Growth or Gridlock?

The Economic Case for Traffic Relief and Transit Improvement for a Greater New York

December 2006

Partnership for New York City

Partnership for New York City

With a mission to maintain the city's position as a global center of commerce and innovation, the Partnership for New York City is an organization of the leaders of New York City's top corporate, investment, and entrepreneurial firms. They work in partnership with city and state government officials, labor groups, and the nonprofit sector to enhance the economy and culture of the city. The Partnership focuses on research, policy formulation, and issue advocacy at the city, state, and federal levels by leveraging its network of CEO partners. Through its affiliate, the New York City Investment Fund, the Partnership directly invests in economic development projects in all five boroughs of the city.

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Executive Summary

On its current course, New York City is forecast to add a million more residents and 750,000 new jobs over the next 25 years. During the same period, Manhattan-bound traffic is projected to increase by at least 20 percent, which would bring the city and the Metro Region to a standstill.

With the release of this report, the Partnership for New York City begins to identify the destructive effects that traffic congestion has on the economy of the city and the region. Research and analysis conducted for this report have generated new evidence that traffic congestion can no longer be dismissed as an inconvenience. Nor is it solely a threat to public health and the environment. Traffic has become a significant drag on the city and regional economy, prompting the business community to take up the issue.

Looking at just a limited set of costs and industry sectors and using very conservative assumptions, economists assisting the Partnership in the preparation of this report were able to identify more than $13 billion in annual costs to businesses and consumers, billions in lost economic output and tens of thousands of lost jobs that result from severely overcrowded conditions on the region's streets and highways. Every year, these losses will grow if something is not done to reduce the number of vehicles moving through the region during peak periods.

As the city's business leadership organization, the Partnership's primary mission is to promote a robust economy that places New York at the forefront among world cities. In recent years, business leaders have become increasingly concerned about traffic congestion in the Manhattan Central Business Districts and the region. Complaints range from the growing length of employee commutes to the unreliability of deliveries and costly delays in work-related travel. In response to these concerns, the Partnership enlisted a team of private sector experts to explore the economic consequences of traffic congestion and the possible remedies that might provide needed relief. The work of HDR Decision Economics and the PB Consult unit of Parsons Brinckerhoff have been central to this report.

The most important conclusion of the Partnership's research is that the level of traffic in the city and much of the Metro Region has crossed the dividing line that separates economically efficient traffic

flow from destructive, **excess** congestion. As a result, virtually every business and industry sector in all five boroughs and across the Metro Region is suffering losses because of congestion.

Left unchecked, excess congestion and its consequences will stunt the region's capacity for sustained growth and innovation in the years ahead.

The Partnership has not yet taken a position on how to solve the congestion problem. Rather, this report seeks to make the case for the city to obtain federal aid for a comprehensive feasibility study of congestion-relief strategies, focusing on best practices around the world. The cost of doing nothing about the traffic congestion problem is simply too great.

Here, in brief, are some of the main findings of this report.

- The primary generator of congestion in the five boroughs and across the region is the 8.5 square miles of Manhattan between 60th Street and the Battery, where the Midtown and Downtown Central Business Districts (CBDs) are the main force in a $901 billion regional economy. Communities across the city and the region suffer from through traffic that is moving toward or away from this super-charged center of commerce, tourism and dense residential activity.
- Every weekday, 3.6 million people travel into Manhattan south of 60th Street, a third of them in vehicles. Only half—or 1.8 million—are commuters going to work.
- Although government is making improvements in mass transit, traffic management and parking regulation, excess congestion continues to grow. The historic response to heavy traffic—building new highways and road capacity—is not an option any longer, since there is simply not room for the tri-state region to build its way out of the problem.
- The costs of congestion are not only borne by motorists and commercial vehicles stuck in traffic, but also affect the cost of doing business and the cost of living in the entire region. For example: traffic delays add to logistical, inventory and personnel costs that annually amount to an estimated $1.9 billion in additional costs of doing business and $4.6 billion in unrealized business revenue.
- Delays endured by commuters, workers and other travelers annually cost some $5 billion to $6.5 billion in

lost time and productivity and an estimated $2 billion in wasted fuel and other vehicle operating costs.

- There is a net loss in regional economic output of at least $3.2 billion to $4 billion annually due to excess congestion, with the greatest losses concentrated in Manhattan, New Jersey and Long Island.
- Combined business costs, lost revenues and lost productivity mean that there are 37,000 to 52,000 fewer jobs created in the Metro Region every year.
- The costs of congestion are distributed across many sectors of the economy, but the effects are most clearly felt in sectors such as manufacturing, wholesale trade, and construction—which pass them on to other businesses and consumers.
- Key sectors of the regional economy, especially financial and professional services, suffer losses in productivity due to congestion that are only hinted at in this report. Further study is required to understand the full impact on sectors that place the highest values on mobility and access to clients.

The Partnership's conclusion is that New York City and the entire Metro Region need to move quickly to plan a comprehensive program of traffic relief and congestion management. This may or may not include the controversial option of user fees or congestion charges, but all possible solutions need to be considered.

This report touches on what some world cities, including New York, are already doing to mitigate the problem. Unfortunately, the complexity of the problem and its potential solutions are daunting and will require a significant effort to sort out. The Federal Department of Transportation is currently offering funding to cities that agree to take this problem seriously and work toward solutions.

Traffic is worse every day. The time to act is now.

Introduction & Overview

Busy streets are a measure of urban health, but only up to a point. Over the past decade, the streets, highways, tunnels and bridges of New York City and the surrounding Metropolitan Region have become increasingly clogged with traffic.

The report that follows validates what most people have figured out for themselves: our Metro Region has passed the tipping point. Congested traffic conditions are resulting in the loss of business and jobs. The road network cannot accommodate the cars, trucks and buses that need to use it and the regional public transit and commuter rail system cannot provide everyone with a reasonable alternative to car travel. As a result, traffic congestion has become a real threat to future economic growth.

In recent years, the Partnership for New York City has listened to growing complaints about traffic congestion from its members, who represent the city's leading businesses and largest employers. Intuitively, they understand that being stuck in traffic translates into higher costs of doing business and disruption of reliable flows of commerce. Most importantly, traffic delays translate into loss of worker productivity which has been New York City's biggest competitive advantage in the global economy.

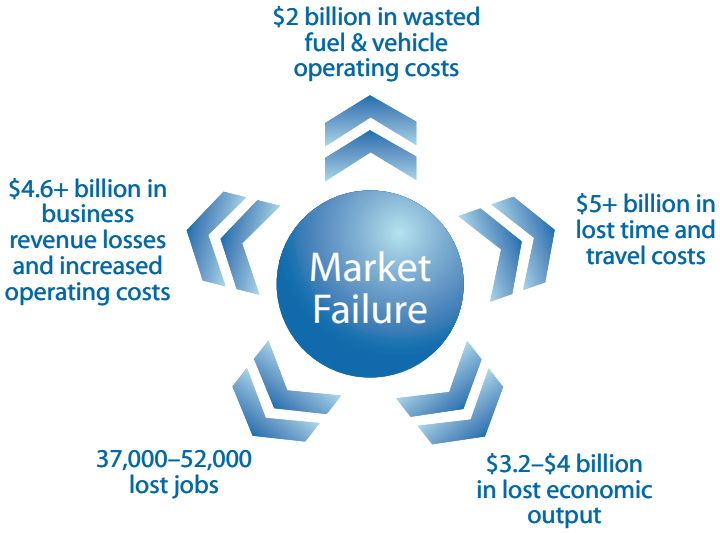
Two years ago, the Partnership began to look for authoritative research on the economic impacts of congestion, hoping to better understand the problem and its possible solutions. There is much data on the negative consequences that traffic congestion has for public health, the environment, and for the quality of life in affected locations. However, little has been documented about impacts on business and the economy. This led to the formation of a working group of experts and the commissioning of several studies to better understand both the congestion problem and possible solutions. Results of this investigation are summarized in this report.

Original research by HDR Decision Economics (HDR), the PB Consult Unit of Parsons Brinckerhoff (PB Consult), and others who are noted in the acknowledgements, generated new information about traffic and its impacts on the regional economy. Most notable is HDR's finding that **48 percent** of the delay New Yorkers experience in traffic is caused by wasteful or "excess congestion"—a level of congestion

that hurts the economy, costs jobs and wastes productive time of individuals.

The annual cost of this excess congestion to the regional economy is huge, even using the most conservative assumptions: at least $5 billion worth of lost time and productivity, $2 billion in wasted fuel and vehicle operating costs, at least $4.6 billion in lost business revenue and increased operating costs, and as many as 50,000 lost jobs.

The Cost of Doing Nothing



SOURCE: Partnership for New York City

The congestion price tag for Metro New York is judged to be higher than any other major metropolitan region in America, largely because time, talent and real estate in New York command a premium. New York City's economy is dominated by headquarters operations that generate constant travel demands. Its high real estate values make delays that affect inventory storage costs particularly expensive. Its key industries are financial services, professional services and media—all sectors where mobility is prized and employee compensation is high. Finally, in the absence of a freight rail system, New York is particularly dependent on trucks for delivery of goods and services. Its retail and manufacturing sectors, service fleets and wholesale trade operations all experience increased costs because of traffic delay and unreliability, and these costs are passed along to customers.

The primary generator of congestion in the five boroughs and across the region are the 8.5 square miles of Manhattan between 60th Street

and the Battery—the Midtown and Downtown Central Business Districts (CBDs), which are the central force in a $901 billion[1] regional economy. However, virtually every community of the region suffers from through traffic that is moving toward or away from this super-charged center of commerce, tourism and dense residential activity. Every weekday, 3.6 million people travel into Manhattan south of 60th Street, a third of them in vehicles.[2] Only half—or 1.8 million—are commuters going to work. This influx is in addition to the 600,000 residents who live in the CBDs.

The current public transit system is not sufficient, in terms of capacity, quality or accessibility, to accommodate the needs of a growing region. Although New York boasts one of the world's best mass transit systems, carrying a third of the nation's daily commuters, almost a million people still drive into Manhattan every day. Of all vehicles entering the CBDs, 40 percent have single occupants. And this number continues to grow. Many of the people who currently drive to Manhattan have no practical option. A comprehensive planning and capital investment program is necessary to identify gaps in current transit service and to design reasonable options.

Trucks are responsible for only 8 percent of the daily travel within the Manhattan CBDs, with about 44,000 trucks representing just 5.4 percent of the 810,000 vehicles that enter the CBDs on weekdays. But they are a major contributor to the traffic problem. Lacking any rail freight system, New York City is entirely dependent on trucks and pretty much at the mercy of their routes and schedules. Limitations on the schedule or number of truck trips (aside from those that are simply driving through the CBDs on the way to other destinations) would have serious negative consequences for the regional economy, since virtually every business that operates in or services the Manhattan CBDs has logistics and inventory issues that require "just in time" performance.

The historic response to traffic problems has been to add highway and road capacity. This is not an option here, since there is simply not room for the Metro Region to build its way out of the problem. Although government has introduced improvements in mass transit, traffic management and parking regulation, congestion keeps getting worse. The costs of excess congestion are not only borne by motorists

1 For the gross product of the NJTPA-NYMTC region, we used as a close proxy the gross regional product for the New York-Northern New Jersey-Long Island Metropolitan Statistical area, which was $901 billion in 2005; see Global Insight, "The Role of Metro Areas in the U.S. Economy," prepared for the United States Conference of Mayors, 2006 (http://www.usmayors.org/74thWinterMeeting/metroeconreport_January2006.pdf).

2 New York Metropolitan Transportation Council 2003 Hub Bound Report. "Vehicles" includes cars, vans, trucks and taxis.

and commercial vehicles stuck in traffic, but also affect the cost of doing business and quality of life in the entire region.

While current traffic conditions are extremely congested, the future looks worse. Population and employment forecasts show robust growth for the region. New York City has had eight consecutive quarters of economic growth, reaching a record Gross City Product of $467 billion. The city is expected to add 750,000 jobs over the next 25 years, a 21 percent increase over the current job base of 3.6 million.[3] The city's current population of 8.2 million is forecast to reach 9.2 million over the same period, representing growth of almost 12 percent.[4]

With a million more people and nearly a million more jobs, more traffic will attempt to reach the CBDs. Since the construction of New York's first modern expressway in the 1920s, average weekday travel into Manhattan south of 60th Street has increased by an average of 7,700 vehicles per year. Based on historical average annual growth rates, the weekday number of vehicles entering Manhattan south of 60th Street could reach more than 1 million by 2030.[5]

Job-growth forecasts are unlikely to be realized, however, if New Yorkers allow congestion to increase. The region could forfeit a substantial share of projected growth if excess congestion is not brought under control.

New York City's subway system has not been significantly expanded since the 1940s. A number of transit projects—for example, the planned Trans-Hudson Express commuter rail tunnel and the No. 7 subway line extension to the Far West Side—are expected to ultimately help reduce traffic, but are many years from completion. Expanded ferry service will help, but only at the margins. The most immediate source of relief—expanded bus services—is caught in a "Catch 22" situation, since people will only move from cars to buses when the buses are speedy and reliable. That scenario is impossible with heavily congested conditions.

Non-compliance with federal environmental law, particularly with air quality standards, could also slow or limit New York City's growth. Tailpipe emissions, magnified when vehicles idle in traffic, are a major source of the compliance problem. Counties all across the region are out of compliance in addition to New York City, including Orange,

3 New York City Economic Development Corporation.
4 New York City Department of City Planning.
5 New York Metropolitan Transportation Council 2003 Hub Bound Report. Since the 1920s, the average annual growth rate for vehicles entering the Hub has been over 7,700. At this rate, by 2030, the number of vehicles entering the Hub will be over 1 million.

Westchester, Rockland, Nassau, and Suffolk.[6] Manhattan-bound traffic through these areas is a significant contributor to the region's non-attainment of air quality standards for ozone and particulates.

The purpose of this report is to inform the public about the economic consequences of traffic congestion and to encourage government agencies and elected officials in the tri-state region to support a comprehensive feasibility study of congestion-relief strategies that would remedy these conditions. The U.S. Department of Transportation has funded such studies in other jurisdictions and would likely do the same in New York. The Partnership hopes that this report, while not advocating any particular solution, will provide some powerful evidence supporting the need to take immediate and meaningful action to design, finance and implement an integrated congestion relief and transit improvement strategy that will ensure that it is *Growth, not Gridlock* that characterizes the future of the New York Metro Region.

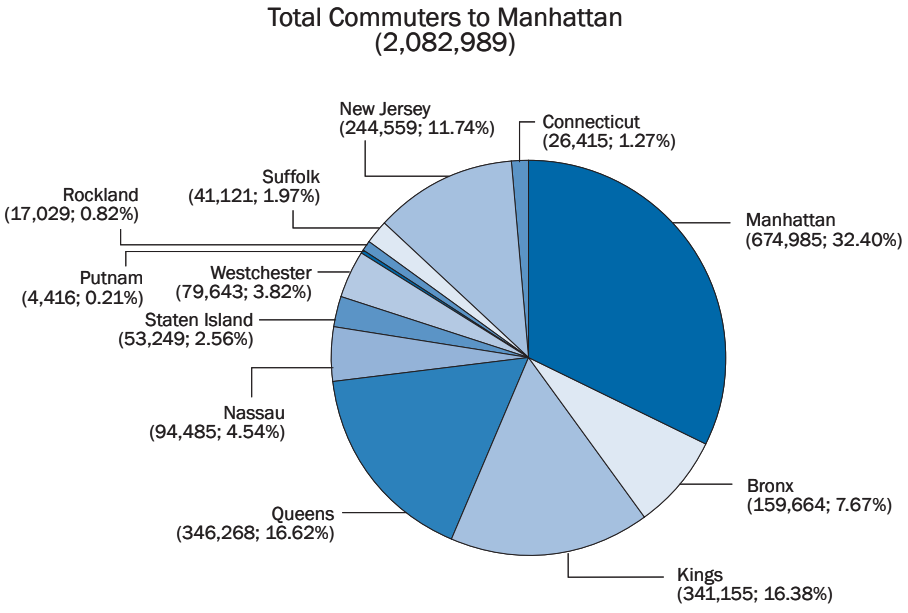
6 Environmental Protection Agency, http://www.epa.gov/air/oaqps/greenbk/qncs.html#NEW%20YORK

Traffic Congestion in the Metro Region: Causes and Consequences

By any measure, traffic delays across the Metro Region are reaching levels that make it one of the most congested of the world's urban centers. Manhattan's CBDs are the economic hub of the region and the overwhelming source of its traffic problem. Each weekday, nearly 3.6 million people enter the Manhattan CBDs south of 60th Street.[7] The majority of these people (67 percent) take mass transit, but fully a third come by vehicle. Vehicles bound for the CBDs generate traffic congestion across a 28-county region.

Midtown and Lower Manhattan contain more than one-third of the office jobs in the entire region. The majority of workers in the CBDs (1.2 million out of 1.8 million) commute from outside their boundaries.

Commuting Patterns to Manhattan



SOURCE: "Urban Transport Fact Book," www.publicpurpose.com (Wendell Cox Consultancy); based on 2000 Census data commuting by county of residence

7 New York Metropolitan Transportation Council Hub Table 1A, pg 1-6; transit: commuter rail, subway, bus, ferry tram; vehicles: cars, taxis, trucks, and vans; New York County is the only county in the United States that has more jobs (2.1 million) than it has residents (1.6 million residents). http://quickfacts.census.gov/qfd/states/36/36061.html

The city's 44.4 million annual tourists are among the 1.8 million non-commuters who enter the CBDs every day, along with students and other city residents who come to shop, visit hospitals and cultural institutions, hotels, entertainment venues and restaurants. The patronage of these discretionary visitors is essential to the healthy diversification and growth of the regional economy.

In contrast to locations with "rush hour" traffic problems, the peak period traffic conditions in and around Manhattan last 12–14 hours each weekday and are characterized by severe congestion, despite the large share of people who use transit, walk or bike. The vast majority of Manhattan vehicle traffic in a 24-hour period is composed of cars. Of the 3.2 million miles driven each day in the CBDs, 2.9 million, or 90 percent, are driven in cars and taxis. Almost 40 percent of the vehicles that enter the CBDs are single occupancy vehicles.[8]

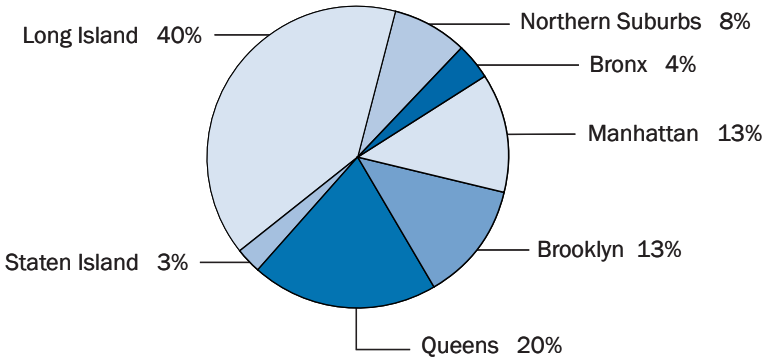
Trucks travel about 268,000 miles daily within the CBDs—on average comprising only 8 percent of total daily vehicle miles traveled in the area. Truck travel is heaviest in the morning period, accounting for 15 percent of the vehicle miles traveled; tapering down to 5 percent after 8 p.m. The number of trucks entering Manhattan's core (60th Street to the Battery) in 2005 totaled 5,497,590, according to the New York Metropolitan Transportation Council (NYMTC) toll data for the Brooklyn Battery, Holland, Lincoln and Queens-Midtown tunnels, or about 44,000 every weekday.

Every large metropolitan area in the United States is required under federal law to develop and implement plans to manage congestion. In New York, this is handled by NYMTC. Its *Congestion Management System 2005 Status Report* (which only tracks weekday activity on the arterials, including highways, interstates, and major roadways) estimates **1.122 million** annual vehicle-hours of delay in the region. This is only **recurring** delay—not the congestion created by traffic accidents, weather and special events. If non-recurring delay were accounted for, total hours of delay would be at least twice this number.

The NYMTC report translated vehicle-hours of delay to person-hours using vehicle occupancy data. The distribution of these person-hour delays is shown below. Automobile users on Long Island, which includes Nassau and Suffolk counties, are affected the most by delay—40 percent of the region's total.

8 PB Consult data; New York Metropolitan Transportation Council Hub Bound 2003 Travel Report, Table 16 and 17.

Person-Hours of Delay As Distributed Across the Metro Region



SOURCE: HDR Decision Economics, 2006

The average number of hours lost to delay (PHD or Person Hours of Delay) each day across the city was almost 900,000 hours. Queens led the city with almost 337,000 PHD, followed by Brooklyn with almost 225,000 PHD. Staten Island loses about 53,000 hours to delay each day.

In addition to volume, traffic speeds are another indicator of congestion. The NYMTC report found that during the morning commute, Manhattan has a Travel Time Index score of 1.54, meaning that travel times take 54 percent longer than they would during free-flow periods. Therefore, a route through Manhattan that would normally take 30 minutes actually takes about 46 minutes. During the evening commute, Queens has a score of 1.75. Therefore, a trip through Queens that would normally take 30 minutes actually takes 53 minutes.

New York City's Congestion Performance Measures (2005)

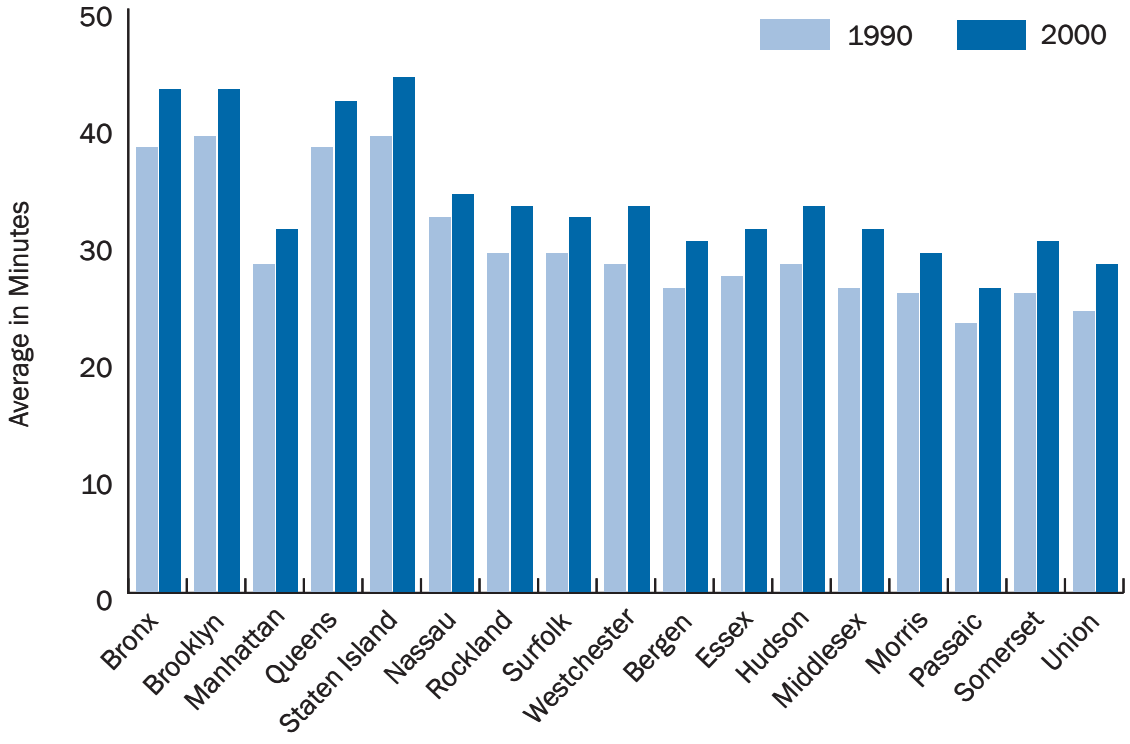
	Travel Time Index		
COUNTY	AM	PM	DAILY PHD
New York	1.54	1.48	212,949
Queens	1.47	1.75	336,811
Bronx	1.21	1.41	68,806
Brooklyn	1.38	1.68	224,838
Staten Island	1.43	1.52	52,618

SOURCE: New York Metropolitan Transportation Council Congestion Management System

In a ranking of large cities, drivers and transit riders in New York also had the nation's highest average commute times across all types of travel at 39.1 minutes.[9] In addition, a report issued by the Census Bureau in 2005 found that of the 231 counties in the United States with populations of 250,000 or more, the four counties with the longest average commute times in the country were all in New York City: Queens, Staten Island, the Bronx and Brooklyn.[10]

These commute times in New York City have increased over the past decade, as have those of other counties in the region. Looking at the average commute time across the region, commuters—both drivers and public transit riders—from points in the region and other parts of the city, have been forced to spend a greater share of their time getting to and from work over the last decade. This is contributing to the erosion of New York's competitive advantage—moving people swiftly and conveniently into, around and out of the city.

Average Commute Time Across Metro Region, 1990–2000



SOURCE: U.S. Census Bureau; Port Authority of NY & NJ. At Capacity: The Need for More Rail Access to the Manhattan CBDs. Scanlon and Seeley.

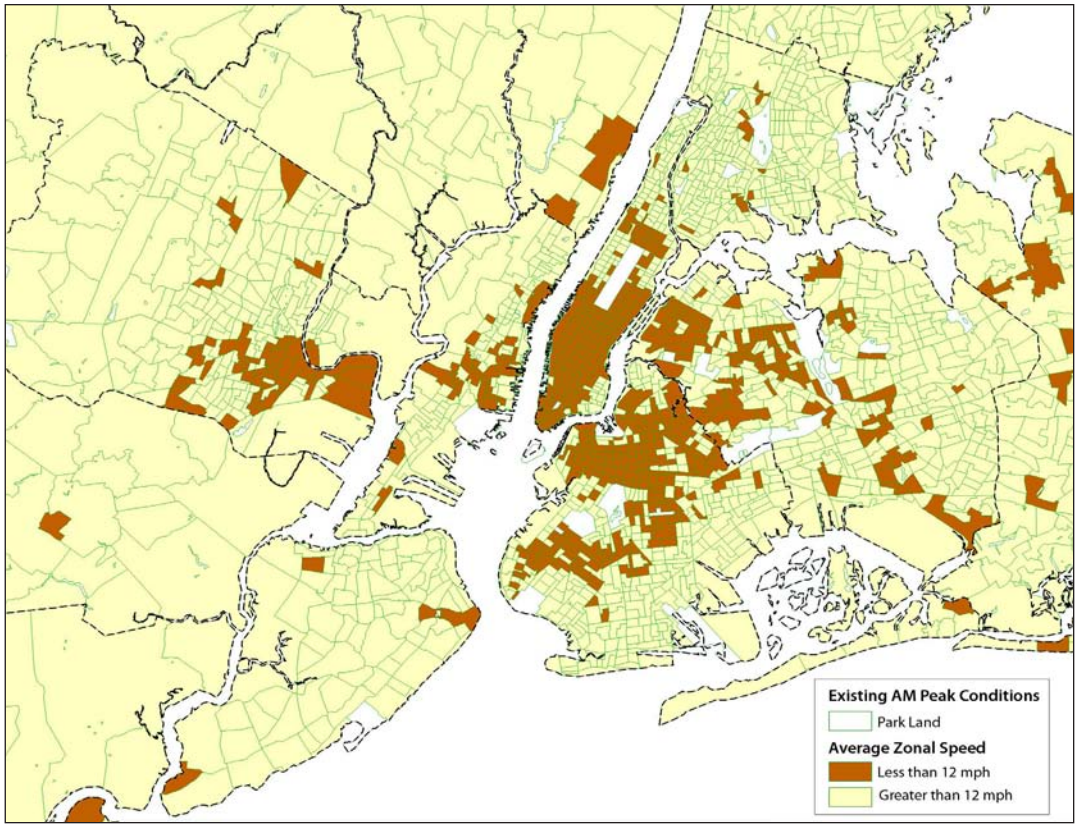
9 Census Bureau, American Community Survey.

10 Census Bureau, "Americans spend more than 100 hours commuting work each year," March 30, 2005.

While travel to and from the Manhattan CBDs is the primary source of congestion, the problem is felt across the region, as illustrated by the map below. All the areas shown in orange have average travel speeds below 12 mph during the peak morning commute time, 6 a.m. to 10 a.m.

Each person traveling in a vehicle during rush hour throughout the year in the Metro Region experienced 49 hours of congestion, according to a 2005 report by the Texas Transportation Institute (TTI), which tracks congestion in metropolitan regions around the nation. TTI also estimated the amount of fuel wasted idling in traffic in 2003 at 200 million gallons. When contrasted to free-flow traffic conditions, TTI judged the cost of congestion in the Metro Region at $7 billion."[11]

Average Morning Peak Commute Travel Speeds Under 12 mph



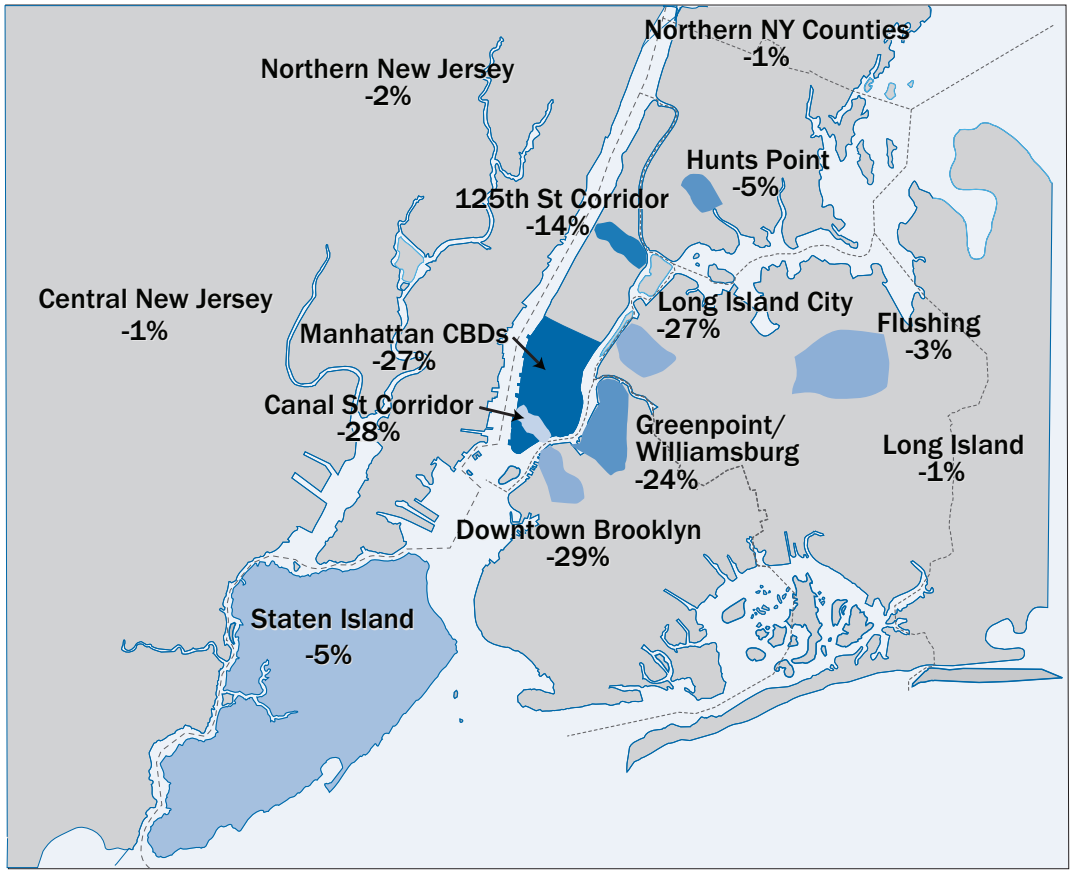
SOURCE: PB Consult

11 Shrank and Lomax, "The 2005 Urban Mobility Report," Texas Transportation Institute, May 2005.

One important observation made by the Partnership consultant teams is how the reduction in the number of vehicles traveling into the Manhattan CBDs during weekdays would have huge benefits for elimination of traffic congestion in the rest of the five boroughs and even across the Metro Region. The strongest positive effects—traffic reduction and improvements in speed—would occur in downtown Brooklyn, Long Island City, around the Williamsburg Bridge, 125th Street and the South Bronx. All these areas and facilities currently have a high level of congestion caused primarily by through traffic to Manhattan that is also overlapped with the intensive local traffic.

To demonstrate the extent to which traffic destined for Manhattan causes congestion in surrounding communities, PB Consult modeled the impact of a 15 percent reduction in vehicle trips traveled into the Manhattan CBDs. As illustrated below, eliminating Manhattan-bound traffic provides dramatic congestion relief to many other communities.

Reduction In Vehicle Hours Traveled



SOURCE: PB Consult

Excess Congestion: When Gridlock Trumps Growth

Transportation experts have accounted for the cost of congestion in terms of wasted fuel, delays in the surface transit system, consequences of air pollution and lost travel time for car commuters sitting in traffic. What has not been quantified up to now is the impact of traffic congestion on the economy as a whole and on various industry sectors.

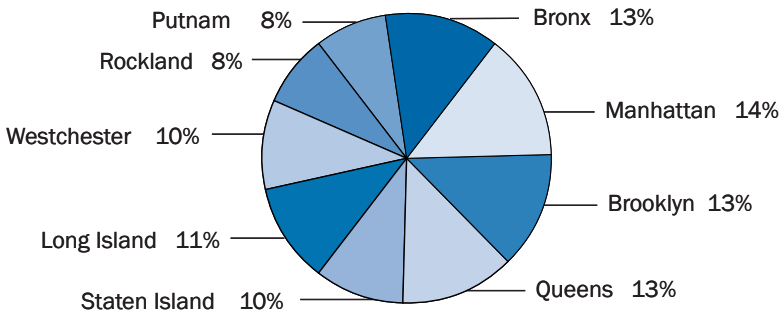
To understand the economic impact of congestion, economists begin with an assessment of the *economically efficient* use of the roadways. This is very different from the approach used by transportation engineers concerned about roadway capacity—and different from the way most people think about congestion (usually, people feel no congestion is best).

The economic impacts identified in this report are based on calculations of the costs of *excess congestion*—that is, congestion beyond the point that is economically efficient. Excess congestion is traffic that costs more in losses to the economy than the benefits provided by accommodating additional shoppers, truckers, commuters, tourists, etc., on crowded roads. In theory, excess congestion happens because road users do not account for the delay that their presence on the road causes other motorists. If each driver took into account his or her own contribution to making the roads congested, economists argue, a city would achieve *economically efficient* congestion.

Economists assume that some level of congestion is a good thing—high demand for roadway space is an indicator of a healthy economy. A full elimination of all congestion is not optimal or desirable. Excess congestion is the amount of traffic that actually damages the economy, as opposed to traffic that represents a healthy economy efficiently using roadway capacity.

The following chart shows how the impact of excess congestion is dispersed within the New York State counties in the Metro Region, based on the percentage of total vehicle hours of delay caused by excess congestion. It demonstrates that economic losses are widespread, making a solution to regional congestion a compelling problem for citizens, businesses and taxpayers well beyond the most congested streets of Manhattan.

The Distribution of Excess Congestion Across the New York Counties



SOURCE: HDR Decision Economics, 2006

This report looks at three basic ways in which excess congestion affects the economy of the Metro Region. While there are some overlapping factors, the combination of these three categories represent a cumulative impact that clearly reaches some $10 billion to $15 billion a year that has not previously been considered in calculating the total cost of congestion. In contrast to transportation estimates, these losses are not based on abstract conditions of the "free-flow" of traffic, but on an increment of heavy traffic that cannot be sustained without damage to the economy.

In order to determine how much of the total congestion in the Metro Region is excess or unhealthy congestion, HDR undertook a three-part analysis. First, they compared hours of travel under free-flow conditions against the hours of travel under actual conditions, using NYMTC's data on average vehicle speeds by county for the relevant times of day. The difference between the two estimates of travel time is equal to the amount of total congestion in the region, an estimated 1,122,000 vehicle hours of delay per day.

HDR then estimated, using a simulation model, what the economically efficient level of congestion is in the Metro Region: 589,000 vehicle hours of delay per day. The simulation model included assumptions regarding elasticity of demand, cost of travel per vehicle mile, and the impact on speed of a change in a road's volume-to-capacity ratio.

The difference between total congestion and the economically efficient level of congestion results in 533,000 vehicle hours per day of delay due to excess congestion. HDR concludes that excess or unhealthy congestion represents 48 percent of the total congestion in the Metro Region.

Based on models developed by HDR and PB Consult, this report presents a range of cost estimates for the economic impact of excess congestion in each of the three categories:

1: **Delay to commuters, workers and other travelers** resulting in annual costs to the regional economy of:

- $5.0 billion–$6.5 billion in lost time and productivity
- Up to $2 billion in wasted fuel and other vehicle operating costs

2: **Increase in the costs of doing business for different industry sectors within the Metro Region**, resulting in annual losses to the economy amounting to:

- $1.9 billion in increased industry operating costs
- $4.6 billion in lost business revenue

3: **Contraction in the size of the regional economy due to costs of congestion**, resulting in:

- $3.2 billion–$4.0 billion in lower Gross Regional Product and Income
- 37,000–52,000 fewer jobs created in the Metro Region every year

The lower end of these estimated impacts is based on a generally accepted standard for the value of time in transportation analyses. The higher end reflects the adjustment of that standard to reflect relatively higher costs in the New York Metro Region, as explained later in this report.

The Costs of Lost Time and Travel

This section of the report provides details on how delay due to excess congestion translates economic losses and additional costs to businesses and individuals, such as lost time during travel to and from work, costs of on-the-job travel, and costs of vehicle operations. These numbers apply to car and truck travel only, and do not include bus commuters—which would significantly increase the projected losses in productivity of employees.

To measure the cost of excess congestion as it relates to all weekday travel, this report accepts $23 per vehicle hour as the baseline value of time used in NYMTC's *Congestion Management 2005 Status Report*. However, this number does not fully reflect the high costs of labor, real estate and transportation in the New York Metro Region. As a result, the conclusions on costs of excess congestion are presented as a range, with lower estimates using the baseline $23 value of time and higher figures calculated on the baseline figure plus 30 percent, or $30 per vehicle hour.

Factors considered in reaching this 30 percent increment include:

- Evidence that reliability and predictability have a particularly high value for major sectors of the Metro Region economy, including financial and professional services, when confronted by very heavy traffic congestion conditions.
- Non-recurring delays, such as traffic incidents, bad weather, road construction, and special events, are responsible for an estimated two-thirds of much of New York's excess congestion and are not accounted for in the $23 figure.[12]
- NYMTC followed the New York State Department of Transportation (NYSDOT) approach, which values freight and transit at $39 per truck-hour. On the other hand, a study by HDR indicated that carriers on average value savings in transit time at $144–$192 per hour.

12 A Texas Transportation Institute study found that in the New York region, roughly two-thirds of total congestion was due to non-recurring delays. Shrank and Lomax, The Urban Mobility Report, pg. 20.

Out of 1,122,000 total vehicle hours of delay, excess congestion accounts for an estimated:

- 533,000 hours per day, or **48 percent** of all total congestion delay in the Metro Region; and,
- Reduction of average vehicle speed of 11 percent.[13]

By multiplying $23 per vehicle hour by the annual hours of delay (533,000 x 260 workdays) the excess congestion in the New York counties within the Metro Region has an estimated annual cost of **$3.2 billion**.

In order to achieve figures that measure congestion in the entire Metro Region, the 13-member counties of the North Jersey Transportation Planning Authority (NJTPA) were added to the analysis.[14]

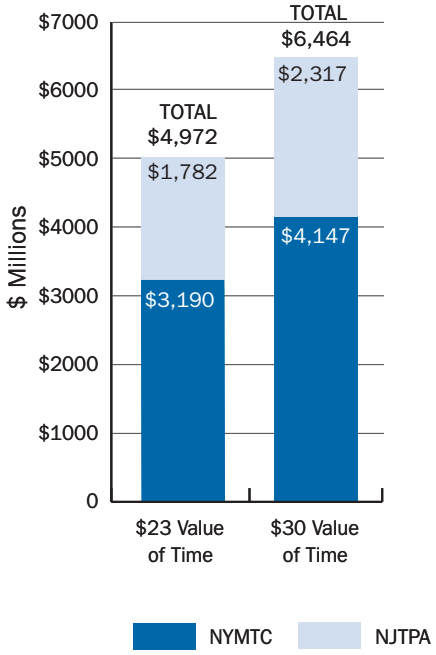
The New Jersey counties in the Metro Region are estimated to lose 77 million hours per year due to excess congestion and experience a 13 percent reduction in vehicle speed. Applying the same $23 per vehicle-hour used for the NYMTC estimates, excess congestion within the NJTPA region increases the cost of road travel by **$1.8 billion** annually.

Added together, the annual cost of excess congestion in the Metro Region is at least $5 billion, based on the $23 value of time. Using the more realistic value of time for the Metro Region of $30 per vehicle-hour, this report concludes that the annual cost of excess congestion for travel is actually closer to **$6.5 billion**.

13 If one looks only at the morning peak period (6 a.m.-10 a.m.), excess congestion reduces speeds by 13 percent rather than the 11 percent reduction that applies for the entire day. Assumptions about commuter time in this report are based on the morning peak period speeds.

14 The 13 NJ counties were grouped into 3 sub-regions based on differing levels of congestion. These sub-regions were then matched with a NYMTC county according to 1) similar transit share of commuting trips and 2) roadway volume to capacity ratio. An assumption was made that excess congestion reduces vehicle speed by the same percentage in the NJ county as in the matched NYMTC county.

Total Travel Costs of Excess Congestion



SOURCE: HDR Decision Economics, 2006

Car Commuter Travel Costs

As a subset of total travel, commuter travel data can be used to estimate the part of excess congestion that is caused by people traveling to and from work.

Data on commuting patterns comes from the 2000 Population Census, which collected data on journeys to work. Each working member of a household answered questions about the usual place of work for the main job, the principal mode of transportation to that job, and the average trip time.

The following table shows regional commuting patterns by place of employment of car commuters and the average time of car commutes. The table indicates the following:

- Almost two-thirds of all workers in the region commute to their jobs by car.
- The various public transit shares are high by national standards—most obviously for Manhattan with its 70 percent transit share.
- Manhattan also claims the longest average length of car commute at more than 50 minutes compared to the region's average of 26 minutes.
- Taxis (not shown in the table) account for 10 percent of car trips in Manhattan—far more than other counties. Taxis are included in the estimate of the impact of excess congestion provided in subsequent sections.

Commuting Patterns in the Metro Region, 2000[15]

	EMPLOYMENT		MODE SHARE			AVERAGE JOURNEY TIME
Place of Employment	# of Workers	% of Workers	Car	Transit	Other	Car
Bronx	271,360	3.4%	51.9%	32.0%	16.1%	31.8
Manhattan	2,030,355	25.8%	18.6%	70.2%	11.2%	50.4
Brooklyn	639,755	8.1%	44.9%	37.9%	17.1%	34.7
Queens	596,550	7.6%	59.5%	27.5%	13.0%	31.5
Staten Island	111,815	1.4%	72.5%	18.3%	9.2%	24.9
Nassau	515,755	6.6%	86.5%	5.6%	7.9%	26.8
Suffolk	559,165	7.1%	91.7%	2.0%	6.3%	23.1
Inner NJ	1,622,375	20.6%	84.3%	7.3%	8.4%	19.6
Outer NJ	790,295	10.0%	90.8%	2.0%	7.2%	26.7
Rural NJ	229,696	2.9%	91.5%	0.6%	8.9%	21.9
Westchester	386,450	4.9%	81.7%	8.3%	10.0%	27.7
Rockland	91,275	1.2%	86.0%	3.2%	10.8%	21.8
Putnam	20,700	0.3%	86.6%	1.3%	12.1%	22.3
NJTPA-NYMTC Regions	**7,865,546**	**100.0%**	**64.8%**	**27.4%**	**7.8%**	**26.5**

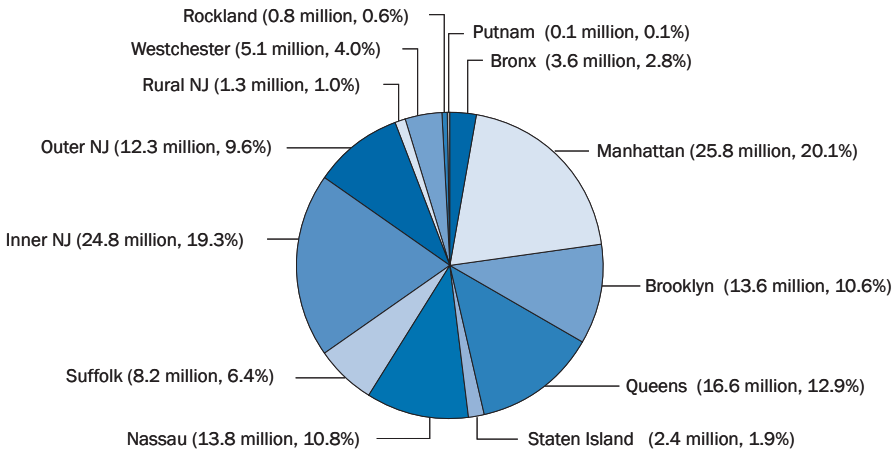
SOURCE: HDR Decision Economics, 2006

15 Two types of place-of-residence counties were excluded: those representing the bottom 5 percent of place-of-residence for all commuters, and counties outside the scope of the NYMTC report. Taxi trips, though not shown, are counted and treated as car trips and are used in the impact calculations for Manhattan. They are not part of "Other" which includes people working at home, commuting by motorcycle, non-motorized modes, etc.

Combined results of speed reductions and the Census data of commuting patterns shown in the above table estimate how many hours lost while commuting are attributable to excess congestion.

Results are shown in chart below.[16] The region's total hours lost to excess congestion is 128.5 million hours annually.

Car Commuting Hours Lost to Excess Congestion: Travel to Jobs in the Metro Region



SOURCE: HDR Decision Economics, 2006

Due to the fact that commuting trips often have multiple occupants and commuting time is valued less than business-related travel time, a lower value of travel time estimate of **$15.81 per person-hour** is used to calculate the cost of commuting time.[17]

Additionally, the varying annual earnings of residents in the region's counties suggested that commuters' value of time would also vary proportionally. A value of time for each of the counties can be calculated by applying the ratio "average county earnings to average region earnings" to the $15.81 value of time.

Therefore, this analysis does not simply assume a single value of time estimate for all car commuters, but accounts for varying earning levels in valuing commuters' time. For example, the imputed value of time per hour for each county hovered closely around the $15.81 per hour

16 For commuters traveling within a single county to work, the speed reduction estimate for that county was used in the calculation. For commuters crossing county lines, the smaller of the two estimates from adjacent counties was used. For commuters crossing two or more counties or arriving from outside the study region, generally the smaller of any given estimates were used or applied to counties outside the region.

17 This figure is borrowed from the PB Consult work used elsewhere in this report.

value of time; however, Manhattan's value of time is an outlier at 150 percent of the $15.81 value ($23.75 per hour).

By multiplying the value of time for a given county by the hours lost for the same county, a full set of results is available for how excess congestion affects the cost of commuting.

As shown below, excess congestion added at least $2.2 billion in 2005 to the region's total cost of car commuting. The cost figure is also presented as a cost per car commuter and cost per all commuters (all workers).

The highest costs per commuter are in Queens and Nassau counties at just over $400, while Manhattan's cost per commuter is about $300. Only 19 percent of Manhattan's commuters use a car or taxi, compared to a car mode share of 65 percent for the region. This suggests that Manhattan employers are somewhat more adversely affected by car commuting problems than employers elsewhere in the region.

Manhattan's cost per car commuter is almost four times higher than the region's (**$1,621 vs. $429**). This is due to Manhattan-based workers' higher values of time, longer commutes and travel through highly congested areas to get to work. Taxis also have a unique impact on commuter costs in Manhattan: taxi commutes, though usually short,

Impacts of Excess Congestion on the Total Costs of Car Commuting

Place of Employment	$ Million	Percent	$/Car-Commuter	$/Commuter
Bronx	$54	2.5%	$382	$198
Manhattan	$613	28.2%	$1,621	$302
Brooklyn	$199	9.2%	$693	$311
Queens	$243	11.2%	$683	$407
Staten Island	$33	1.5%	$402	$291
Nassau	$211	9.7%	$473	$409
Suffolk	$113	5.2%	$221	$202
Inner NJt	$393	18.1%	$258	$242
Outer NJ	$196	9.0%	$273	$248
Rural NJ	$16	0.7%	$69	$75
Westchester	$88	4.1%	$279	$228
Rockland	$12	0.5%	$149	$128
Putnam	$1	0.1%	$78	$68
NJTPA-NYMTC Regions	**$2,170**	**100.0%**	**$429**	**$276**

SOURCE: HDR Decision Economics, 2006

are 18 percent more costly than car commutes. This is due to taxi commuters' very high value of time and the predominance of trips in Manhattan's severe congestion.

Work-Related Travel Costs

It is important to distinguish on-the-job, work-related travel from commuter travel in order to learn how excess congestion affects costs to employers and self-employed workers. Work-related travel costs have a direct impact on job creation and bottom line revenues.

An example with particular resonance for this region is work-related travel to the airports:

> For corporate headquarters, which are still found more in the New York area than in any other metropolitan area, business meetings often necessitate air travel. For many other businesses as well, convenient road access to airports is a critical consideration in the choice of office location.[18] Although public transit to the region's major airports has improved in recent years, in 2002 it accounted for only 5 percent of passenger trips to LaGuardia airport and 8 percent to JFK airport; moreover, many of these transit trips involve bus and thus are affected by road congestion.[19]

This report presents the first analysis of the cost of on-the-job-travel in the Metro Region that is attributable to excess congestion.

In 2001, residents traveled 2,893 million miles in privately operated vehicles for work-related trips in the NYMTC counties, and vehicle occupancy averaged 1.24 persons, for a total of 3,587 million annual person-miles traveled.[20] The figure increases when calculated for the NYMTC-NJTPA counties (as opposed to just the NYMTC counties surveyed) to 4,704 million person-miles.[21] Finally, using regional travel speed figures the estimate for the hours of delay due to excess congestion is 8.3 million hours.

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18 Klier, T. and Testa, W. "Location trends of large company headquarters during the 1990s," *Economic Perspectives*, 2nd Quarter, 2002, pp. 12-26.

19 Leigh Fisher Associates (in association with M.A. Coogan and Market Sense). Strategies for Improving Public Transportation Access to Large Airports. Business travelers presumably rely even less on public transit, given their relatively high values of time, although taking subway or rail to the airport (all or part way) may add some predictability to journey time, road transport remains on average the faster alternative.

20 Data from 2001 National Household Travel Survey, which separated work-related trips from commuting.

21 First, the 3,587 million person-miles is converted to 579 miles traveled per worker using employment estimates from the NYMTC report. Second, this ratio is applied to the total employment at workplaces in the entire NYMTC-NJTPA region.

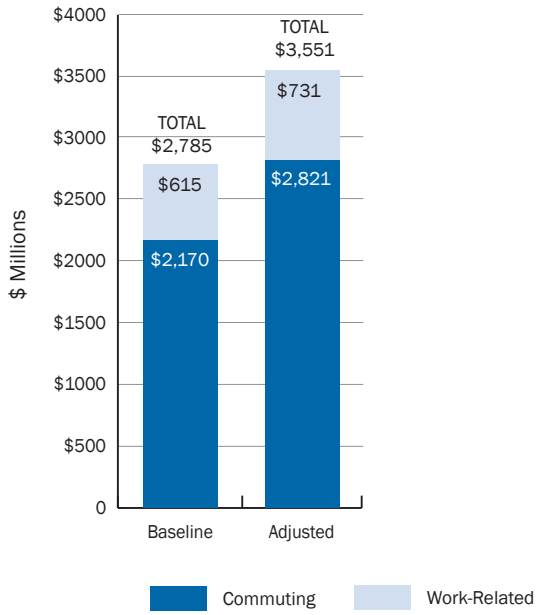
Using a value of business travel time of $34 per hour,[22] excess congestion increased the cost of work-related travel in 2001 by an estimated **$615 million**.

Total Commuter and Work-Related Travel

When the value of time figures for commuting and work related travel are adjusted to reflect actual conditions in the Metro Region, commuting value of time is raised 30 percent to $20.55, and work-related travel value of time is raised to $40, as assumed in the PB Consult study.[23] With these values, the range extends to $2.8 billion for the cost of excess congestion from commuting, and $731 million from work-related trips.

The table below summarizes both the commuting cost and the work-related travel costs, showing both a baseline estimate and the adjusted estimate for the high cost region.

Estimates of the Costs of Excess Congestion for Commuting and Work-Related Travel



SOURCE: HDR Decision Economics, 2006

22 USDOT guidelines for valuing business travel time used and adjusted for higher earning in the metropolitan region.

23 PB Consult, "New York Area Pricing Pre-Feasibility Study: Initial Travel Impact Analysis," 2006.

The range of total costs of commuting and work-related travel due to excess congestion is **$2.8–$3.5 billion**. Therefore the costs of commuting and work-related travel can be viewed as the cause of more than half of all the total excess congestion costs of $5 billion to $6.5 billion in the region.

These estimates do not take into account bus travel times, which require factoring in waiting times and bus stopping time as well as traffic speed. The estimates of congestion costs would increase if bus travel could be factored in. As an illustration of the size of the potential impact, close to 7.5 percent of all commuters entering the Manhattan CBDs travel by bus.

Costs of Vehicle Operations

The cost of travel is not only the value of time lost by the traveler, but must include the cost of vehicle operations. Technologies built into motor vehicles are designed to increase fuel efficiency at higher average speeds. Congestion reduces fuel economy by lowering average vehicle speed.

This study, in contrast to others that estimated the value of travel time,[24] estimated the cost of vehicle operations as a total of increased fuel consumption, plus other components of operating costs, such as motor oil, tires, maintenance, and depreciation.

The calculation made use of readily available estimates of consumption rates per Vehicle Mile Traveled (broken down by average speed and congestion level), unit prices, and VMT volumes. The calculation took into account the stop-and-go driving that occurs in congested roads, which increases wear and tear and fuel consumption.

The estimated additional vehicle operating costs due to excess congestion is $2 billion.[25]

24 New York State Department of Transportation (NYSDOT) and Texas Transportation Institute added fuel consumption in their estimations of total value of travel time.

25 Calculations are based on current prices for fuel, oil, tires and vehicle maintenance, and on rates of consumption of these inputs as reported in "Technical Memorandum for National Cooperative Highway Research Program (NCHRP) Project 7-12." Texas Transportation Institute, the Texas A&M University System, College Station, TX, Jan. 1990.

The Costs to Selected Industries

Research for this report included a first effort to take a granular look at the impact of excess congestion on business revenues, costs and job creation in a number of industries that are most directly affected by congestion. All are industries that are highly dependent on ease of access and mobility, whether it is for purposes of moving employees around, delivering goods and services, or getting customers to a place of business. In addition to the 25 counties in New York and New Jersey, this industry assessment includes Fairfield and New Haven counties in Connecticut, which are increasingly an integral part of the economy of the Metro Region.

The industries examined include retail trade, restaurants, health care and social services, construction, manufacturing, wholesale trade, taxicabs, financial and professional services, service and repair, and for-hire trucking. In total, excess congestion costs for these industries is currently calculated at:

- $4.6 billion in lost industry revenue; and
- $1.9 billion in increased business operating costs.

Distributions of Industry Impacts

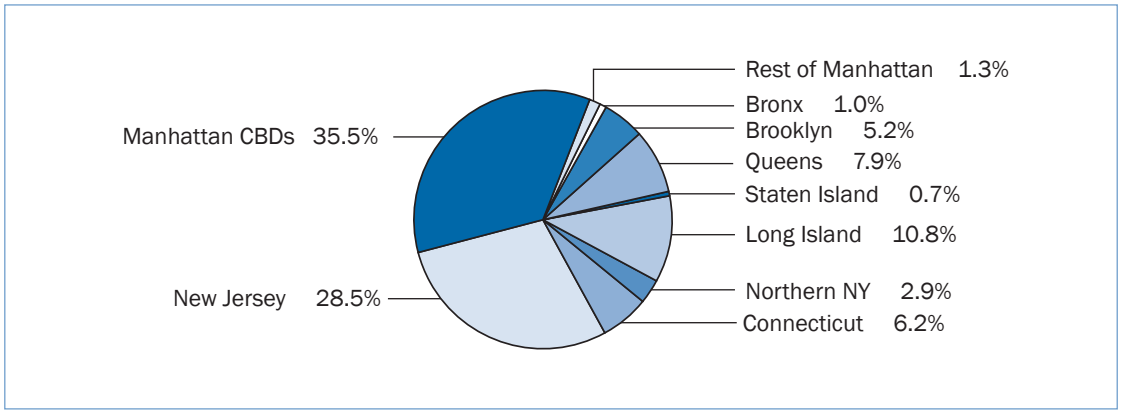
Businesses and industries concentrated in the Manhattan CBDs south of 60th Street bear the largest share of excess congestion costs in all categories (see the following table): more than 35 percent of lost revenue and almost 45 percent of increased industry costs, as well as 39 percent of the lost jobs in the region.

A key reason for such large impacts is that the Manhattan CBDs are the most highly congested area in the region. Revenues in various industries are higher in the Manhattan CBDs than in many other areas within the Metro Region. Therefore, even if the percentage impacts of congestion were the same as for the other areas, the absolute impacts would be larger there.

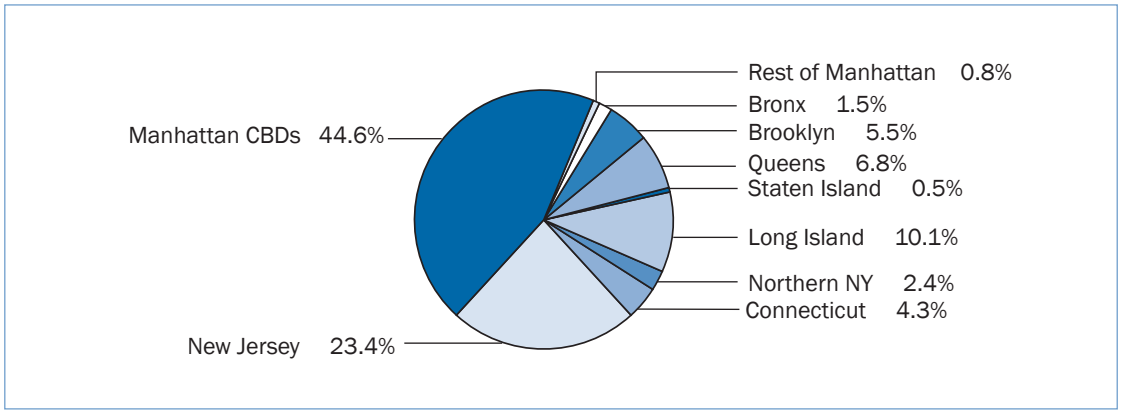
New Jersey is shown to bear the second-largest costs of excess congestion in these sectors: almost 28 percent of revenue lost in the entire Metro Region, about 23 percent of increased operating costs, and 26 of lost employment is in New Jersey. The reason for this high impact is that New Jersey area encompasses a large geographic area with a large share of economic activity in the relevant industry sectors.

Geographic Distribution of the Impact of Excess Congestion

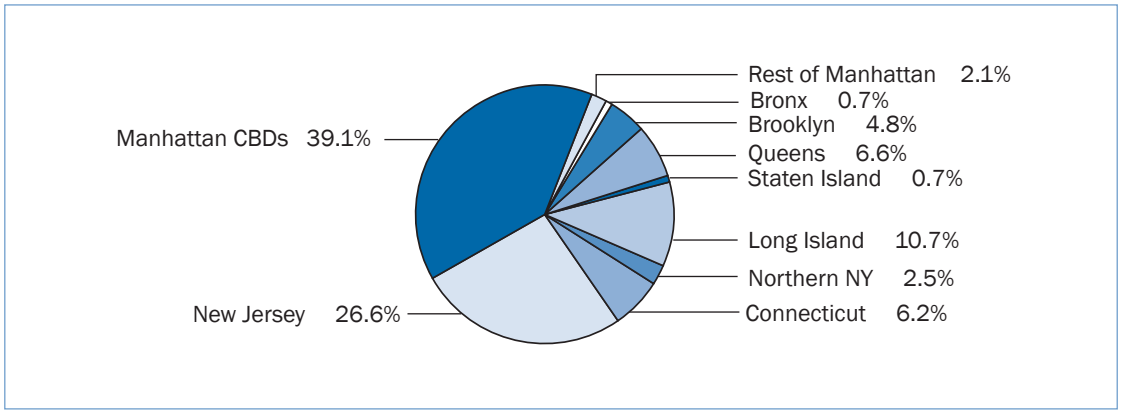
LOSS OF BUSINESS REVENUE



INCREASE IN BUSINESS COSTS



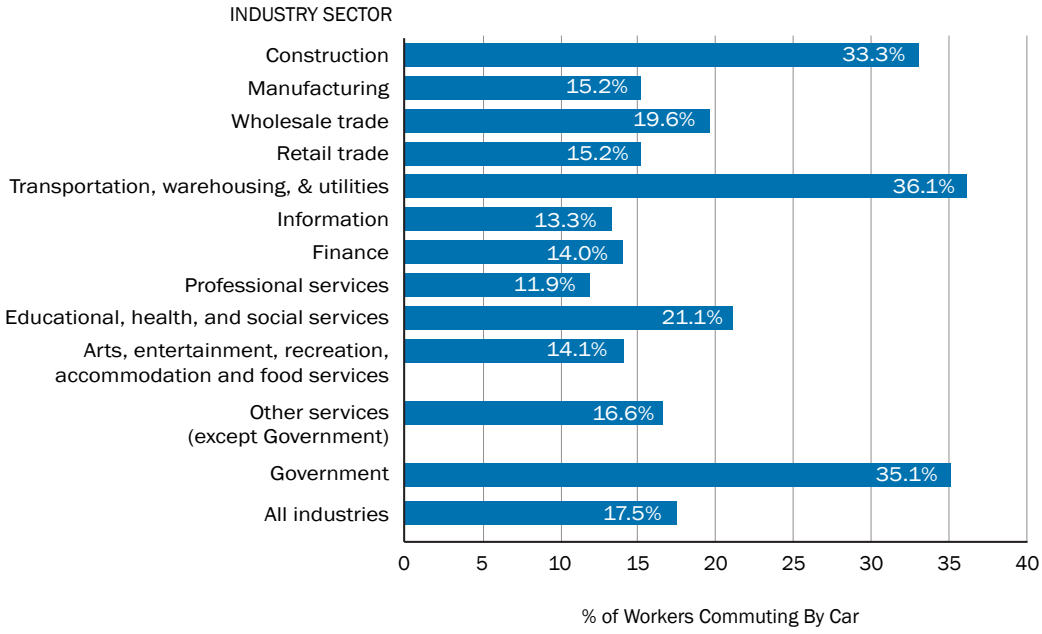
JOB LOSS



SOURCE: HDR Decision Economics, 2006

The data from the 2000 Population Census illustrates to some degree the impact of congestion on certain industries when looking at the percentage of each industry's workers who travel to their jobs by car—known as the "car mode share." The chart below shows the car mode share among commuters to Manhattan by industry sector. Three of the sectors—construction; transportation, warehousing and utilities; and government—have car mode shares above 30 percent, well above the all-industry average of 17.5 percent. The relatively high prevalence of car commuting in these sectors, taken on its own, would suggest that costs and productivity in these industries would be particularly affected by car commuting delays. One consideration is that these industries enjoy more access to free parking than other sectors—on construction sites, jobs sites or on streets restricted for government parking permits.[26]

Car Commuters to Jobs in Manhattan by Industry Sector: Who Drives?

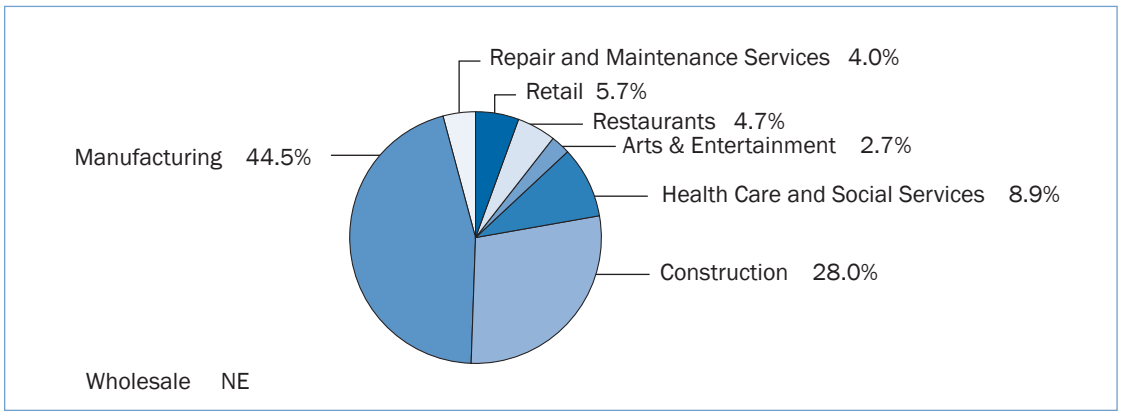


SOURCE: HDR Decision Economics, 2006; 2000 Population Census

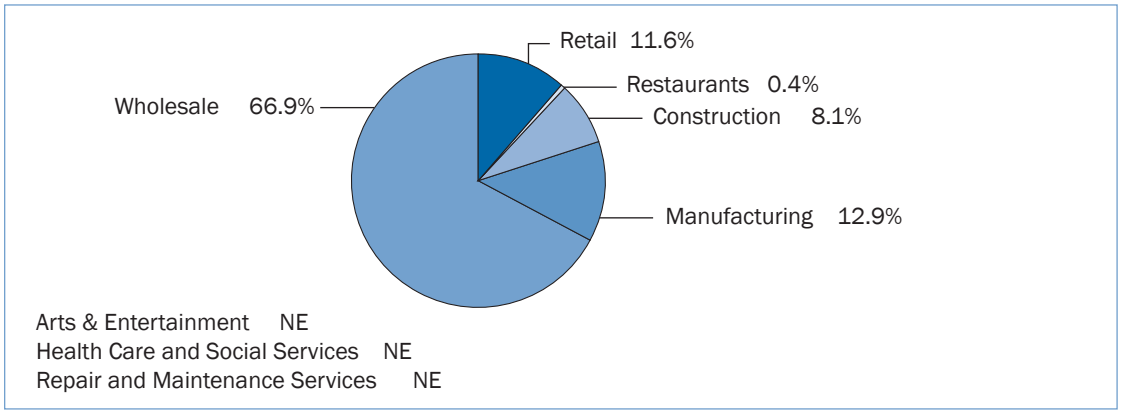
26 HDR built up the estimation framework for this analysis from "structure and logic models," which represent in a flowchart or graph what is known about the causal relationships among the relevant factors as well as the underlying analysis logic. The cost of travel consists in the models of cash costs—expenses for fuel, operation and maintenance, etc., as well as time costs.

Industry Distribution of Congestion Impacts

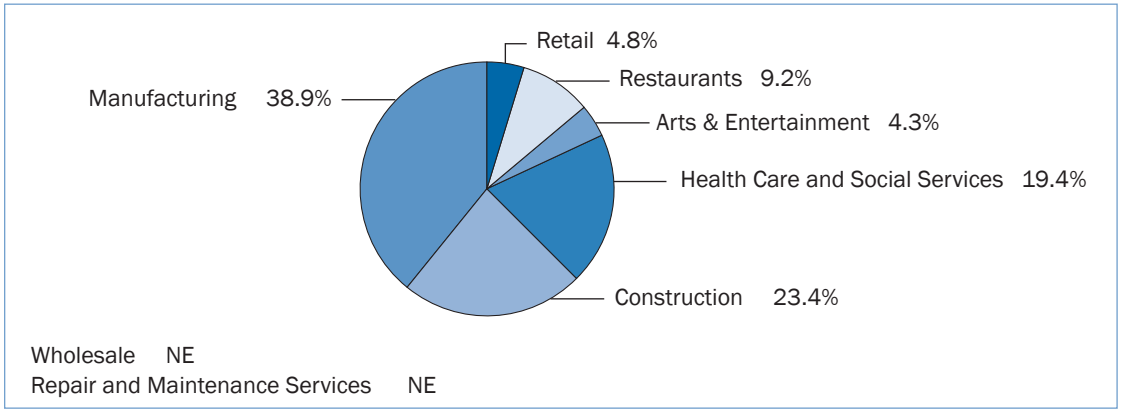
LOSS OF BUSINESS REVENUE



INCREASE IN BUSINESS COSTS



JOB LOSS

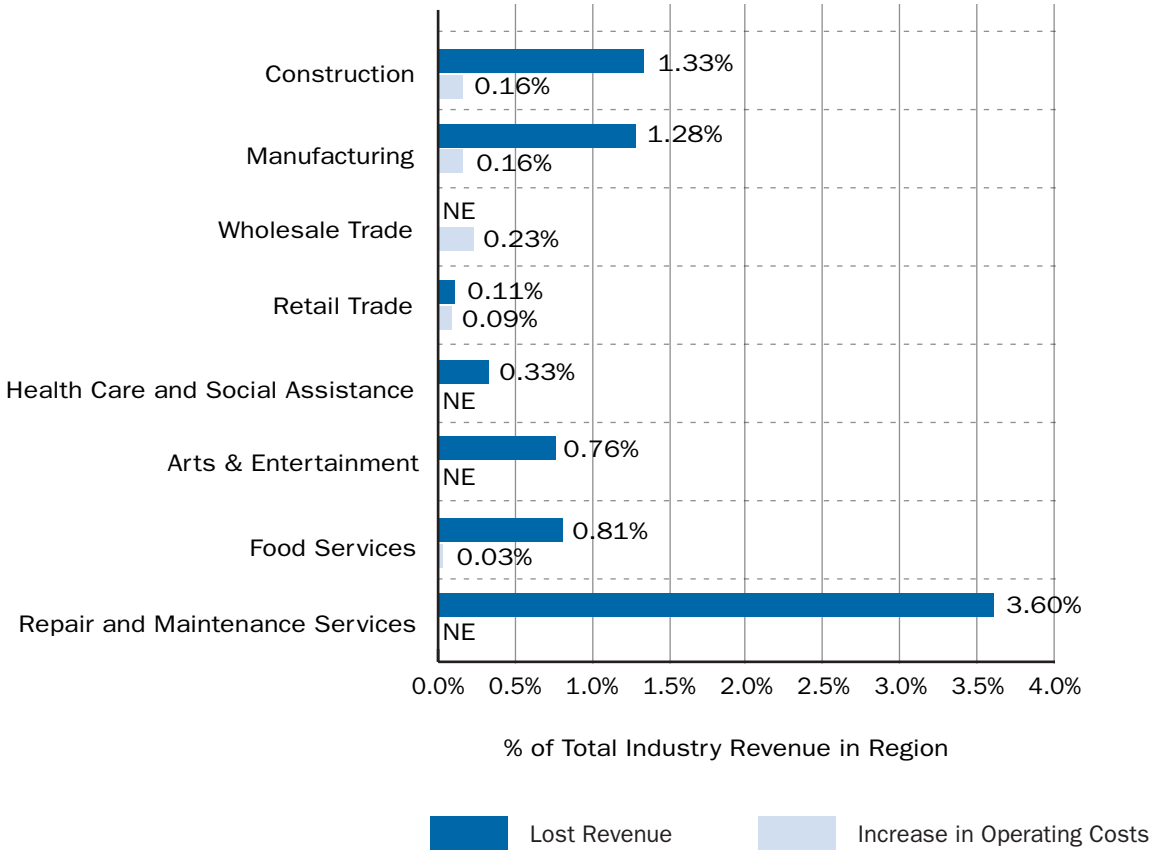


NOTE: NE indicates effect was not evaluated for a particular industry.

SOURCE: HDR Decision Economics, 2006

The chart below shows the estimated congestion cost impacts relative to the baseline industry activity level. Specifically, the table shows that the repair and services industry is most highly affected by congestion: the estimated lost revenue represents about 3.6 percent of total baseline industry revenues.

Estimated Regional Congestion Impacts—Loss of Revenue and Increases in Operating Costs



SOURCE: HDR Decision Economics, 2006

Details on Selected Industry Impacts

Retail Trade

There is limited published research about the effects of travel times and traffic congestion on regional shopping behavior and retail sales. However, it is widely understood that high traffic congestion will impact the net number of shopping trips and retail sales.[27] For example, discretionary shoppers are likely to be discouraged by highly congested traffic conditions. Commuters who experience delay have less time to shop before or after work. Tourists and day-trippers opt to avoid congested locations. As a result, retailers in the area earn less revenue and employ fewer workers.

Congestion also adds to the logistics costs of local retailers by reducing travel speeds and the reliability of delivery times for merchandise and supplies. Evidence indicates that these effects add to costs both directly and also by inhibiting store owners from adopting inventory-saving strategies.

The results of the HDR modeling show that the retail industry in just the Manhattan CBDs currently suffers a reduction in revenue of $99.5 million a year, an increase in operational costs of $66.5 million a year and a reduction in full-time employment of 413 positions a year as a result of excess congestion. Over the entire region, the cost of congestion to the retail industry totals $260.1 million in lost revenue, $220.7 million in additional operational costs and a total reduction in employment of an estimated 1,000 full-time positions per year.

Restaurants

Increased congestion and the consequent reduction in average speed affect the restaurant industry in much the same ways as the retail industry.[28] The number of people coming to restaurants may decrease, as some people will be deterred by the lower average speeds, and the inventory and logistics costs of the industry may increase as a result of slower and less reliable deliveries.

Estimated reductions in revenue to restaurants in the Manhattan CBDs as a result of excess congestion total $214.7 million per year. (Note that this revenue is not a net regional loss, since people still eat out, but in less congested locations.) Additional operating costs in the CBDs amount to $5 million and full-time employment is down

27 Interviews with NYMTC suggest that the agency has developed a land use and transportation model that could potentially be used for the exercise at hand to estimate the effect on travel times on region-wide distribution of travel patterns and resulting employment.

28 The comments and discussion regarding the extent to which congestion affects the net number of shopping trips and retail industry revenues apply here as well.

some 2,000 positions. Across the metropolitan region, the pattern is the same with the largest cost of excess congestion for this sector being felt as a reduction in revenue, totaling $213.5 million a year. Increased operating costs are estimated at $8.5 million and full-time employment is down by more than 2,000 positions. On the other hand, excess congestion also displaces some activity from Manhattan to other parts of the region. Consequently, there would be some negative impact for areas outside Manhattan if excess congestion were reduced and if there were easier access to the Manhattan CBDs. As a result, the regional employment loss that results from excess congestion is lower than the Manhattan CBDs taken in isolation.

Arts & Entertainment, Health Care & Social Services

For the industries in this category, the story is much the same, with the largest cost of excess congestion reflected in decreased revenues, except that the increase in logistics costs is not likely to be consequential. In the Manhattan CBDs south of 60th Street, the loss to these sectors due to excess congestion totals an estimated $334.2 million a year with an estimated 3,028 fewer jobs. Again, as in the Restaurants sector, institutions across the region may currently gain from excess congestion discouraging travel to Manhattan.

Financial and Professional Services

For the Financial and Professional Services sectors, data was not readily available on the impacts of excess congestion and more research is required. Transportation and operating costs (such as storing inventory) do not play a proportionately large role in these sectors and are not included in the cost figures. However, one effect of congestion on the Financial and Professional Services sector arises from the time spent by employees in highly congested conditions when traveling to and from business meetings. Since excess congestion in and around the Manhattan CBDs is not limited to "rush hours," but exists throughout the workday, the cost for industries that involve high degree of client interface is particularly high. HDR estimated that the impact on revenue for this sector from reducing excess congestion in the Manhattan CBDs by a third would be at least $500 million as a value of the time savings for work-related travel. Further study will undoubtedly reveal significant additional losses in this sector.

Construction

Traffic congestion impairs the operations of construction businesses by adding to delays in deliveries and complicating the coordination of materials, equipment and labor force. In addition, the literature indicates that high congestion may reduce the market area that a

contractor can efficiently service, leading to a reduction in sales.[29] For the construction sector, excess congestion causes a loss across all of the counties within the metropolitan region. Increased operating costs are estimated by HDR at $155.7 million a year. Revenue losses are estimated at $1.3 billion annually and overall employment losses at 5,200 full-time positions. The Partnership concurs with the conclusion that construction suffers major damage from excess congestion, but believes the HDR model does not fully account for current conditions in New York City, where construction costs have risen almost 1 percent a month during the past year. Excess congestion is certainly a contributor to these rising costs which, in turn, affect the cost of new housing, public works and commercial space. The industry is at full employment in New York City with demand for labor far outstripping supply. As a result, HDR's revenue loss estimates are likely being absorbed by increased prices in the marketplace—a situation that would seem to be unsustainable over time.

Manufacturing

The effects of congestion and reductions in average speeds on the manufacturing sector include increased costs for inventory as well as loss of revenues due to more limited service areas and loss of customers to lower cost competitors. For the Metro Region, revenue is estimated to be fully $2 billion lower than would be case without excess congestion. Manufacturing revenue suffers because of low margins and ability of customers to easily switch to alternative suppliers and geographic areas with lower production and transportation costs.[30] Operating costs in this sector are estimated to be $247.2 million higher due to excess congestion. In addition, congestion shaves more than 8,600 jobs off the number of positions created each year in the region.

Wholesale Trade

For the wholesale trade industry, excess congestion reduces average speeds, and less reliable delivery times push up inventory levels and logistics costs. The industry also suffers from congestion indirectly, though the adverse effects on sales in retail trade, manufacturing, and other industries from which it draws business. Wholesale trade can be seen, however, as further down the production/supply chain, which means that including these indirect effects in the industry's

29 See as an example Weisberg G., D. Vary, and G. Treyz (2001) "Economic Implications of Congestion," NCHRP Report 463, Transportation Research Board, National Cooperative Highway Research Program.

30 See as an example Weisberg G., D. Vary, and G. Treyz (2001) "Economic Implications of Congestion," NCHRP Report 463, Transportation Research Board, National Cooperative Highway Research Program.

revenues would involve some double counting. Therefore, the effect of congestion on wholesale trade revenue is omitted here.

The effect in this sector is seen entirely as an increase in operating costs—almost $1.3 billion a year across the entire region and $688.1 million in the Manhattan CBDs.

Taxi Cab Industry

Reductions in speeds increase the average time of a taxi trip, reducing the number of trips taxi drivers can make during their shift. This leads to lower incomes for the drivers as well as lower revenues across the industry sector. The HDR model assumes that, under increased congestion, average taxi availability (i.e., the percent of time taxi drivers spend searching for passengers, as well as the average taxi fare) is the same as under lower congestion conditions. With fewer vehicles on the road it is likely—and has been borne out in London and Stockholm—that taxi fares actually decrease while overall utilization and revenues to the taxi industry go up.

Excess congestion is estimated to reduce the number of trips a taxi cab driver can make in a shift by 5.3 trips in the Manhattan CBDs—the impact for drivers in the other boroughs and suburban counties, as well as livery cab drivers, is not included due to a lack of data. Those 5.3 additional trips are worth roughly $8,000 a year per driver in lost income. Over the industry sector, this results in a loss of $181.5 million annually.

Services & Repair Industry

The effect of reduced congestion and improved average speeds in the commercial services and repair industry is similar to the taxi industry. Improved average speeds will lead to a reduction in travel times to client locations. As a result, the number of daily trips per employee will increase, as will industry revenue and possibly employee income. In the Manhattan CBDs—the only area where data for this sector is available—excess congestion results in one fewer trip per driver per day, resulting in a loss of $7,000 in annual income per driver.

For-Hire Trucking Industry

The effect of reduced congestion and improved average speeds on the trucking industry would be similar in nature to that in the services and repair industry: an improvement in average speed would reduce the average delivery time. In addition, increased reliability of delivery times and frequency may work to decrease inventory levels held on premises and increase the number of requested deliveries. These effects in turn would increase industry revenues and income

per driver. Truck drivers may not see these revenues in their paychecks, however, and would likely lose overtime generated by excess congestion conditions.

A Note on Negative Values

In the following table, certain figures in the "Reduction in Revenues" and "Reduction in Employment" columns are negative. The reason is that revenues and employment within certain industries in counties outside Manhattan actually benefit from Manhattan's congested conditions. For example, more people currently shop, eat in restaurants or go out for entertainment in non-Manhattan locations to avoid traffic delay. For example, in the retail industry, retailers in the Bronx gain—an estimated $1.2 million per year—from customers choosing to shop locally in the Bronx as opposed to going into the CBDs.

The following table shows the distribution of the estimated congestion costs by industry. Among industry sectors, the largest shares of revenue lost to excess congestion are estimated to be borne by the manufacturing sector and construction sector—44.5 percent and 28 percent of total regional lost revenues, respectively. These two industries also bear the largest loss of employment—38.9 percent and 23.4 percent of total regional employment lost, respectively.

Impact on Industry in the Metro Region

Industry and Type of Congestion Cost Effect (Revenue, $Millions/Year)	Manhattan CBDs	Rest of Manhattan	Bronx	Brooklyn	Queens	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam	Connecticut	New Jersey	TOTAL
Retail Industry														
Reduction in Revenue	$99.5	$8.5	-$1.2	$7.0	$7.3	$4.7	$20.9	$15.6	$3.0	$1.7	-$0.1	$17.4	$75.7	**$260.1**
Increase in Operational Costs	$66.5	$7.8	$4.3	$15.6	$15.9	$4.8	$17.0	$11.7	$4.6	$1.7	$0.1	$12.4	$58.4	**$220.7**
Reduction in Employment (FTE/Year)	413	35	-5	29	30	19	87	65	13	7	0	72	314	**1,079**
Restaurants														
Reduction in Revenue	$214.7	$7.4	-$12.3	-$22.0	-$14.5	-$1.0	$8.4	$7.8	-$3.4	-$0.1	-$0.4	$9.2	$19.9	**$213.5**
Increase in Operational Costs	$5.0	$0.3	$0.1	$0.3	$0.5	$0.1	$0.4	$0.3	$0.1	$0.0	$0.0	$0.3	$1.1	**$8.5**
Reduction in Employment (FTE/Year)	2,054	71	-117	-210	-139	-9	80	74	-33	-1	-4	88	190	**2,043**
Arts & Entertainment														
Reduction in Revenue	$181.7	$0.5	-$11.6	-$23.3	-$21.7	-$3.0	$2.3	$2.1	-$3.3	-$0.9	-$0.3	$4.6	-$4.0	**$123.3**
Reduction in Employment (FTE/Year)	1,402	4	-89	-179	-167	-23	18	16	-25	-7	-3	35	-31	**951**
Health Care & Social Services														
Reduction in Revenue	$152.5	$26.3	$14.1	$44.7	$22.8	$7.7	$23.5	$16.7	$3.8	$2.2	-$0.1	$21.3	$69.7	**$405.1**
Reduction in Employment (FTE/Year)	1,626	280	151	477	243	82	250	178	40	23	-1	227	743	**4,319**
Construction														
Reduction in Revenue	$280.6	$15.1	$28.8	$92.8	$203.9	$18.6	$78.5	$12.0	$4.8	$1.6	$0.1	$11.9	$45.1	**$1,282.2**
Increase in Operational Costs	$34.1	$1.8	$3.5	$11.3	$24.8	$2.3	$9.5	-$4.2	-$8.2	-$1.8	-$0.5	-$2.7	-$25.2	**$155.7**
Reduction in Employment (FTE/Year)	1,142	61	117	378	830	76	320	347	153	41	5	273	1,476	**5,218**
Manufacturing														
Reduction in Revenue	$488.3	$3.2	$24.6	$132.8	$159.2	$3.6	$91.7	$130.4	$18.7	$62.3	$0.8	$161.6	$758.3	**$2,035.5**
Increase in Operational Costs	$59.3	$0.4	$3.0	$16.1	$19.3	$0.4	$11.1	$15.8	$2.3	$7.6	$0.1	$19.6	$92.1	**$247.2**
Reduction in Employment (FTE/Year)	2,081	14	105	566	678	15	391	556	80	265	3	689	3,231	**8,674**

Impact on Industry in the Metro Region (continued)

Industry and Type of Congestion Cost Effect (Revenue, $Millions/Year)	Manhattan CBDs	Rest of Manhattan	Bronx	Brooklyn	Queens	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam	Connecticut	New Jersey	TOTAL
Wholesale														
Increase in Operational Costs	$688.1	$4.0	$17.0	$61.8	$70.0	$2.9	$52.4	$65.2	$16.7	$6.4	$0.2	$42.2	$251.8	**$1,278.6**
Taxi Cabs														
Reduction in Revenue	$181.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Reduction in Average Daily Trip Potentia	5.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Reduction in Driver Income ($/Year per Driver)	$8,094.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**$181.5**
Repair & Maintenance Services														
Reduction in Revenue	$24.8	$0.61	$1.40	$4.25	$5.95	$1.33	$5.36	$4.69	$1.39	$0.57	$0.06	$4.27	$21.58	**$76.2**
Reduction in Average Daily Client Visit Potential	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Reduction in Employee Income ($/Year per Employee)	$7,012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
For Hire Trucking/ Freight														
Reduction in Revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Reduction in Average Daily Trips/ Deliveries Potential	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
Reduction in Driver Income ($/Year per Driver)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**
TOTAL REVENUE LOSS	**$1,623.5**	**$61.7**	**$43.8**	**$236.4**	**$362.9**	**$32.0**	**$230.7**	**$262.5**	**$57.9**	**$75.8**	**$1.1**	**$285.4**	**$1,303.9**	**$4,577.5**
INCREASE IN OPERATING COSTS	**$852.9**	**$14.4**	**$27.8**	**$105.0**	**$130.5**	**$10.5**	**$90.4**	**$103.3**	**$28.3**	**$16.9**	**$0.5**	**$82.7**	**$447.4**	**$1,910.8**
TOTAL JOBS LOST	**8,717**	**466**	**161**	**1,060**	**1,475**	**160**	**1,145**	**1,236**	**228**	**328**	**0**	**1,384**	**5,924**	**22,285**

SOURCE: HDR Decision Economics

Costs to the Regional Economy

Turning to the macroeconomic level, the experts involved in preparing this report agree that excess congestion has a negative impact on the Gross Regional Product (GRP)—about $901 billion in 2005—and regional employment of the New York metropolitan area—about 8 million workers.[31] Increased costs for travel and transportation as well as business logistics and various goods and services translate into losses that are shared by everyone who resides in, does business in, or visits the Metro Region.

Congestion has a depressing effect on the regional economic output that is distinct from (but somewhat overlapping with) the measurement of impacts on specific industry gross output provided in the previous chapter.

More in depth research is required to fully capture the macroeconomic affect of excess congestion. For this report, however, HDR has taken the first step in calculating the impact of lost productivity in the overall regional economy.

The starting assumption of this calculation is that workers who must commute through congested areas, and lose time in doing so, will require higher pay. From the employer's viewpoint, higher salaries will help attract workers who might otherwise not wish to put up with lost time commuting. Another important assumption, related to work-related travel such as business meetings, is that congestion-caused delays reduce labor productivity, which drive up production costs.

This research and analysis concludes that increased commuting, work-related travel and logistics costs to industry due to excess congestion, exclusive of any other costs, are responsible for losses amounting to:

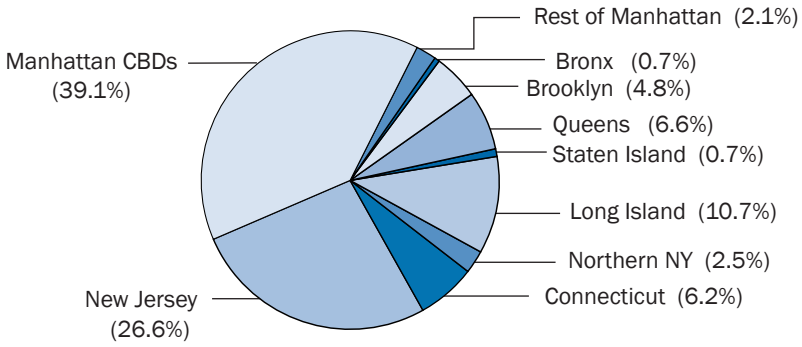
- **$3.252–$4.022 billion** to the Gross Regional Product (GRP)
- **37,623–51,512** employment reduction across the region

31 During the reference week for the 2000 Population Census, the number of people whose principal place of employment was in the region was 7,865,546. To update this figure, HDR used Bureau of Economic Analysis data for the New York-Northern New Jersey-Long Island Metropolitan Statistical Area, where the number of jobs grew by 1.4 percent from 2000 to 2004 (http://bea.gov/bea/regional/reis/). Allowing for this growth and a slight increase from 2004 to 2005, HDR arrived at the estimate of about 8 million workers for the study region. For the gross product of the NJTPA-NYMTC region, HDR used as a close proxy the gross regional product for the New York-Northern New Jersey-Long Island Metropolitan Statistical area, which was $901 billion in 2005; see Global Insight, "The Role of Metro Areas in the U.S. Economy," prepared for the United States Conference of Mayors, 2006 (http://www.usmayors.org/74thWinterMeeting/metroeconreport_January2006.pdf).

The industries that suffer highest negative impact in terms of employment are the professional services and financial services sectors with 2,574 and 2,122 reductions to employment, respectively.[32]

HDR also looked at the geographic distribution of the employment losses across the Metro Region, as illustrated below:

Regional Distribution of Employment Loss



SOURCE: HDR Decision Economics, 2006

In addition to these GRP calculations, there are also regional costs associated with the public health consequences of poor air quality that require economic analysis. A 1999 study by the Federal Highway Administration estimated the national health costs of transportation related air pollution at $40–60 billion per year, some $500 per U.S. household. These costs are disproportionately higher in more polluted urban areas.[33]

A report released this year by the EPA put New York at the top of cities with the worst air pollution. According to this report, New Yorkers are 60 percent more likely to get cancer from air pollutants than the national average.[34] It should be possible to work with public health experts to quantify the additional impact associated with the impact of pollution on the overall economy.

32 HDR Decision Economics, "The Economic Costs of Congestion in the New York City Region," 2006.

33 Addendum to the 1997 Federal Highway Cost Allocation Study Final Report, U.S. Department of Transportation Federal Highway Administration, May 2000.

34 "NY air has nation's highest cancer risk," New York Post, March 23, 2006.

Traffic-Relief and Transit Improvements: What World Cities Are Doing

A strategic approach to traffic relief and transit improvements can take many forms. One set of options involves capital investment in new street capacity, more transit or combinations of the two. Other options involve regulatory measures, such as steps to control on-street parking and rules that would govern when and where different classes of vehicle can enter different parts of the city. There are traffic management options, such as one-way street systems, bus lanes and contra-flow lanes. Technology options are emerging, such as "intelligent vehicle systems" that give vehicle operators up to the minute information about traffic conditions and alternative routes. And there are pricing options under which vehicle operators pay a fee or a toll in order to enter specified lanes or parts of the city.

Finding the right solutions for a given region's traffic problem is more difficult than counting the costs of the problem. Each approach differs in its potential effectiveness, in the costs of its implementation, and in the kind of steps that would be needed to mitigate possible disruptions as people transition from one set of transportation conditions to another. Yet despite the difficulties involved in finding genuine solutions, the size of the congestion problem, shown in this report to be draining billions of dollars from the region's economy every year, indicates that its resolution offers enormous reward to New Yorkers and residents of the tri-state region.

There have been a number of failed experiments in congestion relief. In the late 1980s, Mexico City sought to reduce traffic by allowing only vehicles with odd-numbered licensed plates to come in on certain days of the week and vehicles with even-numbered licensed plates to come in on other days. Initially, the odd-even policy worked. Over time, the policy led to growing car ownership as people just bought a second car with a different license plate. And more often than not, the second car was an older vehicle that emitted more pollutants.[35]

Other parts of the world have tried to raise fuel taxes to curb auto use. However, with the development of improved fuel-economy vehicles, vehicle travel has not waned. Madrid experimented with banning cars from the center city—a policy that was reversed quickly due to the devastating impact on local business.

35 http://www.vtpi.org/tdm/tdm33.htm

In New York City, traffic management initiatives have included Mayor Giuliani's effort to curb jaywalking in 1998 and Mayor Bloomberg's mandate that east-west corridors in Midtown become no-turn thoroughfares. Mayor Bloomberg's Thru Streets Program began in the fall of 2002. Vehicles were restricted from turning on nine Midtown streets between 10 a.m. and 6 p.m. A one-year evaluation of the program found that average travel speeds on the Thru Streets increased to 5.3 mph from 4.0 mph. Travel times along the Thru Streets fell to 6:31 minutes from 8:40 minutes. The number of motorists traveling on the Thru Streets increased to 4,854 from 4,187 vehicles per hour.[36]

An understanding of best practices in reduction of excess congestion is a new but rapidly developing area of public policy. Cities around the world have identified ease of mobility as a key selling point to attract business and top talent. To set the stage for further discussion, the Partnership has reviewed congestion-relief strategies that fall into three categories: more effective regulation, improved transit services, and market-based incentives that manage demand.

Regulatory Initiatives: Freight Truck Partnerships

Thriving cities depend on the movement of freight to ensure that inhabitants have the goods and services they need, at the right place, at the right time and in good condition. Trucks and truck operators play a vital role in any city's economy. At the same time trucks contribute to and are delayed by the conditions that result from traffic congestion.

Truck traffic is especially significant in New York City, where nearly 99 percent of goods and services are supplied by truck.[37] It may come as a surprise that trucks comprise only about 8 percent of daily vehicle miles driven in the city because trucks have a disproportionate impact as a source of traffic congestion. This is due to their size, level of noise, and loading/unloading requirements as well as the concentration of activity during the busiest times of the day.

After a review of best practices, the Partnership has concluded that regulating the timing of truck pick-ups and deliveries would impose costs on the users of trucking services, and on the economy, that exceed the economic benefits of reduced congestion. The scheduling of truck pick-ups and deliveries often coincides with the timing

36 New York City Department of Transportation, "Thru Streets—An Innovative Approach to Managing Midtown Traffic," March 2004.

37 New York City Department of Transportation, "Truck Route Management and Community Impact Reduction Study," February 10, 2006.

of inventory and other business requirements. Many shippers and recipients of freight operate with just-in-time management systems or are sensitive for other reasons to the timing of pick-ups and deliveries (e.g., restaurants and fresh food wholesalers/retailers).

A draft study by the New York City Department of Transportation (NYCDOT) on truck route management (released in February 2006) noted that most regulations governing truck traffic were instituted more than 20 years ago. NYCDOT's preliminary recommendations covered signage improvements, increased enforcement, engineering and routing improvements, regulatory and policy issues, and education and outreach. Similar recommendations have already been implemented in other world cities with generally positive reviews.

Cities like Barcelona, Rome and Paris are implementing freight efficiency measures such as the following:

- Creating networks of preferred truck routes and providing freight web pages with maps to improve travel and route planning;
- Using Variable Message Signing (VMS) to clarify use of the street (e.g., residents, deliveries, areas for vehicle breakdowns) according to time of day;
- Reviewing loading and traffic restrictions; increasing the number of on-street loading/unloading zones and safeguarding them with better enforcement;
- Shielding peak rush hour periods for commuters from freight traffic and giving incentives for "out of normal hours" deliveries; and
- Creating edge-of-city consolidation centers and multi-modal freight solutions, including rail freight or inland waterway.

In October 2006, Mayor Bloomberg announced the creation of the Mayor's Office of Long Term Planning and Sustainability and an Advisory Council on Sustainability. Together with NYCDOT, this office plans to develop systems that improve the efficiency of freight movement and delivery in the city.

Regulatory Initiatives: Zoning Changes and Loading Docks

Off-street conditions exacerbate traffic congestion during the work week. Two conditions with the most significant impact are:

- Chokepoints and constraints in the built environment; and
- Outdated standards and rules in the zoning and building codes.

Federally funded research conducted by logistics experts from Baruch College and Princeton University suggests that the chokepoints in and around Class A and Class B office buildings in the Midtown and Lower Manhattan CBDs lengthen the times that delivery trucks sit idling on the street. Loading docks that are not large enough and/or equipped to handle the volume of freight deliveries efficiently are one major chokepoint. Insufficient freight elevator capacity in relation to the commercial footprint of office buildings is another.

In a 1999 research paper on the problems of moving freight into and around Manhattan's two CBDs, shippers and carriers identified seven conditions that complicated making deliveries. "Physical constraints: vehicle space; dock space, etc." was one of the seven.[38]

Two of the report's six recommendations for improving conditions in Manhattan for shippers and carriers called for the following:[39]

- Upgrading city codes to reflect current and future requirements for dock and off-loading facilities and sufficient elevators; and
- Offering incentives to retrofit loading docks, where feasible, and managing the final link of the supply chain the drop-off to the end customer.

Post-9/11 research by Baruch found that upgraded security measures and procedures at off-loading facilities have led to "longer waiting times and more energy usage, raising carriers costs."[40]

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38 *Getting The Goods Delivered In Dense Urban Areas: A Snapshot of the Last Link of the Supply Chain,* Anne G. Morris, PhD and director of the Center for Logistics and Transportation, Zicklin School of Business, Baruch College; Alain L. Kornhauser, PhD and director of the Transportation Program, School of Engineering, Princeton University; and Mark J. Kay, PhD and assistant professor, Department of Marketing, Montclair State University. Published in the *Transportation Research Record 1653,* TRB, and National Research Council, Washington, D.C., 1999. The other six barriers cited by delivery for shippers and carriers were: time of day; season of the year; congestion that interferes with delivery or pickup; security; labor costs; size of shipment; and policies and regulations.

39 Ibid, page 14 and 15. The other recommendations called for: improving road maintenance; utilizing intelligent transportation systems (ITS) to manage parking in commercial zones; and monitoring freight deliveries to prevent theft and vandalism.

40 Ibid.

A comprehensive strategy for reducing and managing congestion would likely include:

- Updating of standards and guidelines for sufficient loading bays and freight elevators in new construction, which could be reflected in the city's zoning and building codes;
- Incentives for property owners to modify, retrofit and upgrade existing off-loading facilities, where feasible; and
- Other recommendations for changes in codes (zoning, building including changes to a proposed international building code) that would expedite freight handling.

Discussions are underway for a voluntary project for the real estate and freight industries, through which Baruch College would map conditions in the Manhattan CBDs and develop programs to improve the efficiency of freight deliveries and avoid traffic jams.

Regulatory Initiatives: On-Street Parking

The impact of low on-street parking prices on traffic congestion is often overlooked. A European Union Commission in 2000 found that with high levels of enforcement, increasing the price of parking is an effective way of reducing traffic congestion.[41] On-street parking in Manhattan, as in most cities, is priced far below market. In a city where garage parking spots are sold for the price of a new car and where garage parking fees can be as high as $15 to $20 for the first hour, on-street parking, the most convenient and most sought-after by drivers, costs about $2 to $3 an hour in Manhattan.[42]

Studies have shown that below-market prices for street parking lead to increased vehicle miles traveled as drivers circle in the hopes of finding a spot.[43] Congestion increases as drivers circle and double park while waiting for spots to open. In his 2005 book, "The High Cost of Free Parking," Donald Shoup suggests that cities should charge the market rate for on-street parking, aiming for a 15 percent vacancy rate.

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41 European Commission, "Transprice" 2000.

42 Lower Manhattan parking meters charge $0.25 per 10 minutes for a maximum of 3 hours. Midtown Manhattan parking meters, called munimeters, charge $2 for one hour, $5 for two hours, and $9 for three hours.

43 Donald Shoup, "The High Cost of Free Parking," P. 287; A 1995 study estimated the time spent searching for on-street parking in Manhattan's central business district by interviewing drivers who parked during the weekday. It found that the average time to find a space was 7.2 minutes between 8 a. m. and 10 a.m., and 10.6 minutes between 11 a.m. and 2 p.m. The study also estimated that the search for on-street parking created about 8 percent of the total vehicle miles traveled in the Midtown and West Side area.

The vacancy rate allows delivery trucks and those making quick stops to find a curbside spot and reduce congestion.

Raising the price of on-street parking is especially important to improve access to curbside parking for trucks. One of the consequences of inexpensive on-street parking policies is demonstrated by the following statistics from the New York City Department of Finance. In 2005, there were 2,236,678 parking tickets written for commercial vehicles. Of these, 300,288 were written for double parking.[44] Companies like UPS and FedEx are wracking up millions of dollars in parking fines that are ultimately passed along to their customers. In response, the City has attempted to provide relief through several programs that allow participating companies to legally double-park their trucks in certain circumstances and to pay reduced parking fines.[45] In fact, the City's Finance Commissioner testified that of the more than two million parking tickets written on commercial vehicles, hundreds of thousands are dismissed because there is a provision that allows trucks making expeditious deliveries to double park.[46]

Double parking could be reduced, thereby relieving conditions that cause many traffic jams, if trucks could get more curbside parking as a result of increased prices for on-street parking and restriction of additional curbside space for commercial vehicles.

Another contributor to the problems associated with managing freight deliveries in the city is the abuse of free-parking permits issued by government agencies. The advocacy organization Transportation Alternatives has issued several reports pointing out that huge numbers of city, state and federal employees enjoy free-parking privileges that are often used to park employees' own cars, not government-owned cars, illegally. It is estimated that there are 150,000 permits in use in the city and the findings of a recent study show that 77 percent of those with permits are using them illegally.[47] Many of these are treated as lifetime entitlements for past service in government.

The total number of public employees who have these privileges as well as the impact of these practices on city neighborhoods and congestion can only be determined by a census of all government agencies that are authorized to issue permits. Without a census, it

44 New York Post, "Double Parkers Beating the Rap," February 27, 2006.
45 New York City Department of Finance, http://www.nyc.gov/html/dof/html/parking/park_commercial_fleet.shtml
46 "City Hall Park Row," New York Post, March 1, 2006.
47 Transportation Alternatives, "Above the Law: A Study of Government Permit Parking Abuse in New York City," September 2006.

will be difficult to determine which employees have a legitimate job-related reason for such a privilege and whether this should be subject to tax as additional compensation. (Private employers in Manhattan have substantially eliminated free parking perks for employees since federal tax law was changed to require reporting the value as income. Instead, employers typically offer pretax TransitCheks for use on buses, subways and commuter rail.)

New Services: Improving Public Transportation

Every city that has successfully introduced a congestion relief strategy has started out with the identification of gaps in their mass transit system that effectively force people into cars. In some cases, new revenues generated by user fees have been dedicated to expanding capacity and adding services. The current Five Year Capital Plan of the Metropolitan Transit Authority includes significant system expansion projects. New Jersey is pursuing a new commuter rail tunnel under the Hudson River. New and expanded commuter rail services and roadways to accommodate commuters to the growing labor market on Long Island and in Westchester are also being planned.

Additional needs, such as parking facilities at New Jersey commuter rail stations and New York City subway stations that accommodate non-residents on a park-and-ride basis have also been identified. New York City buses, including "express" buses, remain a limited and unreliable option for areas of the city not served by subways. London and Stockholm both accompanied their congestion relief programs with upgraded bus service, including global positioning devices on every bus that communicate the location and arrival time to riders waiting at every stop.

New Services: Bus Rapid Transit

The popularity and acceptance of Bus Rapid Transit (BRT) has grown in the last decade. Cities in Europe, North America, South America and Australia have built these transit systems with a high degree of success, offering travel times and comfort levels similar to light rail systems. A BRT system can include:

- Dedicated roads for BRT (e.g., London; Bogotá, Columbia; Ottawa, Canada; Brisbane, Australia; Amsterdam, Netherlands);
- High Occupancy Vehicles lanes (e.g., Houston, Texas);

- Curb-guided buses (e.g., Adelaide, Australia; Leeds, United Kingdom; Essen, Germany); and
- Electronically guided buses (e.g., Las Vegas, Nevada).

Since the introduction of the MetroCard, New York City has experienced significant growth in bus ridership, which is at its highest level ever. BRT is one of the options that New York City transportation officials are examining to improve transit's performance for existing customers as well as to accommodate new customers.

The results of BRT in other cities have been significant. In Los Angeles and Oakland, the cities' bus service went from limited-stop buses to BRT and saw an increase in bus speeds of 6 percent to 10 percent. BRT in New York City is expected to increase bus speeds from 11 percent to 16 percent.[48]

NYCDOT and the MTA are moving forward with a bus rapid transit demonstration project in New York City. Five corridors have been selected on the basis of the highest probability of success and potential benefit to communities poorly served by mass transit, including:

- The Bronx—Pelham Parkway & Fordham Road;
- Manhattan—First & Second Avenues and the 125th Street Corridor;
- Brooklyn—Nostrand Avenue Corridor;
- Queens—Merrick Boulevard Corridor; and
- Staten Island—Hylan Boulevard Corridor.

The next stage of the demonstration includes developing conceptual plans for the project and then moving into implementation shortly thereafter.[49]

New Services: Traffic Signal Controls

Urban road systems, such as those in London, are predominantly managed by traffic signal controlled junctions, which provide a safe balance between the movement of vehicles and other transportation modes. The effective management of traffic signal control is essential to delivering an efficient and effective transportation system.

48 New York City Transit, NYCBRT Study, http://www.mta.info/mta/planning/brt/projectupdate.htm

49 New York City Transit, NYCBRT Study,http://www.mta.info/mta/planning/brt/projectupdate.htm

Fixed time Urban Traffic Control was introduced in the 1960s to provide coordinated operation of traffic signals. London now uses a traffic-signal control system called Split Cycle and Offset Optimization Technique (SCOOT), first introduced in 1984, which automatically responds to fluctuations in traffic patterns. The phasing cycles are varied periodically to improve traffic flow. There are 4,500 traffic signal installations across London, of which 1,600 are SCOOT-controlled. The system has delivered reductions of 8 percent in travel time and an 18 percent reduction in delay.

New Services: Universal Transportation Account

Transit agencies have been exploring for many years the use of "smart cards" to add convenience when traveling the subways and buses. The most efficient system would integrate a smart card with the E-ZPass system resulting in a Universal Transportation Account.

The ability to provide travelers with one payment mechanism through a smart card opens up possibilities for travel mode incentives—for example, the issuance of "frequent transit traveler" credits good for a congestion-zone discount or E-ZPass travel during off-peak hours. There are several smart-card applications underway and many more being planned in the transit arena that would make it possible for a customer to use one payment device for travel on multiple transit systems. So far there are none that incorporate toll facilities.

Examples of similar types of smart cards currently used around the world include the Octopus Card, which is widely used in Hong Kong for purchases on public transport and in convenience stores, fast food shops, supermarkets, vending machines, schools and parking. However, Hong Kong toll facilities use a transponder based electronic payment system and are not connected to Octopus.

In San Francisco, cardholders can use Translink at select stations and on select routes operated by AC Transit (18 bus lines), BART (9 BART stations), Caltrain (9 Caltrain stations), Golden Gate Bus and Ferry Transit (2 ferry routes and 8 bus lines), Muni (6 Muni Metro lines), and Santa Clara VTA (4 bus lines and light rail). At the present time, Translink cannot be used for payment of tolls on the San Francisco-area toll bridges.

The Port Authority of New York and New Jersey is coordinating development of a regional interoperability standard (RIS) for electronic transit fare payments. Eventually all of the transit systems will utilize this standard for a regional transit smart card.

New Services: Expanded Use of Ferries

Each weekday, more than 90,000 passenger trips are made on the municipally operated Staten Island Ferry and ferries run by a handful of private operators.[50] The largest share of these work week trips, about 60,000 to 65,000,[51] are provided by the Staten Island Ferry, a seven-day, 24-hour service that is operated free of charge by New York City's Department of Transportation. A city service since 1905, the Staten Island Ferry transports more than 19 million passengers a year.[52] Operating costs for the Staten Island Ferry totaled $53.8 million in 2005 and are expected to be $73.7 million in 2006, an increase that reflects additional security, additional service, fuel and costs associated with new and improved terminals.[53]

As of the second quarter of 2006, the rest of the workday trips are provided by New York Waterway (18,384), Billy Bey (9,697), New York Water Taxi (3,599), Seastreak (2,979) and Liberty Landing Marina (511).[54] Commuters who rely on these private operators have access to about 20 routes that serve destinations primarily in Manhattan and New Jersey, with limited service to other parts of the city.

Passenger ferry service that transports commuters is seldom profitable. In Seattle, where ferries play an integral role in the regional transportation system, passenger ferry service is generally not profitable. However, operating deficits are offset by vehicular ferry service.

In a report issued in December 2005, two members of the New York City Council—David Yassky and John Liu (who heads the Council's Transportation Committee)—and the Metropolitan Waterfront Alliance proposed a series of recommendations to increase ferry service and bring more stability to the industry. The study urged policy makers in the city and region to:

- Integrate the ferry transit system into the MTA's MetroCard system;
- Market the federal program that lets commuters use pre-tax income to buy transit passes that could be used to pay fares on ferries;
- Subsidize the operating costs of ferries on critical routes;
- Offer leases for pier management to ferry operators;

50 New York City Department of Transportation. Daily ridership results for April 2006.
51 New York City Department of Transportation. Daily ridership results for April 2006.
52 New York City Department of Transportation. Facts about the Ferry. Page 3.
53 New York City Independent Budget Office. Staff analysis of city data.
54 New York Metropolitan Council, October 2006 (http://nymtc.org/files/2nd_QTR_2006.pdf)

- Permit ferry operators to lease ferries purchased by New York City and/or the Port Authority;
- Identify ways for ferry operators to make bulk purchases of diesel fuel through a cooperative purchasing agreement; and
- Set a long-term goal of shifting the operators to the use of ultra low-sulfur fuel diesel.

New York City's Economic Development Corporation (EDC), along with other agencies, groups and stakeholders have recommended initiatives that would expand private ferry services and connect Manhattan with other locations in the metropolitan region. These plans include expanded ferry service along the East River in Manhattan and providing more ferry connections between Brooklyn and Manhattan.

New York Water Taxi is currently planning a longer route from Haverstraw in Rockland County to the World Financial Center and then on to Pier 11 at Wall Street. The ferry would stop at a new terminal in Yonkers and then complete its journey to Manhattan. The route from Yonkers to Manhattan will open in the spring of 2007 with the expansion to Haverstraw soon afterwards. The trip is expected to take 90 minutes to reach the World Financial Center and another 12 minutes to arrive at Pier 11. This would be the only ferry service from Rockland and Westchester counties to Manhattan. Another new project includes New York Waterway's plans to expand service to Edgewater, NJ by early 2007. Also, federal funds were recently awarded to Bridgeport, CT in order to study new high-speed ferry service from that city to LaGuardia Airport and Lower Manhattan.

In the $286.4 billion federal transportation bill covering fiscal 2005 through fiscal 2009, $15 million was set aside for the NYCDOT to expand ferry service. This line item will enable NYCDOT to buy ferries and create a high-speed service that will bring commuters from the Rockaway Peninsula to Manhattan.

Other studies have suggested that there is strong demand and momentum for new ferry services between the northern suburbs and Lower Manhattan, as well as between Manhattan and both airports, LaGuardia and Kennedy. Strategic locations for new suburban ferry service could include: Nyack in Rockland County; New Rochelle, Rye and Tarrytown in Westchester County; and Stamford, Connecticut. In a recent study entitled "Long Island Sound Waterborne Transportation Plan," the NYMTC identified three strong candidates for ferry service: New Rochelle in Westchester County; Glen Clove on Long Island; and a Connecticut-based service that would combine Stamford and Bridgeport.

The public-private partnership required to identify and activate top-tier locations for suburban ferry terminals must also take into account the cars of ferry customers. Ferry operators and public agencies will need to identify park-and-ride sites. Within the New York Metropolitan area, there may be as many as 35,000 parking spaces available for use on weekdays in public parks on Long Island, in southern Connecticut, the lower Hudson Valley and New Jersey.[55]

Plans for expanded ferry service can be incorporated in all major waterfront development projects in the region and further feasibility studies should be carried out on the potential to serve more suburbs and the airports. Because ferry trips help reduce the volume of traffic trying to use the region's congested highways, tunnels and bridges, expanded ferry service could help relieve congestion at all entryways to Manhattan. The comparatively low capital costs of introducing new ferry service is far more attractive than building new fixed crossings, and ferries are one of the few transportation improvements that leverage private sources of capital in an effort to help relieve congestion around the region.

To provide for the stability of an expanding ferry service, the optimal solution is for the MTA to manage the ferry system (public and private) so that it receives the level of service and maintenance of the other key transportation systems. Under public management, certain commuter ferry routes might qualify for operating subsidies and could be integrated with the bus, subway and commuter rail services of the region.

Demand Management Tools: HOT Lanes

In the face of growing urban congestion, the range of strategies to maintain and improve highway service is also increasing. The traditional approach has been the addition of general-purpose lanes. However, because of the high costs and impacts of creating new capacity, increasing attention is also being given to strategies that make the maximum use of existing highway capacity.

Transportation officials are using a range of demand-management strategies to influence user demand and provide preferential services to certain vehicle types. One such strategy, High Occupancy Vehicles (HOV) lanes, reserves existing or new highway lanes for the exclusive use of car pools and transit vehicles. In some areas, departments of transportation are expanding HOV lanes into metropolitan area-wide networks. Another technique is to use variable prices for these dedicated lanes to attract motorists to lower priced off-peak travel times.

55 Estimate from New York Water Taxi.

One of the most recent management concepts—High Occupancy Toll (HOT) lanes—combines HOV and pricing strategies by allowing single occupancy vehicles to gain access to HOV lanes by paying a fee. The lanes are "managed" through pricing to maintain free flow conditions even during the height of rush hours. This approach is appealing for three reasons:

- It expands mobility options in congested urban areas by providing an opportunity for reliable travel times to users prepared to pay a significant premium for this service;
- It generates a new source of revenue, which can be used to pay for transportation improvements, including enhanced transit service; and
- It improves the efficiency of HOV facilities, which is especially important given the recent decline in use of HOV lanes in 36 of the 40 largest metro areas.[56]

A 2003 GAO study of various approaches to congestion pricing examined the HOT lanes in Orange County and San Diego, CA, and Houston, TX. GAO found that HOT lane users saved an average of 12 to 20 minutes per trip in the peak period.[57]

There are a number of congested corridors in the greater region where HOT lanes could be used to reduce congestion and improve overall efficiency, including:

- The Gowanus Expressway HOV lanes;[58]
- The Tappan Zee Bridge I-84/284 Corridor;[59]
- The Long Island Expressway HOV lanes;[60] and
- The Van Wyck Expressway.

Environmental studies are currently underway for the replacement of the Gowanus Expressway and the Tappan Zee Bridge, which are both nearing the end of their useful lives. The pending replacement of these congested links provides an opportunity to incorporate managed lanes in the new facilities that will replace them.

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56 U.S. Census Bureau, 2000 Journey-to-Work Survey.
57 GAO, "Reducing Congestion: congestion pricing has promise for improving use of transportation infrastructure," May 6, 2003.
58 This corridor was discussed at the September 2001 Federal Highway Administration and New York State Department of Transportation workshop.
59 Ibid.
60 Ibid.

Demand Management Tools: Congestion Charging District

Companies with operations in cities around the world have first-hand knowledge about how bad traffic problems are in Beijing, Mexico City and Mumbai. They also have noted that in London and Stockholm, with the introduction of congestion-pricing zones and complementary improvements in mass transit, traffic congestion has been reduced and the business climate has almost immediately improved.

In places like the United Kingdom, Sweden, Norway and Singapore, experts have diagnosed chronic traffic congestion as a symptom of market failure in the transportation sector. The remedy these nations have chosen, inspired by supply and demand principles applied in virtually every other sector of the modern economy, is market-based pricing. Under this approach, motorists begin to make decisions on whether to drive or take mass transit based on the size of the user fee and the how much they value their time. Imposing the charge can deflect enough vehicle trips to reduce traffic congestion to manageable levels throughout the day.

Until recently in the U.S., surface transportation operators have largely resisted the application of market principles as a means of managing demand. In the absence of price signals that capture the marginal cost that one's travel imposes on others, travel demand in large metropolitan regions often exceeds supply of street, road and highway space, leading to excess traffic congestion. In other words, wherever and whenever motorists are not charged for using scarce street space, and the roadway capacity is insufficient to meet peak period demand, excess traffic congestion will result.

In the first six months of 2006, Stockholm, Sweden, experimented with a trial of congestion pricing for its center city. The demonstration was successful. Fears of negative impact on the economy turned out to be unfounded, as retailers, suppliers, taxis and other sectors experienced significant gains in their bottom line during the demonstration. In September 2006, citizens voted in a public referendum to make the congestion-charging zone permanent. Based on their observation of Stockholm's positive experience, the citizens of Denmark are moving to adopt similar policies.

The example of a city's successful effort to manage traffic congestion with market-based incentives that is most relevant to New York is London, England, where an area-pricing scheme was put in place in February 2003. London has emerged as New York City's European counterpart as a financial services capital. Since instituting a

congestion charge in the central business district, London has seen freer flow in traffic, increased reliability of trip times and increased utilization of rapid transit. Equally important, fears that pricing could hurt business in the zone have not been realized.

London's Congestion-Charging Experience[61]

Before implementing congestion pricing, London suffered the worst traffic in the United Kingdom and among the worst in Europe. Drivers in central London routinely spent 50 percent of their commuting time sitting in traffic. Economic estimates showed that London lost between $178 million and $357 million a year due to time lost in congestion.[62] Surveys also showed that congestion was one of the biggest issues facing the capital and that Londoners did not want to see congestion clogging up roads, threatening businesses and damaging London's status as a thriving world city.[63] In February 2003, the city launched a program of congestion pricing for the center city in London.

The method of collecting the charge involves video cameras, not toll plazas. There are a range of payment methods to ensure easy access for all drivers, including call center, web-based payments, SMS text payments, retail outlets and postal service. A driver is required to pay the charge on the day of travel into the zone. Some vehicles are exempt (emergency vehicles, taxis, motorcycles, buses, disabled driver vehicles, and alternative fuel) and residents of the zone receive a 90 percent discount.

The £8 charge applies to a central zone of the city, including the main business, retail and theater districts, from 7 a.m. to 6:30 p.m. each weekday. The area covered by the London zone is about eight square miles. London has a number of cross routes through the zone that are also subject to the charge, but there is a free periphery route that enables traffic to avoid the charge. Net revenues from the pricing zone must be spent on measures that improve transportation in London.

London made significant improvements to its public transportation system to expand capacity and encourage people to switch from cars to some form of rapid transit. These measures included the commissioning of 300 more buses; integrated tickets which made it easier for passengers to switch modes; information boards that enabled passengers to know when a bus would arrive; and installation

61 Throughout this chapter, reference is made only to the existing Central London Scheme. The Western Extension to the London Scheme is not considered except where explicitly mentioned.

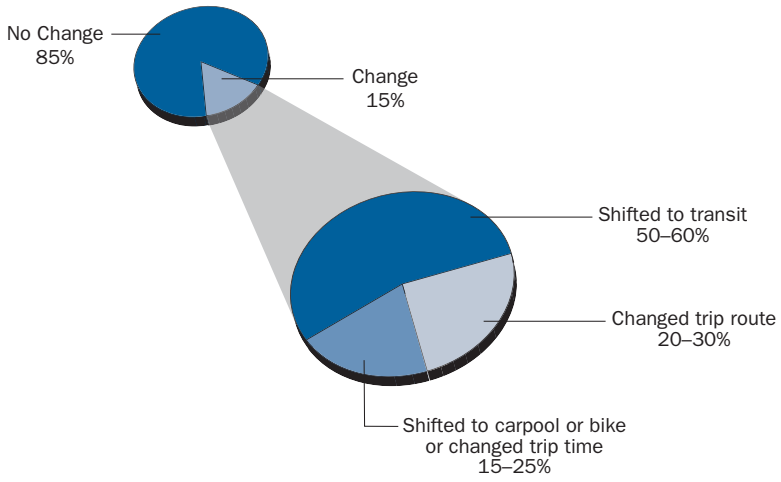
62 Transport for London, http://www.cclondon.com/whatis.html

63 Transport for London, http://www.cclondon.com/whatis.html

of new bus lanes. After congestion pricing was introduced, bus ridership increased by 37 percent.[64]

The latest transportation statistics from Transport for London (TfL) show that the congestion-pricing zone has substantially reduced the number of vehicles entering central London. After two years, about 15 percent of vehicle trips into the zone, or 65,000 to 70,000 trips, were eliminated during the 12-hour peak period. Of these, more than half shifted to transit, 20 percent to 30 percent changed their trip route, and 15 percent to 25 percent shifted to carpool, bicycles or changed the timing of their trip, as illustrated below:

Impact of Congestion Pricing Zone on Transportation Mode



SOURCE: Partnership for New York City; Transport for London.

On average there has been a 17 percent reduction in total traffic in the charging zone. Trip speeds for those still driving into the zone have increased by 19 percent, from 8.5 miles per hour to 10.1 miles per hour. In addition, trip reliability also improved by 22 percent, with excess delays falling from 2.3 minutes per km to 1.8 minutes per km. These results have been relatively consistent over the first three years of the pricing program.[65]

Recent findings in the *Fourth Annual Monitoring Report*[66] indicate that three years after the introduction of congestion pricing there have been no negative consequences for businesses in the pricing zone. In fact, London's economy is booming, with growth expected to be at 3.4 percent for 2006, the strongest year since 2000. However, TfL has

64 Transport for London, "Fourth Annual Report: Impacts Monitoring," June 2006.
65 Transport for London, "Fourth Annual Report: Impacts Monitoring," June 2006.
66 Ibid.

not yet performed a quantitative assessment of the economic benefits of the zone.[67] Annual net revenues of $238 million were generated by the congestion zone in 2005–2006.[68]

In addition, there have been significant reductions in air pollutants in the charging zone: a 15.7 percent decrease in CO_2, an 8 percent reduction in NOx, and a 6 percent reduction in PM_{10}.

EU *TransPrice* Study

There has been little opportunity to gather empirical evidence demonstrating the effects of integrated congestion relief and mass transit strategy, aside from the early results of the experience in London, Stockholm and cities in Norway. One of the most comprehensive studies, *TransPrice*, was conducted in the late 1990s and continues to be relevant today. *TransPrice* was a pan-European investigation funded by the European Commission (2000) with experiments and modeling exercises taking place in Athens, Madrid, Helsinki, Leeds, Goteborg, Graz, Como, and York. The project's aim was to explore how the congestion-relief measures, when combined, affected mode of travel chosen and thereby reduced congestion and the negative environmental effects of automobile use.

The results of the *TransPrice* project were evaluated using a common framework that allowed for comparisons using models, behavioral research, and demonstrations across the different cities included in the study. The results were as follows:

Road User Charging

- Area pricing (a fee for entering the designated zone) was found to be highly effective (more so than other types of road use charging) when applied to a congested city center. Benefits did not substantially increase when area pricing was expanded to include areas other than the most congested parts of the city or increased to be in effect outside of peak hours.
- High Occupancy Toll (HOT) lanes had marginal impact on modal shift in European settings and only were

67 Ernst & Young, "Review of Transport for London's Assessment of the Business and Economic Impacts of the Congestion Charge in Chapter 6 of "Impacts Monitoring—Third Annual Report 2005," Final Report," February 10, 2006, Page 7.

68 Transport for London, "Fourth Annual Report: Impacts Monitoring," June 2006, Page 173; currency converted at 1 USD = 0.527287 GBP. Net revenues from congestion charging were $173 million.

effective in shifting vehicle users to transit when congestion was very high.

- Park & Ride and other intermodal facilities can have positive impact on the performance of pricing measures.

Parking Measures

- Assuming high levels of enforcement, increasing the price of parking proved to be an effective way to reduce car trips; however, increasing the price of parking works best when it is not used as an isolated measure.
- Increasing parking fees, on average, can have a similar effect to area-based pricing.

Integrated Ticketing/Smart Cards

- The introduction of integrated ticketing has a marginal affect on the mode of travel chosen, but the effects could be greater over time.
- Smart cards on their own (without integration) have a small, but significant, impact on mode of travel chosen, especially for the use of Park & Ride facilities.

Next Steps: The Need for Further Study

The Partnership's work to understand congestion and congestion relief options provides only a partial analysis of the economic impact of excess congestion on the city and the region and a snapshot of congestion-relief options. Nevertheless, it provides sufficient empirical data and analysis to justify a request to the U.S. Department of Transportation for a grant to New York City to carry out a full-blown feasibility study of congestion relief options and companion public transportation improvements for the New York Metro Region.

San Francisco has already obtained $1 million in federal aid to conduct a feasibility study for the city and the Bay Area. New York City should be able to obtain whatever level of federal aid is required for a feasibility study in this region by signing an Urban Partnership Agreement with the U. S. Department of Transportation.

As the Partnership makes the business case for undertaking a feasibility study, it recognizes the limitations of its work to date. What follows is an outline of some of the issues and tasks that need to be thoroughly examined in a comprehensive feasibility study.

	ISSUE	ACTION
Expanded Study of Impacts of Congestion	This report presents an initial assessment of excess congestion's impact on Gross City Product, Gross Regional Product, business sectors, the five boroughs and suburban counties. But more detailed research is needed on the impacts of congestion and of congestion relief strategies on industries and communities.	Survey and gather relevant data from employers and workers in each sector of the city and regional economy to obtain a granular view of the impact of congestion charges, regulation and other congestion relief options.
Redistribution of Economic Activity	Congestion-relief initiatives are likely to redistribute some economic activity in the city and the region. Various sectors of the economy and communities around the region experience gains and losses as a result of congestion and might experience gains or losses from its remedies.	Assess the distributional effects of congestion-relief initiatives as part of the scope of a federally funded feasibility study.

	ISSUE	ACTION
Transit Improvements	The level, quality, frequency and convenience of rapid-transit services in the five boroughs and the 28-county Metro Region are not evenly or uniformly distributed. Some areas are transit-rich; others have few or inadequate options, making private cars the only practical and comfortable alternative for many commuters and visitors. Many transit services are already at or over capacity.	Identify gaps in the transit system and improvements needed to insure that all areas of the city and region have adequate services. (This would include park and ride facilities.) Prepare financial analyses of the costs and sources of funding to fill these gaps.
Factors Behind Mode Choices	Residents, commuters, business travelers and tourists elect to reach their destinations by car for a variety of reasons, which need to be collected and analyzed as part of any effort to eliminate excess congestion.	Undertake a comprehensive set of stated preference surveys to understand the conditions and reasons why New Yorkers, business travelers, tourists and residents of the 28-county Metro Region elect to reach their destinations by car.
Truck and Freight Activity	Inadequate off-loading facilities in commercial properties are a major contributor to congestion, which interferes with freight mobility and compromises security.	Survey existing conditions and develop guidelines and incentives for more efficient off-loading facilities and systems in new and existing commercial office buildings.
Parking	Parking policies, including pricing, permits and restricted curbside uses, have not been integrated into traffic management and congestion relief programs.	Assess how parking policies can be adapted to improve traffic flow, including an inventory of existing permits and pricing policies.
Regional Collaboration	Traffic relief and transit improvement require the tri-state region and the localities within it to cooperate in ways that are unprecedented.	Convene public agencies and relevant leadership in order to prepare and carry out a regional approach to traffic relief and transit improvement.

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