Portland, Oregon, and Wilmington, Delaware, have followed suit. This example was drawn from Harvard University's annual list of Innovations in American Government Awards at: <http://www.innovations.harvard.edu/awards.html?id=15709>.

Paris, France: Although the citywide bicycle-renting program, *Velib'*, has only been in existence since the summer of 2007, it is already inspiring similar efforts elsewhere in Europe and in the United States. The Paris program initially placed 10,600 bikes at 750 stations across the city; by 2008 those numbers had nearly doubled. Passes are available for purchase at the bike stations and require a credit or debit card with an initial deposit to insure against theft. After acquiring a pass, users can rent out a bicycle for up to thirty minutes without being charged. Bicycles can be returned to any station in town. *Velib'* is fully funded by an outdoor advertising company in exchange for exclusive rights to the city's billboards; rental income goes to the city. The program receives high satisfaction grades from both tourists and residents, and has been a crucial step in easing the city's congestion problems. Detailed information on the program is available at: http://www.nytimes.com/2007/07/16/world/europe/16paris.html?_r=2&oref=slogin&oref=slogin.

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