Feeling the Pain:

The Impact of Traffic Congestion on Commuters

Executive Summary

Janet Caldow

Institute for Electronic Government, IBM Corporation

May 30, 2008

This page is intentionally blank.

In the green spirit, print double sided on recycled paper.

Foreword

Consider what commuting would be like if nearly half of the other drivers on the road during the morning or evening rush hours were stressed, angry, or sleep deprived – or all three? What if the mere chore of getting to work every day negatively affected the productivity of twenty-five percent of your employees? For many cities in the U.S. and abroad, this is a daily reality. Coupled with rising gas prices and the urgency to reduce greenhouse gasses, traffic congestion is an international nightmare. Governments are frustrated with disappointing and inadequate efforts to remediate congestion. And, commuters are fed up.

This paper summarizes survey results from over four thousand drivers in ten major U.S. cities. Although there are many well-documented congestion studies using government statistics and sophisticated data estimation techniques, few explore the issues from the perspective of the commuter. As a result, IBM's Institute for Electronic Government commissioned the study in an effort to better understand the effects of traffic congestion from the perspective of U.S. commuters.

Perhaps Christopher Elliott in his December 7, 2007, article for Frommers.com, Gridlock Alert: The 5 U.S. Cities with the Worst Traffic, sums it up best: "There's no major U.S. city where traffic can be described as good. There are only varying degrees of bad."

The causes of burgeoning traffic congestion are many and complex. Transportation experts agree there is no one solution. Building more roads is not enough. More ridesharing is not enough. More public transit is not enough. More people working at home is not enough. All of this needs to be done…and much more.

To alleviate the congestion crisis, the answer is actually a compendium of solutions – a comprehensive portfolio of traditional methods coupled with new innovations and political will. On the innovations forefront are "intelligent transportation" capabilities. Collecting data from cameras, sensors, and optical scanners and linking to other information from disparate databases (speed, volume, license plates, incidents, weather, financial, emissions, etc.) produce a variety of new capabilities impossible only a few years ago. These include computerized freeway ramp metering, automated tolling, better traffic signal coordination, predictive traffic modeling, congestion charging, route planning, and real-time monitoring that boost traditional congestion management methods. On the political forefront governments are taking a fresh look at traffic-related policies to balance driving privileges with pursuit of the public good. Businesses are expanding workplace policies that offer employees greater flexibility and remote-work options.

Finally, many thanks to all the commuters who took time to share their pain. Your voices have been heard. Findings from the survey will be used by IBM scientists to better understand citizen concerns toward traffic and commuter issues as they research and deploy innovative approaches to traffic mitigation.

Janet Caldow

"The only way to solve the traffic problems of the country is to pass a law that only paid-for cars are allowed to use the highways. That would make traffic so scarce, we could use our boulevards for children's playgrounds."

Will Rogers

Only a few million cars were on the road at the time of Will Rogers' death in 1935, yet traffic was a problem even then. Today, for nearly 200 million Americans, traffic congestion is an overwhelming, mind-numbing, daily burden. According to the Texas Transportation Institute's 2007 Urban Mobility Report, congestion caused urban Americans to travel 4.2 billion hours more and to purchase an extra 2.9 billion gallons of fuel for a congestion cost of $78 billion. This is an increase of 220 million hours, 140 million gallons and $5 billion from 2004.

Although there are many well-documented traffic studies using government statistics and sophisticated data estimation techniques, few explore the issues from the perspective of the commuter. Therefore, in an effort to better understand consumer thinking toward traffic congestion, IBM conducted a survey of drivers in ten major U.S. cities during May, 2008. Random samples of interviewees were selected from Atlanta, Boston, Chicago, Dallas-Forth Worth, Los Angeles, Miami-Ft Lauderdale, Minneapolis-St Paul, New York, San Francisco-Oakland-San Jose, and Washington, DC. There were 4,091 participants – at least 400 in each area. The results have a five-point margin of error when comparing cities.

IBM scientists and services professionals are actively working in the area of 'intelligent' transportation management to research, test and deploy new traffic information management capabilities in cities such as Brisbane, London, Singapore, and Stockholm. The survey findings are intended to broaden awareness of commuter thinking on traffic congestion, as well as help IBM scientists as they develop and deploy new approaches to traffic mitigation like automated tolling, real-time traffic prediction, congestion charging, and intelligent route planning.

A woman sat on the edge of an Interstate-95 bridge in Fredericksburg, Virginia, contemplating suicide. For 90 minutes a police officer on the scene tried to persuade her away from the edge. During that time at least a dozen drivers angry about the 10-mile traffic backup, yelled at her to jump as they drove across the bridge. She did. (The Free Lance-Star, Kari Pugh, April 27, 2002.)

Research Findings

Feeling the Pain

Some study results are startling. The deeply personal human toll, caused by continuous exposure to unrelenting traffic congestion on a daily basis, is unmistakable. These include increased stress, sleep deprivation, reduced work performance, and diminished family time.

- 45% of all drivers surveyed report traffic congestion increases their stress levels. In Dallas, Los Angeles and Miami, 50% are stressed by driving.
- 28% of respondents report feelings of increased anger (a high of 36% in Los Angeles)
- 19% report that traffic challenges negatively affect work or school performance (a high of 27% in Los Angeles)
- 12% reported getting less sleep due to travel time (a high of 18% in Los Angeles).

The majority of commuters indicate congestion is worse than three years ago. Sixty-three percent think roadway traffic has worsened in the last three years; and, 24% think it is much worse. In Los Angeles and Atlanta, 70% of drivers say traffic is worse than three years ago. Fifty-two percent of Boston respondents say traffic is worse. Despite using different data collection and data estimation techniques, the Texas Transportation Institute arrived at the same conclusion in their 2007 Urban Mobility Report— that congestion is getting worse in regions of all sizes. In our study, only Miami and Minneapolis respondents (15% each) say traffic is better now than three years ago.

The National Highway Traffic Safety Administration estimates that drowsy drivers cause 100,000 police-reported crashes each year. The Sleep Foundation found drowsy drivers are equivalent to drinkers with blood-alcohol concentrations of 0.08 percent. It is illegal in all 50 states to drive with a blood alcohol level of .08 or higher.

Twenty-seven percent of drivers surveyed report that traffic has been so bad within the last three years that they turned around and went home. This percentage is higher in Miami (33%) and in Los Angeles (32%). Thirty-five percent of drivers report they decided not to make a driving trip in the last month due to anticipated traffic. Forty-six percent report this in Los Angeles.

When asked how they would spend time if commuting time could be reduced, drivers responded as follows:

- 43% would spend more time with family/friends
- 34% would have more time for recreation
- 31% would exercise
- 31% say they would get more sleep

When asked what would help improve traffic congestion:

- 30% said the option to work from home. (42% of workers report that they can work from home one or more days per week. Only 4% work at home on a daily basis.) This idea is particularly appealing in Atlanta (37%) and Dallas (35%), but less so in Miami (22%)
- 30% think improved public transportation would help (especially in Miami)
- 23% think accurate and timely road condition information would help (again, particularly in Miami, 31%).

Gas Prices

At the time of the study, the national average price for regular unleaded gasoline was nearly $3.67 per gallon. Participants were given a range of gas prices and asked at what price per gallon would they seriously consider other commuting options:

Price per Gallon	Percent Who Would Make Changes	Cumulative
$3.50	9%	9%
$4.00	22%	31%
$4.50	15%	46%
$5.00	20%	66%

According to these responses, 9% are already making changes. If gas prices reach $5.00 per gallon, as many predict, 66% plan to make changes in commuting habits. Looking for new alternatives to driving is occurring fastest in Atlanta, Minneapolis and Dallas, and slowest in San Francisco.

Travel Habits

Driving is by far the predominant way Americans get to work. Sixty-eight percent of drivers in this study drive to work or school …alone. The percentage is particularly high in the Dallas-Forth Worth area (76%), and lower in New York (59%) and San Francisco (60%). All other forms of transportation were reported in single-digit percentages. Four percent of drivers report working from home full time.

For trips other than to work or school, 91% of drivers in the study say driving is their main mode of transportation. The variance between cities is no more than 10%, with New York at 85% and both Atlanta and Minneapolis at 95%.

The two most frequently cited commuter frustrations are start-stop traffic (37% agree) and aggressive/rude drivers (24% agree). Only 15% think there is nothing frustrating about the commuting experience. Start-stop traffic is especially poor in Los Angeles (44% agree), Atlanta (43% agree) and Miami (42% agree). Thirty-five percent of Miami drivers report aggressive drivers as an annoyance, whereas that score is only 18% in New York. AutoVantage reports a similar finding in their 2008 Road Rage Survey. According to that report, the least courteous city in the country for driving is Miami. The report states, "It is the third consecutive year that Miami takes the crown as road rage capital of America."

Behaviors by other drivers that trigger stress and can lead to road rage, include talking on cell phones, driving too fast, tailgating, eating or drinking while driving, cutting over without notice, slamming on breaks or running red lights. As a reaction to bad driving by others, people surveyed admitted that they honk their horn at the offending driver (43%), curse at the other driver (36%), wave their fist or arms (11%), make an obscene gesture (9%), report the driver to police (8%), or slam into the car in front of them (1%). In the Drivers' Seat, 2008 AutoVantage Road Rage Survey

Commute Time & Cost

Drivers indicate a typical one-way commute is 16.7 miles or 32 minutes. The longest commutes are reported in Atlanta (19 miles, 35 minutes). The shortest commutes were in Miami (14.7 miles, 30 minutes) and Minneapolis (15.2 miles, 28 minutes).

Most (66%) morning commuting occurs in three hours between 6:00 a.m. and 9:00 a.m. The majority (51%) of the evening commute is compressed within two hours, between 4:00 p.m. and 6:00 p.m. The hourly breakdown is as follows:

Morning Commute	Percent Traveling each Hour
6 a.m. – 7 a.m.	19%
7 a.m. – 8 a.m.	29%
8 a.m. – 9 a.m.	18%
Total	66%

Evening Commute	Percent Traveling each Hour
4 p.m. – 5 p.m.	23%
5 p.m. – 6 p.m.	28%
Total	51%

The same general hourly pattern in the morning commute is observed in all areas studied, except in San Francisco where the volume during each hour varies little (21-25%) and in New York where traffic increases each hour from 16% to 25% to 28%, respectively. During the evening commute, the volume of traffic during the period 5:00 p.m. to 6:00 p.m. is higher than the volume between 4:00 p.m. and 5:00 p.m. in every city, except in Minneapolis and in Boston where it is about the same each hour. The opportunity here is greater attention to flex-time, especially to alleviate the evening commute.

In the early 1930s Gottlieb Daimler predicted the maximum number of cars in Europe would be around 5000, due to a shortage of chauffeurs. Today, the total number of vehicles on roads worldwide is estimated at 600 million. Some predict the number will grow to over one billion by 2030.

Almost 90% of respondents have been stuck in traffic in the last three years with an average delay of one hour. Both Los Angeles and Washington, DC, have higher average delays (75 minutes or more). The only average delay under one hour was reported for Minneapolis with a 53-minute average delay.

Drivers' perceived value of time wasted commuting is significant. More than 75% of respondents say that every 15 minutes they could save $10 to $20 – a minimum of $40/hour. The average for all ten areas is $73.22 per hour (more than $78 per hour in Los Angeles and Atlanta).

Worst Roads

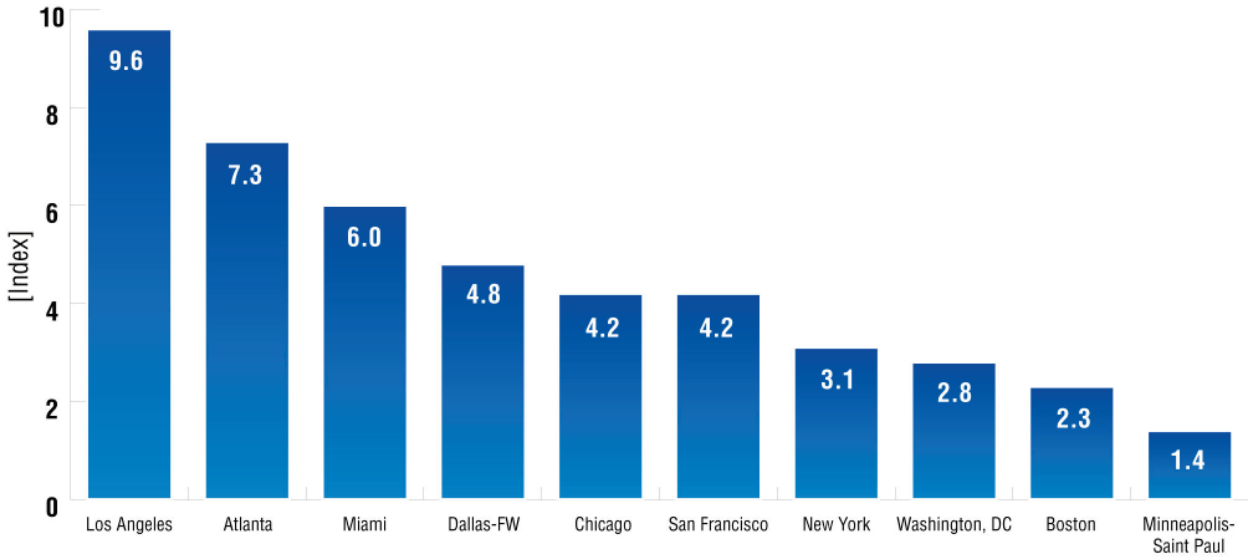
Respondents were asked to report the worst roads for traffic in their areas. The list by city includes significant mentions of the following roads:

City	Worst Roads
Atlanta	I-85, I-75, I-285 (especially where these roads intersect); GA-400, "Downtown"
Boston	I-93, I-28, Route 9, "Downtown"
Dallas	I-20, I-30, 820, "Downtown"
Los Angeles	Ventura Freeway, I-405, San Diego Freeway, I-10, Pacific Coast Highway, Routes 110, 5 and 60
Miami	I-95, 826 turnpike, US-1, Kendall Drive, Palmetto Expressway
Minneapolis	35W, "Downtown"
New York	"Midtown," I-95, Route 80, Garden State Parkway, Route 78, Route 1, Long Island Expressway, GW Bridge
San Francisco	Route 101, Bay Bridge, Route 880
Washington, DC	I-95, Beltway, 270, 495

Commuter Pain Index

The Commuter Pain Index is derived from the survey scores for each city on ten key issues. Scores significantly above or below average are weighted. The average score for each city is converted to a ten point scale.

Commuter Pain Index



The index is comprised of 10 issues: 1) Commuting time; 2) time stuck in traffic, 3) value of time; agreement that 4) traffic has gotten worse, 5) start-stop traffic is a problem, 6) driving causes stress, 7) driving causes anger, 8) traffic affects work; 9) traffic so bad driving stopped, and 10) decided not to make trip due to traffic.

Conclusions & Recommendations: Where do we go from here?

Traffic congestion has reached crisis proportions nationwide. There is no end in sight to rising gas prices. Auto emissions carry enormous environmental and public health implications. Driving is unpleasant, if not downright dangerous, on roads choked with cars driven by frustrated, tired, and angry commuters.

As the Texas Transportation Institute concluded in its 2007 report, the causes of burgeoning traffic congestion are many and complex. As such, there is no one solution. Simply building more roads is not enough. More carpooling, ridesharing and vanpooling is not enough. More public transportation is not enough. More people working at home is not enough. All of this needs to be done…and much more. To alleviate the congestion crisis, the answer is actually a compendium of solutions – a comprehensive portfolio of traditional methods coupled with new innovations and political will.

Governments are beginning to augment traditional traffic management remedies with "intelligent transportation" solutions. Intelligent transportation technologies that can get at the core of transportation operations management are coming to the forefront. For example, data collected from cameras, sensors, and optical scanners can be linked to disparate databases that include information about speed, traffic volume, license plates, incidents, weather, financial, or emissions. New combinations of information produce a variety of new capabilities impossible only a few years ago. These include computerized freeway ramp metering, automated tolling, better traffic signal coordination, predictive traffic modeling, congestion charging, route planning, and real-time monitoring. All leverage traditional congestion management methods to a higher level.

On the political forefront, governments are taking a fresh look at traffic-related policies to balance driving privileges with protection of the public good – the congestion effects on air pollution/greenhouse gases, public health, and the quality of life. One might argue that good roads are among citizens 'rights' – i.e., the responsibility of their governments to build and maintain transportation infrastructure. However, a driver's license is a privilege. Graduated driver's licenses for young drivers have already proven their merits. These permits are valid only for certain times, on certain roads, and carry passenger restrictions. The same concept may be extended to commuters through travel time restrictions, cap and trade driving privileges, or congestion charging options for traveling during peak traffic periods. Sustainable land-use planning and zoning for mixed-use and transit-oriented developments can help minimize car travel, energy consumption, and pollution.

Congestion and resulting emissions are not just the government's problem. Businesses have much to contribute and gain by expanding workplace policies that offer employees greater workday flexibility and work-at-home options. Intelligent fleet management principles including better route planning, off-peak freight movement, alternative fuel vehicles, and hybrid vehicles are among many strategies that can help. And, commuters carry their share of responsibility for change. The survey results are encouraging in that many are already exhibiting willingness to change their own driving patterns.

> ***"One lesson from more than 20 years of mobility studies is that congestion relief is not just a matter of highway and transit agencies building big projects."***
> ***2007 Urban Mobility Report, Texas Transportation Institute.***

Taken together, traditional and emerging solutions, coupled with policy changes, can create a diversified and powerful portfolio approach that will have an enormous impact in reducing congestion. It will take the active commitment of all the stakeholders – governments, businesses, and commuters – to make it happen.

Then again, we could always try Will Rogers' suggestion.

1301 K Strret, NW, 4th Floor, West Tower
Washington, DC 20005
202-218-3940

08-0227