

Transport for London

Central London

Congestion charging



Impacts monitoring

Fourth Annual Report, June 2006



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Overview

Congestion charging was introduced into central London in February 2003. It contributes directly to the achievement of four of the Mayor's transport priorities:

- to reduce congestion;
- to make radical improvements to bus services;
- to improve journey time reliability for car users;
- to make the distribution of goods and services more efficient.

It also generates net revenues to support the Mayor's Transport Strategy more generally.

This is the fourth in a series of annual reports describing the impacts of congestion charging in and around central London.

In June 2003 TfL published the *First Annual Monitoring Report*. This described the scope of the monitoring work that had been put in place to ensure that the impacts of congestion charging were comprehensively measured. Conditions applying before charging across a range of key indicators were set out, and information given describing how and when any changes to these indicators would be measured.

In April 2004 TfL produced the *Second Annual Monitoring Report*. This described available information on the impacts of the scheme after approximately one year of operation.

TfL's *Third Annual Monitoring Report* was published in April 2005. This updated and extended the assessment of the impacts of congestion charging based on two years of data following the start of the scheme.

This *Fourth Annual Monitoring Report* draws on the most recent data for 2005, reflecting three years of operation of the scheme, alongside previously published findings for 2004 and 2003. It further extends and consolidates the body of knowledge and understanding now available, enabling commentary on the development of post-charging trends as well as comparisons with conditions before charging started in 2002.

This report also provides initial data on the impacts of the Variations to the scheme in July 2005, consisting of an increase to the basic daily charge from £5 to £8 alongside other related changes to the operation of the scheme. However, given issues of uncertainty in the data, it is not yet possible to give a complete analysis of the impacts.

This report also outlines TfL's proposals for monitoring the impacts of the forthcoming western extension to the central London congestion charging zone.

This Overview summarises the key contents of this *Fourth Annual Monitoring Report*.

Three years on

- During 2005, congestion charging has continued to meet its principal traffic and transport objectives; and the scheme continues to operate well.
- Traffic patterns in and around the charging zone remained broadly stable during 2005. The changes to the scheme introduced in July 2005 were associated with small net reductions in traffic volumes, and overall traffic patterns are close to those of 2003 and 2004.
- Reductions in congestion inside the charging zone over the whole period since the introduction of the scheme now average 26 percent. This reflects an apparent combined effect of some gains following the July 2005 changes, offset by the loss of decongestion benefits since late 2004.
- However, measurements against a 'static' pre-charging baseline are increasingly inappropriate. In comparison with pre-charging trends, road users in 2005 were probably experiencing an effective 30 percent reduction in congestion, comparable to that in 2003 and early 2004.
- Although a full analysis is not yet available, it is clear that traffic conditions inside and outside the charging zone are being influenced by the reallocation of network capacity to meet other policy objectives, such as improved pedestrian safety and amenity. The effect of the charging scheme therefore needs to be assessed in this context.
- Public transport continues to successfully accommodate displaced car users, and bus services continue to benefit from significantly improved reliability and ongoing investment.
- Further economic trend data and comparative analyses continue to demonstrate that there are no significant net impacts from the scheme on the central London economy.
- Gains in road traffic accidents and reductions to emissions of key traffic pollutants in and around the charging zone continue to be apparent, alongside favourable 'background' trends in both of these indicators.
- The scheme generated net revenues of £122 million in 2005/6 (provisional figures), partly reflecting the charge increases from July 2005. These are being spent largely on improved bus services within London.
- The operation and enforcement of the scheme continue to work well, with several improvements and innovations introduced during 2005.
- TfL's monitoring proposals for the forthcoming western extension to the central London congestion charging zone have now been defined, and baseline data collection has commenced for all key indicators.

Traffic patterns

- Traffic patterns in and around the charging zone remained broadly stable during 2005. The changes to the scheme introduced in July 2005 were associated with small net reductions to traffic volumes, and overall patterns of traffic are close to those of 2003 and 2004.
- The total volume of traffic (vehicles with four or more wheels) entering the charging zone on an average day during charging hours in Spring 2005 was 1 percent less than the equivalent value for 2004. The total volume of traffic entering the charging zone during Autumn 2005, following the changes to the scheme in July 2005, was 4 percent lower than the equivalent value for 2004.
- Data for early 2006 suggest reductions of 6 percent in traffic (vehicles with four or more wheels) entering the charging zone compared to equivalent counts in 2005.
- Available indicators of traffic circulating within the charging zone for 2005 suggest slightly declining traffic levels. However, road network issues have affected the comparability of counts, and the picture relating to the impact of the July 2005 changes to the scheme is less clear for circulating traffic than for traffic entering the charging zone.
- Measured vehicle-kilometres driven on the Inner Ring Road again fell slightly during 2005. These are now closely comparable to pre-charging values in 2002.
- Volumes of radial traffic approaching the charging zone during Autumn 2005 across a cordon surrounding central London again declined slightly compared to values recorded in the previous year.
- There continues to be no evidence of adverse traffic impacts on roads surrounding the charging zone, and an overall pattern of slowly declining 'background' traffic levels is again evident from various measurements of traffic in inner London.
- Measurements of traffic entering the charging zone at weekends between 2002 and 2005 also show a trend of small year-on-year 'background' declines. There are no obvious direct effects from congestion charging on weekend traffic levels, though peak traffic volumes entering the charging zone on both Saturdays and Sundays exceed those on weekdays for parts of the afternoon and overnight periods.

Congestion

- Measurements of congestion within the charging zone during 2005 have begun to reflect the long-term 'background' evolution of the road network, with the continuing adjustment of effective network capacities to meet a wider range of traffic and transport priorities.
- Taking the 18 available bi-monthly survey measurements, post-charging reductions to congestion inside the charging zone compared with pre-charging conditions in 2002 now average 26 percent during charging

hours. Looking only at the 2005 calendar year, the average reduction is 22 percent.

- Typical delay values in the charging zone in 2005 were 1.8 minutes per kilometre, compared with 1.6 minutes per kilometre previously reported and 2.3 minutes per kilometre for representative conditions before the introduction of charging in 2002.
- These are lower percentage reductions than those reported for 2003 and 2004, but are still within TfL's range of expectation of between 20 and 30 percent.
- The results need to be understood in the context of longer-term trends to congestion in central and inner London. These suggest that competing demands on road network capacity have meant continuing adjustments to capacity, leading to increasing delays for traffic inside and outside the charging zone. Inside the zone these adjustments would have had a broadly similar effect on network traffic speeds with or without congestion charging.
- These adjustments, in pursuit of other Mayoral transport priorities, have resulted in, for example, improved safety and amenity and increased priority for buses, taxis and cyclists. In simple terms, the moving-motor-vehicle capacity of the network has been adjusted in favour of the people-moving capacity of the network.
- Therefore, comparison against a 'static' baseline for 2002 is increasingly inappropriate. Comparisons based on a projection to 2005 of the long-term trend, in the notional absence of congestion charging, suggest that road users in the charging zone are probably still experiencing reduced congestion of the order of 30 percent.
- TfL continue to record overall reductions in congestion on both the Inner Ring Road and on the main radial routes approaching the charging zone. Conditions in 2005 have shown similar conditions to those previously reported for 2004, and there are still small gains compared with pre-charging conditions on these routes in 2002.
- Measurements of congestion on main roads in inner London for 2005 show a small increase in congestion compared with previous surveys, both before and after the introduction of charging, with average delays of 1.5 minutes per kilometre, compared to 1.3 minutes per kilometre in 2002. Again, this appears to reflect a longer-term trend.

Public transport

- Numbers of passengers entering the charging zone by bus were not measured directly in 2005. However, the number of bus passengers entering a wider definition of central London in the weekday morning peak was comparable to 2004, at 116,000.
- The availability of bus services continues to satisfactorily accommodate patronage.

- Reliability of bus services in and around the charging zone remained broadly unchanged in 2005, reflecting established gains from both congestion charging and other improvements to bus operations.
- Although 52 people were killed and 700 were injured and there was considerable short-term disruption, the London bombings of July 2005 had little long-term impact on Underground travel. The number of passengers entering central London by Underground increased overall in comparison with both 2003 and 2004, usage in 2005 overall being closely comparable to pre-charging conditions in 2002.

Business and the economy

- The growth of the London economy remained positive in 2005 despite the effects of the bombings in central London in July 2005.
- Businesses performance in the charging zone was significantly better than in the rest of London, particularly in terms of profitability and productivity.
- Updated analysis of comparative trends in various indicators of overall business performance, including change in jobs, business populations and turnover continue to show no evidence of differential effects between the charging zone and comparator locations that might be indicative of a congestion charging impact, either positive or negative, on aggregate business performance in central London.
- Trends in business registrations for VAT, appeals in respect of business rate valuations, and commercial property price trends, do not support the suggestion of a significant congestion charging impact on businesses in central London.
- Although year-on-year retail sales in central London saw a sharp decline throughout the July to September 2005 period, following the London bombings, by early 2006 this trend was reversed resulting in full recovery with annual growth rates above those being seen in the rest of the UK.
- Within the charging zone, the retail sector has increased its share of enterprises and employment since 2003.
- The majority of charging zone businesses continue to recognise that decongestion had created a more pleasant working environment and easier journeys for employees using public transport for travel to work.
- Amongst businesses in the charging zone as a whole, there were more supporters of the congestion charge than opponents.
- An independent review of the monitoring of the economic and business impacts of congestion charging reported that it was reasonable to conclude that the £5 congestion charge had had a broadly neutral impact on the central London economy.

Accidents and the environment

- 2004/2005 saw substantial further falls in the number of road accidents across Greater London, reflecting wider TfL and borough road safety initiatives.
- Trends in accidents within the charging zone during 2004/2005 have been comparable to those observed elsewhere in London, reflecting broader trends and continuing road safety initiatives, and maintaining the incremental gains from congestion charging.
- Independent statistical treatment of the accumulating time series of road traffic accident data confirm TfL's earlier conclusions that congestion charging has led to additional net reductions of between 40 and 70 personal injury accidents per year within the charging zone and on the Inner Ring Road.
- There continues to be no evidence of disproportionate or detrimental impacts on the more vulnerable road users in or around the charging zone.
- A revised assessment of vehicle emission impacts broadly confirms the scale of estimated reductions in emissions of NO_x, PM₁₀ and CO₂ within the charging zone resulting from changed traffic conditions and developments in vehicle technology. They also confirm the broadly neutral impact of congestion charging on emissions in relation to the Inner Ring Road.
- Technical enhancements to the monitoring have led to the identification of a relatively larger contribution to reduced emissions in central London over recent years from changes to the technology profile of vehicles in central London than was previously recognised.
- The combined effect of charging and improved vehicle technology is that NO_x emissions within the charging zone fell by 13 percent and total PM₁₀ emissions fell by 15 percent, comparing annual average values for 2002 and 2003 – comparable to the estimates previously reported.
- Measured concentrations of PM₁₀ within the charging zone have declined somewhat, but this could be for a range of reasons as well as congestion charging. Concentrations of NO_x have declined slowly, but this has not been matched by corresponding decreases in NO₂.
- Limited sample surveys of ambient noise in and around the charging zone continue to suggest the absence of a detectable congestion charging impact.

Boundary case study

- Further monitoring work in a case study area adjacent to the charging zone boundary in the boroughs of Islington and Hackney reveals a similar picture to that previously reported. The impacts of congestion charging remain broadly neutral overall, and there is a continuing absence of 'boundary related' problems associated with the scheme.

- Traffic patterns in the boundary case study area in 2005 remained comparable to those observed generally in relation to congestion charging, with further small reductions to traffic crossing into or out of the charging zone, generally stable flows on the Inner Ring Road, and continuing small reductions to radial traffic approaching the charging zone.
- Public transport trends similarly mirrored those observed elsewhere, with continued improvements to bus service provision, further small increases in bus patronage, and increases in Underground travel – all reflecting wider network trends.
- The economy in the boundary case study is characterised by small businesses, many of which classify themselves as ‘places that customers visit’. VAT registrations show that the number of businesses operating in the area both inside and outside the charging zone was unaffected by the introduction of charging, and independent data show that there has been steady growth in sales since the introduction of charging.
- Businesses in the boundary case study area were broadly supportive of congestion charging and did not report any significant negative effects. Factors such as organisational change, the economy, and the threat of terrorism were seen to have had more of an influence on business performance. There were no significant differences between the attitudes and experiences of business operating just inside and just outside the boundary in this area.
- Trends in air quality in the boundary case study area have followed the inner London trend, as have trends in personal injury road traffic accidents.
- Generally, it has not been possible to identify any specific effects in this boundary case study area that can be associated with the introduction of congestion charging.

July 2005 Variations

- The charge payment, traffic trend and congestion data now available permit an interim assessment of the impacts of the July 2005 Variations, though seasonal effects mean that these results need to be interpreted with caution. Latest data indicate outcomes broadly within TfL’s range of expectation, but data for earlier months during the latter half of 2005 are less clear, potentially reflecting influences associated with the bombings in central London in July 2005.
- The total number of charge payments valid on a typical day during the latter part of 2005 was about 96,000. This reflects a reduction of about 11 percent over typical payment levels in the first half of 2005. Users of the fleet scheme increased by 8 percent, reflecting the enhancements made to this scheme. The number of residents’ payments remained broadly unchanged, as did the number of chargepayers purchasing monthly or annual charges, despite the financial incentive now available.
- Volumes of traffic entering the charging zone declined by up to 6 percent (vehicles with four or more wheels, equivalent weeks in 2005 and 2006). Taking background trends into account, this suggests that the July 2005

Variations have been responsible for reductions in entering traffic of about 4 percent – towards the lower end of the range of TfL's prior expectation.

- Trends in traffic circulating within the charging zone are less distinct, data for early 2006 indicating overall reductions of between 3 and 4 percent in circulating traffic (vehicles with four or more wheels). Taking background trends into account, this again suggests an outcome towards the lower end of TfL's range of prior expectation.
- There is evidence from across the available data that reductions to potentially chargeable vehicles (cars, vans and lorries) have been partly offset by increases in non-chargeable vehicles (buses, taxis and two-wheeled vehicles).
- Surveys of travel behaviour change by chargepayers in response to the July 2005 Variations indicate that typically two-thirds of vehicle trips in the charging zone are work-related (either for commuting to and from work or for employers' business), and that approximately 60 percent of drivers paying through non-retail and non-fleet payment channels report that they bore the cost of the congestion charge themselves.
- The surveys suggest reductions in chargeable travel to the zone in the range 8 to 17 percent across a range of indicators of travel, these broadly corresponding to the observed changes in payments and traffic levels.

Scheme costs, benefits and revenues

- A revised analysis of the operating costs and traffic benefits of the scheme has confirmed that the £5 charge resulted in net annual benefits of roundly £90 million.
- In financial year 2005/06 the scheme generated net revenues of £122M (provisional figures) including additional net income in the period from July 2005, when the basic daily charge was raised from £5 to £8.
- These revenues have again been largely spent on improved bus services within London.

Scheme operation

- The benefits of TfL's Supplemental Agreement with Capita continue to be apparent, with all major elements of the scheme operating satisfactorily during 2005. Chargepayer satisfaction with the quality of service reached a new high of 78 percent in 2005.
- The July 2005 Variations introduced several changes to the operation of the scheme. In addition to an increase in the charge to £8 and an increase to £7 in the charge for registered fleet vehicles, chargepayers purchasing monthly or annual charges now receive a 16 percent discount, to better reflect their actual usage. The automated fleet scheme is now open to all vehicle types.
- Total valid charge payments reduced after the increase in the daily charge in July, and stabilised at new levels relatively quickly. In the second half of

2005 typically 96,000 charge payments were made per charging day, about 11 percent lower than in the first half of 2005.

- Residents' discount processes were greatly improved, through streamlining the renewal process and aligning the discount and annual charge payment periods.
- Public Information developments in the past year include a downloadable computer desktop reminder to pay the charge, and radio campaign reminding motorists of the hours of operation of the scheme.
- Enhancements have been made to the charge payment channels, including the addition of more PayPoint outlets in petrol stations, and implementation of an express payment option into the interactive voice response system.
- The internet is now the most-used channel for charge payments, accounting for 30 percent of transactions.

Scheme enforcement and compliance

- The number of Penalty Charge Notices issued has continued to reduce throughout 2005. This can be attributed to greater chargepayer understanding of the operation of the scheme, as well as ongoing service improvements and reduced levels of chargeable travel to the zone following the July 2005 charge increase.
- Overall, 21 percent fewer Penalty Charge Notices were issued in 2005 compared to 2004. The percentage of these that resulted in representations fell to a new low of 17 percent.
- Several aspects of TfL's enforcement of the scheme were further enhanced during 2005, including the introduction of new mobile enforcement units.
- TfL's congestion charging enforcement also provided assistance to the Metropolitan Police and other enforcement agencies in respect of criminal activity in and around the charging zone.

Monitoring programme

- The monitoring programme continues to proceed according to the broad plan set out in the *First Annual Monitoring Report*. Various enhancements have been put in place to reflect evolving priorities since the introduction of the scheme, including a supplementary programme of work to measure the impacts of the July 2005 Variations. In general, the arrangements have proven effective in enabling TfL to understand and interpret the changes that congestion charging has brought about.
- TfL expects to implement the western extension to the central London congestion charging zone in early 2007. A comprehensive programme of impacts monitoring work has been defined to reflect this, building on and incorporating the work for the central London zone. Full baseline data collection is being undertaken throughout 2006, with a comprehensive

Overview

report on conditions before the implementation of the extension expected to be published in 2007.

1 Introduction

1.1 Purpose

This is the fourth in a series of annual reports describing the impacts of congestion charging in central London. It summarises the growing body of evidence and insight from across the monitoring programme, now reflecting three years of operation of the central London congestion charging scheme. It makes comparisons with conditions applying before charging started and, where appropriate, with Transport for London's (TfL's) expectations for the scheme before it was launched. It reviews available information describing the impacts so far of the July 2005 Variations to the scheme, and summarises TfL's monitoring proposals for the forthcoming western extension to the central London charging zone, expected to be implemented in February 2007.

The contents of this report reflect the Mayor and TfL's commitment to a comprehensive programme of monitoring of TfL's congestion charging schemes. TfL's monitoring covers not only the more immediate traffic and transport impacts of charging, but also wider social, economic and environmental impacts. It consolidates information from a large number of specially-designed surveys, whilst making full use of already established surveys and data resources.

The scope of the material now available to TfL far exceeds what is possible to publish in a report of this nature. This report therefore provides a summary of key findings and emerging appreciations of impacts that are likely to be of most general interest.

1.2 The central London congestion charging scheme

Congestion charging was successfully introduced in central London in February 2003. It contributes directly to four of the Mayor's transport priorities:

- to reduce congestion;
- to make radical improvements to bus services;
- to improve journey time reliability for car users;
- to make the distribution of goods and services more efficient.

It also generates revenues to support the Mayor's Transport Strategy more generally.

Until July 2005, the congestion charge was a £5 daily charge for driving or parking a vehicle on public roads within the congestion charging zone between 07.00 and 18.30, Monday to Friday, excluding weekends and public holidays. Since July 2005 the basic daily charge has been £8.

The central London congestion charging zone is shown in Figure 1.1. It covers 22 square kilometres in the heart of London, including centres of government, law, business, finance and entertainment.

1. Introduction

Figure 1.1 The central London congestion charging zone.

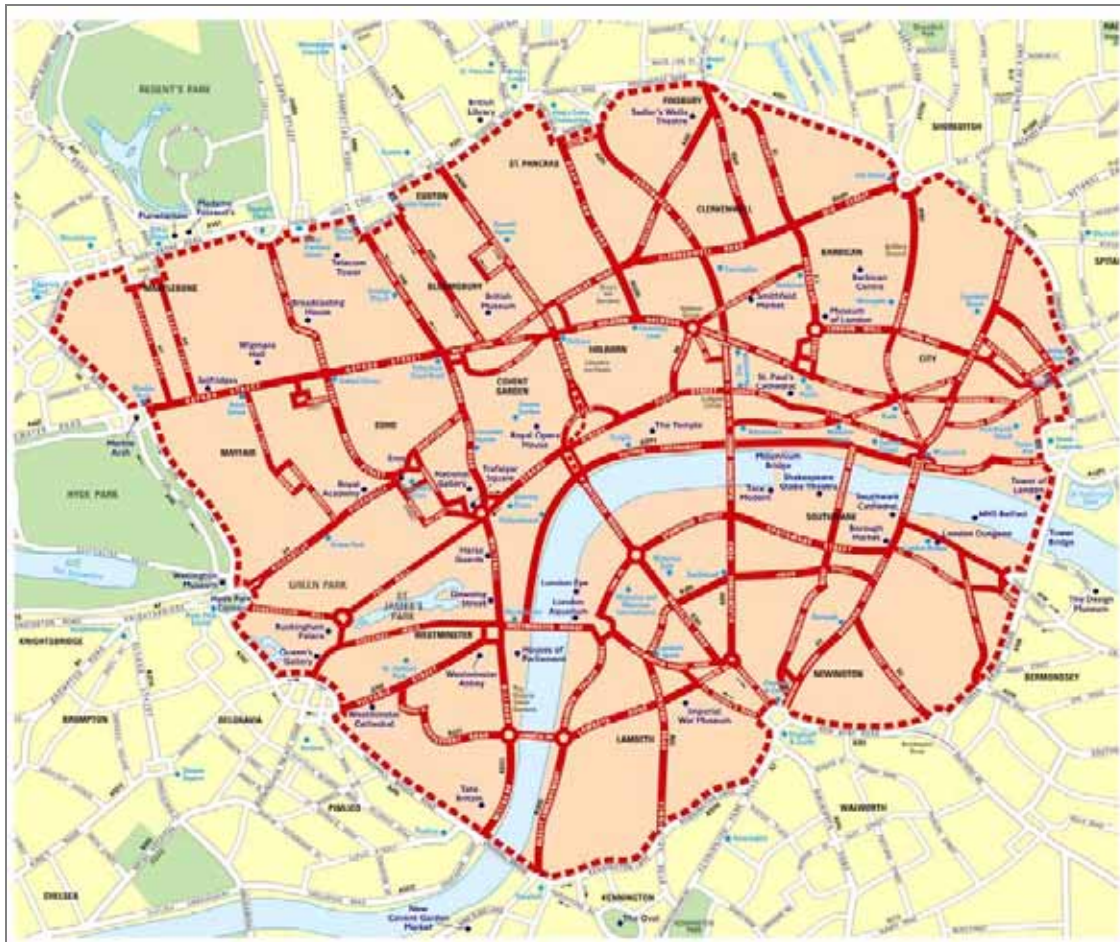


Figure 1.2 The central London congestion charging zone within the Greater London boundary.



The Inner Ring Road forms the boundary of the congestion charging zone, and no charge applies to vehicles using this route.

Certain categories of vehicle, notably taxis, London licensed private hire vehicles, motorcycles, pedal cycles and buses, are exempt from the charge. Certain categories of vehicle users can register for discounts. For example, residents of the congestion charging zone can register for a 90 percent discount (for a minimum weekly payment), and disabled persons' Blue Badge holders and certain alternative fuel vehicles are eligible for a 100 percent discount and so pay no charge.

1.3 Key developments with the scheme

The central London congestion charging scheme – including its associated traffic management and complementary public transport measures – is kept under continual review by TfL. Various adjustments have been made to the scheme since it was first formally proposed in a Scheme Order made by TfL in 2001 and confirmed by the Mayor in 2002. The Scheme Order is the legal framework for the congestion charging scheme and contains the definitions of what the charge is, where it applies, details on discounts and exemptions from the scheme, penalty charges, refunds and so on. Scheme Orders are made under the powers set out in Schedule 23 of the *Greater London Authority Act 1999*.

TfL's *Third Annual Monitoring Report*, published in April 2005, listed 10 variations to the Scheme Order that had either been made or were being consulted upon to that date. The majority were concerned with improving operational, payment and enforcement arrangements for the scheme. Others were proposals to change the basic daily charge amount itself from £5 to £8, alongside modification to other elements of the charging structure.

Changes to the Scheme Order are made through a procedure known as a Variation Order. Each Variation Order is subject to public consultation before the Mayor considers TfL's response to the representations received and decides whether or not he wishes to confirm the change (with or without modifications) and make it part of the Scheme Order.

Variation Orders dealing with the changes to the charge level and payment structure were implemented in July 2005. These significantly altered the basis of the original scheme and involved the following key changes:

- Raising the level of the charge from £5 per charging day to £8 per charging day for vehicles not on fleet schemes.
- Raising the level of the charge from £5.50 per charging day to £7 per charging day for vehicles on the automated fleet scheme; and from £5 per charging day to £7 per charging day for vehicles on the notification fleet scheme. The notification fleet scheme was subsequently replaced by extension of the automated fleet scheme.
- Discounting monthly and annual charges by 15 percent.

1. Introduction

- Reducing a number of administrative charges.

Early findings from the monitoring programme relating to the impact of these changes are reflected throughout this report.

In the year since the publication of the *Third Annual Monitoring Report*, TfL have undertaken consultation on a further three Variation Orders:

- **Variation Order 2005:** introduced the western extension (which is dealt with elsewhere in this report) and also confirmed the 'Pay Next Day' facility to commence in October 2006 (subsequently further amended).
- **Variation Order (No. 2) 2005:** removed an anomaly and ensured that a resident could not purchase monthly or annual charges at the discounted rate, which extended beyond the period which their vehicle is registered for the discount.
- **Variation Order 2006:** bought forward the implementation date for the Pay Next Day facility from October 2006 to June 2006, and provided an incentive for residents in the western extension residents discount zone and Blue Badge holders to apply for their respective discount early. This is intended to avoid excessive demand on the congestion charging contact centre close to the start date of the western extension.

TfL will continue to keep all elements of the congestion charging scheme under review and will recommend making further changes to the Scheme Order where appropriate.

1.4 Overview of the monitoring programme

The scope of the monitoring programme for the scheme was described in detail in the *First Annual Monitoring Report*.

The monitoring programme consists of five key work streams, designed to assess the range of traffic, transport, social, economic and environmental impacts of congestion charging. In addition, information from key scheme operational and enforcement functions is also available.

The programme features over 100 directly-sponsored survey and research activities, designed to investigate specific issues and complement the wealth of information gathered by third-parties, such as the public transport operators, together with other official sources and stakeholder groups.

The work is managed by a team of permanent TfL staff, with independent contractors undertaking most of the main data collection and analysis tasks. The TfL team is supported by a number of specialist external academic and professional advisers. Specialist input on economic and business impacts is provided by GLA Economics.

In general, the monitoring for the central London congestion charging scheme has operated satisfactorily and continues to track key developments and

provide a growing body of evidence and appreciations describing both the impacts of charging and the mechanisms at work.

Going forward, the forthcoming western extension to the central London congestion charging zone has led to a thorough review and extension of the monitoring work. This will ensure that the key impacts of the western extension are captured, including any consequent impacts on the central London zone. TfL's proposals for monitoring the western extension are summarised in this report.

1.5 Findings from the monitoring work so far

In June 2003 TfL published the *First Annual Monitoring Report*. This described the scope of the monitoring work that had been put in place to ensure that the impacts of congestion charging in central London were robustly and comprehensively measured. Conditions applying before the introduction of the scheme across a range of key indicators were set out, and information given describing how and when changes to these indicators would be measured.

Since the introduction of congestion charging TfL has produced a range of reports detailing emerging results from the monitoring work. Three summary update reports were produced during 2003 and into 2004, providing early feedback on the key impacts of the scheme. In April 2004 TfL published the *Second Annual Monitoring Report*, giving comprehensive overview of key outcomes reflecting one year of operation of the scheme. In January 2005, TfL produced a further *Summary Review* reporting on the position for the remainder of 2004. In April 2005, TfL published the *Third Annual Monitoring Report*, giving a more comprehensive summary of developments during 2004.

This *Fourth Annual Monitoring Report* is informed by a further year of evidence from the monitoring work, enabling a more thorough appreciation of the impacts of the central London scheme to date. The focus is on the impacts of charging at £5, prior to the July 2005 Variations. However, early indications of the impact of these Variations, principally the raising of the basic daily charge to £8, are explored. This report also looks forward to the forthcoming western extension to the central London charging zone, expected to be implemented in February 2007. It summarises the monitoring that is being put in place by TfL and briefly describes some of the key indicators that will be available.

All of these reports now provide a good appreciation of the impacts of the scheme. In general, during 2005, congestion charging has again continued to meet its principal traffic and transport objectives and the main elements of the scheme continue to operate satisfactorily.

1.6 Report contents

The remainder of this report presents a summary of findings from across the monitoring programme to date, combined with updates on key aspects of scheme operation and enforcement. The emphasis is on consolidation of the increasing body of evidence and understanding available from the monitoring work for the central London scheme, briefly looking forward to the monitoring proposed for the forthcoming western extension.

There are 11 sections, including this introduction:

- **Traffic patterns.** The impacts of the scheme on traffic volumes and characteristics in and around the charging zone are described, drawing principally on comprehensive traffic surveys undertaken during 2005.
- **Congestion.** This section updates key indicators of traffic congestion in and around the charging zone, drawing on surveys undertaken throughout 2005, and also looking at new camera and satellite-based indicators of road network performance.
- **Public transport.** Trends and developments since the introduction of charging are reviewed, alongside some specific findings for 2005.
- **Business and economic impacts.** This section reviews new and updated evidence relating to the impacts of the scheme on businesses and economic activity in central London.
- **Accidents and the environment.** This section updates the position on key indicators of road safety and air quality.
- **Boundary case study.** This section updates the findings for 2005 from the research undertaken in a boundary case study area, comprising parts of the boroughs of Islington and Hackney outside of, but immediately adjacent to, the boundary of the charging zone.
- **July 2005 charge Variations.** This section assembles available evidence from traffic surveys, TfL's charge payment data and behavioural surveys to describe emerging appreciations of the impact of the July 2005 Variations.
- **Scheme costs, benefits and revenues.** This section summarises and updates the valuation of the benefits and the financial impacts of the scheme.
- **Scheme operation, enforcement and compliance.** This section reviews key indicators relating to the operation of the scheme and recent trends and developments in relation to the enforcement of the scheme.
- **Monitoring an extended congestion charging zone.** This section outlines TfL's monitoring proposals for the forthcoming western extension to the central London congestion charging zone and illustrates some of the key indicators that will be available, preliminary to a more comprehensive presentation of these indicators in a report to be published during 2007.

1.7 Other influences

Congestion charging was introduced against a backdrop of wider changes to travel patterns in London, brought about by social and economic change and the implementation of the other elements of the Mayor's Transport and other Strategies.

All of these will have had an effect on the measurements described in this report, which in general will reflect the net out-turn of a combination of traffic, transport and other effects, many of which are completely unrelated to congestion charging. It is not therefore usually possible to precisely identify a 'congestion charging effect', although in many cases the available evidence allows a reasonable estimate to be made.

A particular example affecting the period covered by this report would be the July 2005 bombings of three Underground trains and a bus in central London. These killed 52 people and injured a further 700. These and the subsequent security measures understandably had an effect on travel to and within central London, although the evidence presented in this report suggests these effects were largely short term.

2 Traffic patterns

2.1 Introduction

This section reviews the key trends in traffic activity in and around the central London congestion charging zone during 2005. It builds upon previous analyses and provides a perspective on three years of operation of congestion charging in central London.

The analysis covers the period of the adjustments to the charge in July 2005. Whilst these changes are necessarily considered in this section, a more in-depth consideration of the overall impacts of the July 2005 Variations is given in Section 8.

Key findings from previous reports

Congestion charging was expected to deliver decongestion benefits by reducing the volume of traffic entering and circulating within the charging zone during charging hours.

After one year of operation, TfL observed that:

- Traffic had adjusted rapidly to the introduction of charging and there had been few operational traffic problems. Post-charging traffic patterns became established quickly and had remained relatively stable throughout 2003.
- Traffic circulating within the charging zone had reduced by 15 percent during charging hours (vehicle-kilometres driven by vehicles with four or more wheels). Traffic entering the charging zone during charging hours had reduced by 18 percent (vehicles with four or more wheels). Both of these outcomes were towards the top end of the range of TfL's prior expectation.
- Although overall increases in traffic had been observed on the Inner Ring Road, these were smaller than TfL had expected and were not leading to traffic operational problems on this key diversionary route.
- There was no systematic evidence of increased traffic outside of scheme operational hours or in the area surrounding the charging zone, and the balance of evidence was pointing to overall 'background' declines in traffic in central and inner London.
- On selected local roads in boroughs in and around the charging zone there was no significant change observed in overall traffic levels.

After two years of operation, TfL observed that:

- Traffic patterns in and around the charging zone had again remained broadly stable throughout 2004. The main indicators of traffic volumes were comparable to those recorded in 2003, and therefore the traffic changes observed with the introduction of charging had been maintained.

- The total volume of traffic entering the charging zone during charging hours during 2004 was identical to 2003, still representing a reduction of 18 percent against 2002 pre-charging levels. Indicators of traffic circulating within the charging zone for 2004 suggested broadly stable or slightly-declining traffic levels.
- Measured vehicle-kilometres driven on the Inner Ring Road fell very slightly during 2004, compared to 2003.
- Volumes of radial traffic approaching the charging zone during Autumn 2004 across a cordon surrounding central London were almost identical to those recorded in 2003 following the introduction of charging.
- Traffic levels on selected local roads in boroughs in and around the charging zone decreased slightly overall in 2004 compared to 2003.
- There was increasing evidence of small but consistent year-on-year 'background' declines to traffic in central and inner London, complicating the assessment of charging impacts.

Traffic trends in 2005

TfL's traffic monitoring has continued throughout 2005, providing a comparable set of indicators to those previously reported.

The established counts were supplemented in several respects during 2005 to allow examination of changes associated with the July 2005 Variations. A key implication of these Variations is that the previous practice of expressing traffic trends as 'annualised estimates' based on a simple average of counts undertaken in the Spring and Autumn 'neutral' survey periods is less appropriate, as the Variations themselves will have affected traffic levels during 2005. Where available counts and statistical precision allow, findings for Spring and Autumn 2005 are considered separately, based on the average of the two counts in each 'season' in 2005.

Key findings for 2005 are that:

- The main indicators of traffic volumes for 2005 are comparable to those previously observed in 2003 and 2004, with evidence of overall reductions in traffic coinciding with the July 2005 Variations.
- The total volume of traffic entering the charging zone during charging hours in Spring 2005 was 1 percent less than the annualised value for 2004 (vehicles with four or more wheels). The Autumn 2005 counts showed an equivalent reduction of 4 percent in the number of vehicles with four or more wheels entering the charging zone. This gives an average 'annualised' reduction for 2005 of 3 percent against 2004, and now represents an overall reduction of 21 percent compared to pre-charging levels in 2002.
- Available indicators of traffic circulating within the charging zone for 2005 again suggest broadly stable or slightly declining traffic levels. However, road network issues have affected the continuity of the time-series of

2. Traffic patterns

counts, and the picture relating to the impact of the July 2005 Variations is less clear for circulating traffic than for traffic entering the charging zone.

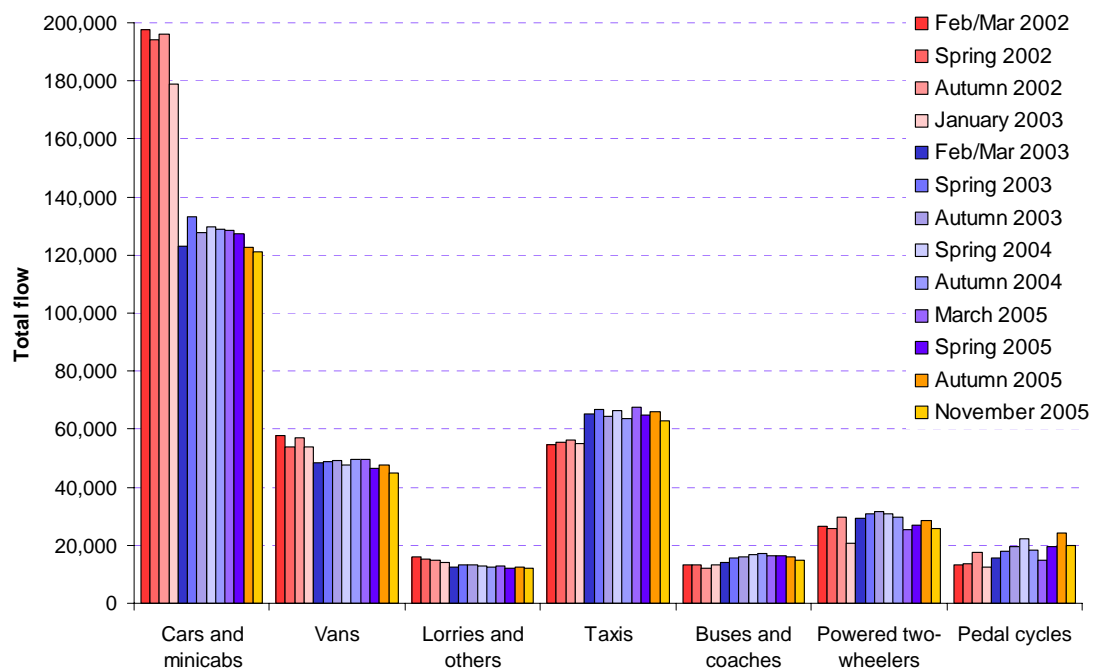
- Measured vehicle-kilometres driven on the Inner Ring Road fell slightly during 2005. These are now closely comparable to pre-charging values in 2002.
- Volumes of radial traffic approaching the charging zone during Autumn 2005 across a cordon surrounding central London declined very slightly compared to values recorded in the previous year.
- There continues to be no evidence of adverse traffic impacts on roads surrounding the charging zone, and an overall pattern of slowly declining 'background' traffic levels is again evident from various measurements of traffic in inner London.
- Measurements of traffic entering the charging zone at weekends between 2002 and 2005 also show a trend of small year-on-year 'background' declines. There are no obvious direct effects from congestion charging on weekend traffic levels, but peak traffic volumes entering the charging zone on both Saturdays and Sundays exceed those on weekdays for parts of the afternoon and overnight periods.

2.2 Traffic entering the charging zone during 2005

Comprehensive counts of weekday traffic entering and leaving the charging zone across all road-based entry and exit points are conducted each Spring and Autumn. The combined counts provide an 'annualised' estimate of traffic volumes for each year (ie the average of Spring and Autumn counts in each year). Additional counts have also been undertaken at other times.

For monitoring the July 2005 Variations, the counting frequency was doubled for 2005, giving two counts each Spring and Autumn, albeit during different months. This results in increased statistical precision for each of the Spring and Autumn estimates.

Figure 2.1 shows the available time-series for traffic entering the charging zone. Counts relating to the period before charging taken in 2002, those relating to the period of the £5 charge, between February 2003 and July 2005, and those following the July 2005 Variations are separately identified.

Figure 2.1 Traffic entering the charging zone during charging hours.

The overall picture is of broadly comparable levels of traffic to previous years albeit with some reductions to potentially-chargeable vehicles evident during the two Autumn 2005 counts. Therefore the significant reductions to traffic entering the zone observed after the introduction of charging continue to be maintained. Headline 'annualised' results for 2005 are: reductions of 17 percent in total traffic, 21 percent in vehicles with four or more wheels and 31 percent in potentially-chargeable vehicles, in relation to equivalent pre-charging figures for 2002.

These simple comparisons are potentially misleading, as it is necessary to consider the impact of the July 2005 Variations. Table 2.1 summarises trends in traffic entering the zone for charging hours for each of the 2005 'seasonal' counts, alongside established comparisons for earlier years. It is necessary to bear in mind that normal seasonal variation will affect these comparisons, particularly the implementation in 2005 of 'early Spring' and 'late Autumn' counts, which are included in the combined estimates for each season but which cover periods not previously surveyed.

2. Traffic patterns

Table 2.1 Key changes in traffic entering the charging zone during charging hours. Annualised weekdays for 2002 (pre-charging), 2003, 2004 and Spring 2005 (charging at £5) and Autumn 2005 (charging at £8).

Vehicle type	Change in inbound traffic:					
	2003 vs 2002	2004 vs 2003	2005 vs 2004	Spring 2005 vs Spring 2004	Autumn 2005 vs Spring 2005	Autumn 2005 vs Autumn 2004
All vehicles	-14%	0%	-4%	-4%	-2%	-3%
Four or more wheels	-18%	0%	-3%	-1%	-4%	-4%
Potentially chargeable	-27%	-1%	-3%	-1%	-4%	-6%
- Cars and minicabs	-33%	-1%	-3%	-1%	-5%	-6%
- Vans	-11%	-1%	-3%	+1%	-4%	-7%
- Lorries and other	-11%	-5%	-4%	-4%	0%	-3%
Non chargeable	+18%	+1%	-4%	-8%	+3%	0%
- Licensed taxis	+17%	-1%	0%	0%	-2%	+1%
- Buses and coaches	+23%	+8%	-6%	-2%	-5%	-10%
- Powered two-wheelers	+12%	-3%	-12%	-16%	+4%	-9%
- Pedal cycles	+19%	+8%	-3%	-23%	+28%	+20%

The overall picture for Spring 2005, before the July 2005 Variations, was of small reductions across all vehicle types compared with the equivalent Spring 2004 counts. These probably reflect the small 'background' declines to traffic referred to elsewhere in this section, although the indicated changes are not generally statistically significant. Furthermore, the 2005 data are the average of the two counts taken during each 'season', and the comparison between 2005 and 2004 (which was based on one count in each 'season' only) may also contain a seasonal component.

Comparing Autumn 2005 with Spring 2005, across the period of the July 2005 Variations, more pronounced declines in the majority of vehicle types are seen. Vehicles with four or more wheels and potentially chargeable vehicles each reduced by 4 percent, with an indicated 5 percent reduction in cars. This category includes 'minicabs', or London licensed private hire vehicles, which are exempt from the charge.

These reductions would appear to be associated with the July Variations themselves, since the Autumn 2005 to Autumn 2004 comparison gives a picture of more intense reductions. This suggests a possible compounding effect reflecting both the impact of the July 2005 Variations and a background decline in traffic.

In interpreting these comparisons for 2004 and 2005 it should be noted that:

- The majority of the indicated changes are not statistically significant at the 95 percent level.
- Whilst there have been declines for most vehicle types, potentially chargeable vehicles (cars, vans and lorries) have declined at a faster rate than non-chargeable vehicles (buses, taxis, two-wheelers).

- The larger changes indicated for pedal cycles are at least partly a function of the weather, but the overall picture is of strong increases in pedal cyclist numbers since the introduction of charging.
- Counts for buses are particularly susceptible to sampling error as these operate to an organised (regular) service pattern, but perhaps also reflect the substitution of larger articulated buses on some routes over the review period.

As previously reported, very similar trends in total traffic and for the individual types have also been observed for traffic leaving the charging zone during charging hours (Figure 2.2). This also applies to the more detailed 'seasonal' comparisons in relation to the July 2005 Variations.

Figure 2.2 Traffic leaving the charging zone during charging hours.

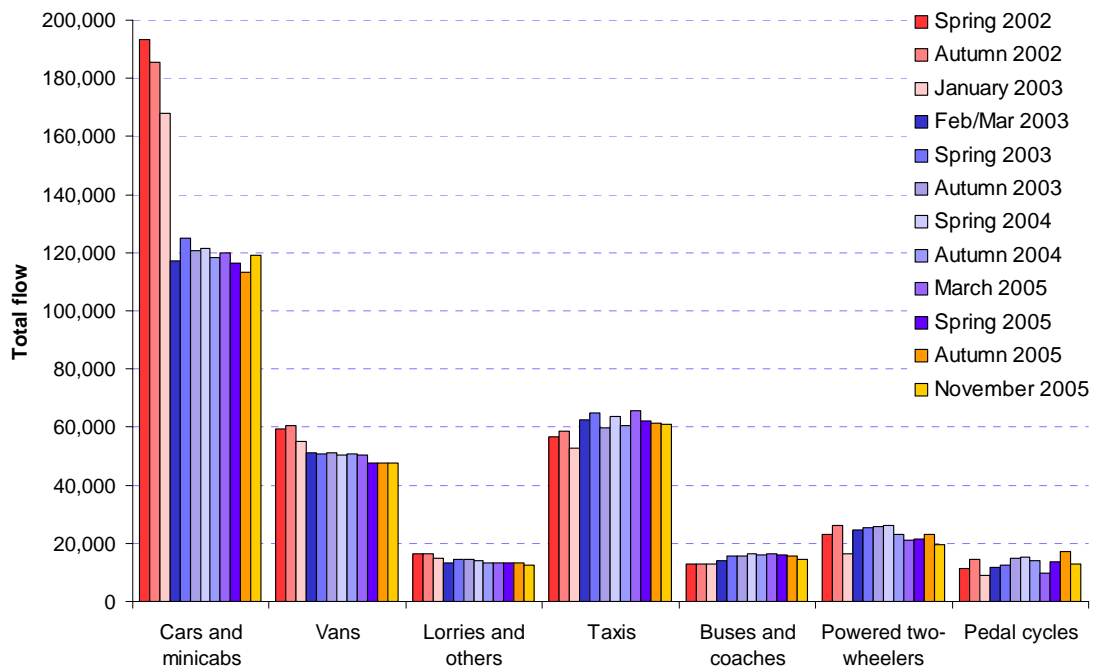


Figure 2.3 shows how volumes of traffic entering the charging zone are distributed across the day. Noting that the 'counting day' extends either side of the charging hours (from 06.00 to 20.00 hours) and that the four lines represent 'annualised' counts for 2002, 2003 and 2004 and 2005 (comparable Spring and Autumn counts only), the sustained effect of charging in reducing traffic levels is clear, as is the continuing trend of small year-on-year reductions in traffic entering the charging zone. Figure 2.4 shows the corresponding profile for traffic leaving the charging zone.

2. Traffic patterns

Figure 2.3 Traffic entering the charging zone by time of day. Annualised weekdays for 2002 (pre-charging), and 2003, 2004 and 2005 (post-charging), all vehicles.

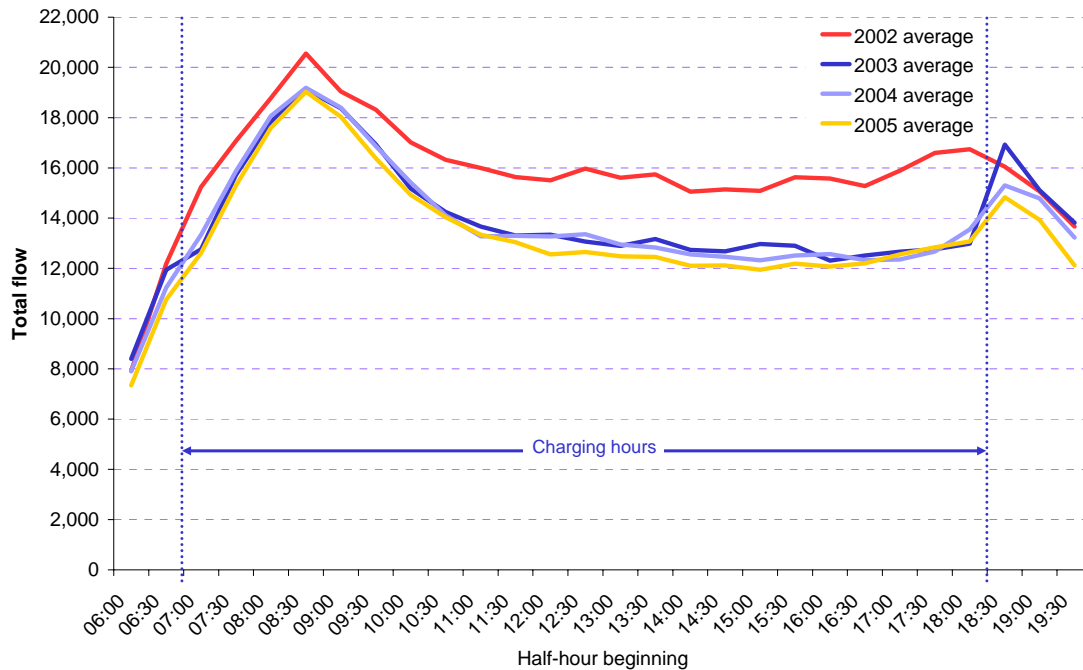
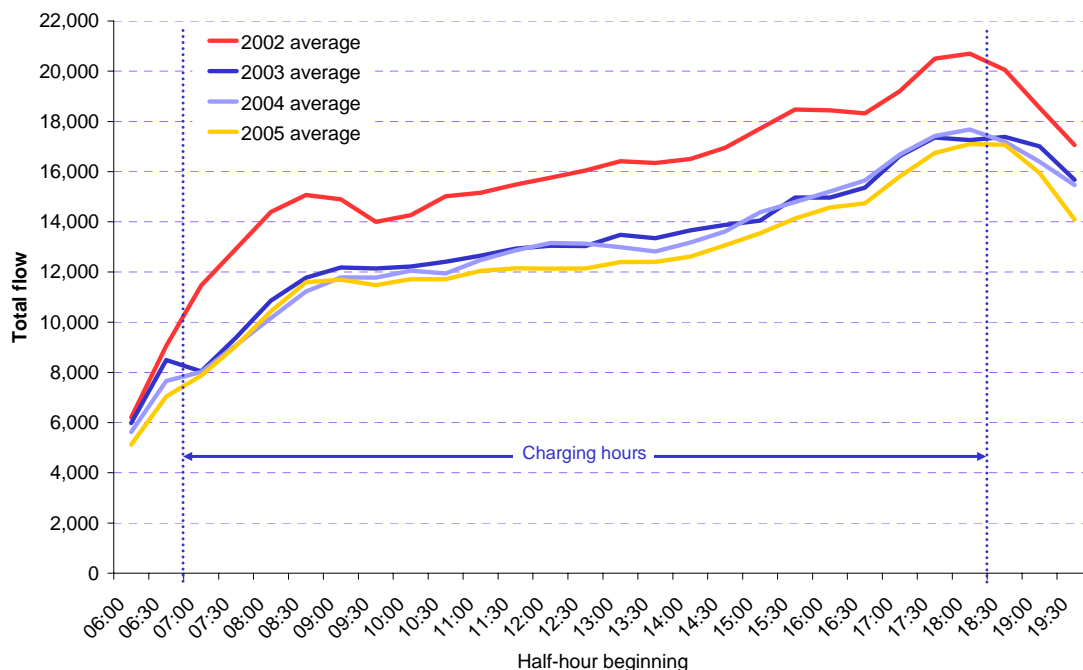


Figure 2.4 Traffic leaving the charging zone by time of day. Annualised weekdays for 2002 (pre-charging), and 2003, 2004 and 2005 (post-charging), all vehicles.



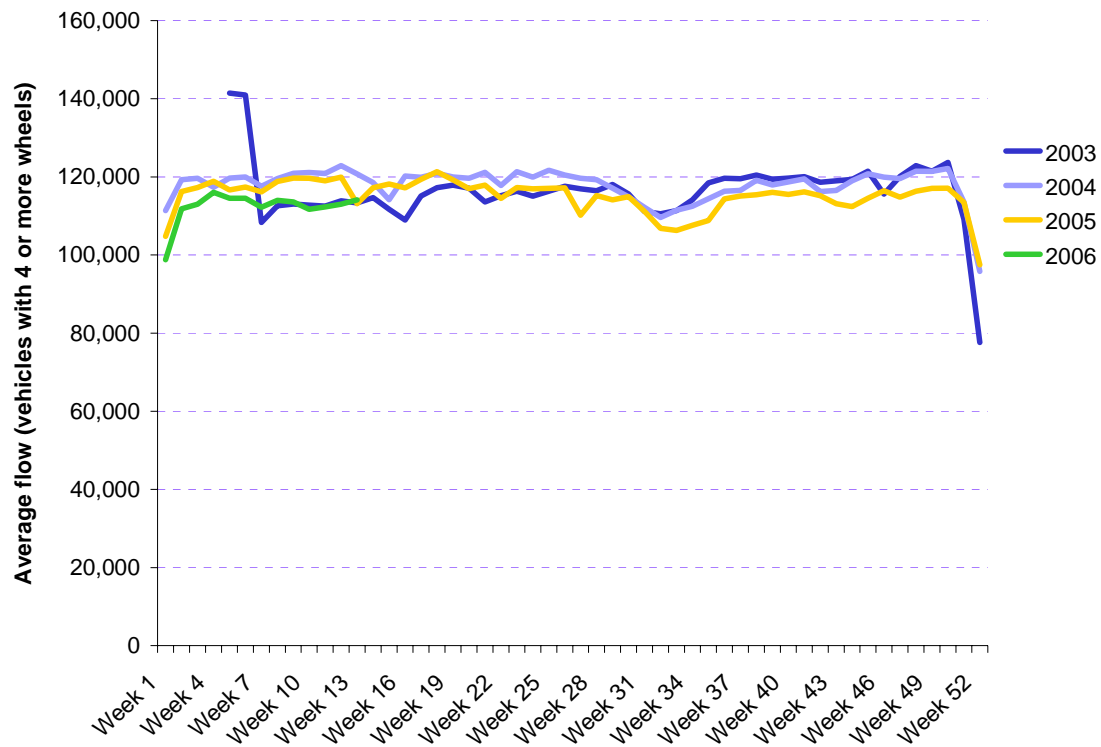
In addition to these periodic manual classified traffic counts, traffic entering the charging zone is monitored on a continuous basis using permanent automatic counters at sixteen of the busier inbound roads. These collectively account for over 40 percent of traffic entering the zone during the morning

peak period. Although therefore biased towards the busier roads, they nevertheless provide a good indicator of both short- and long-term variations in traffic entering the zone.

Figure 2.5 shows weekly average flows at these 16 locations since shortly before charging began in early 2003. Complete data are shown for every week up until the end of March 2006. Taking expected seasonal effects into account (eg Christmas and Summer holiday periods) it is clear that the picture up to July 2005 was of continued stability of post-charging traffic. Traffic levels were typically 15 percent below those recorded in early 2003 before charging at £5 was introduced.

During Autumn 2005 and into 2006, these data demonstrate a consistent reduction over equivalent 2004/5 flows, with typically between 2 and 4 percent less traffic (vehicles with four or more wheels) entering the charging zone on weekdays during the latter part of 2005, and typically between 4 and 6 percent less traffic entering during the early part of 2006, compared to the equivalent periods in 2005. The trends in the first part of 2006 appear to suggest either an intensification of the response to the July 2005 Variations and/or a continuation of the background trend of slowly-declining traffic.

Figure 2.5 Traffic entering the congestion charging zone across 16 busier inbound roads. Average weekly flows, charging hours, vehicles with four or more wheels.



The above data relate to weekdays only. Similar volumetric data for weekends are also available from automatic traffic counters. Figure 2.6 shows comparable data from a sub-set of the automatic counters for Saturdays and

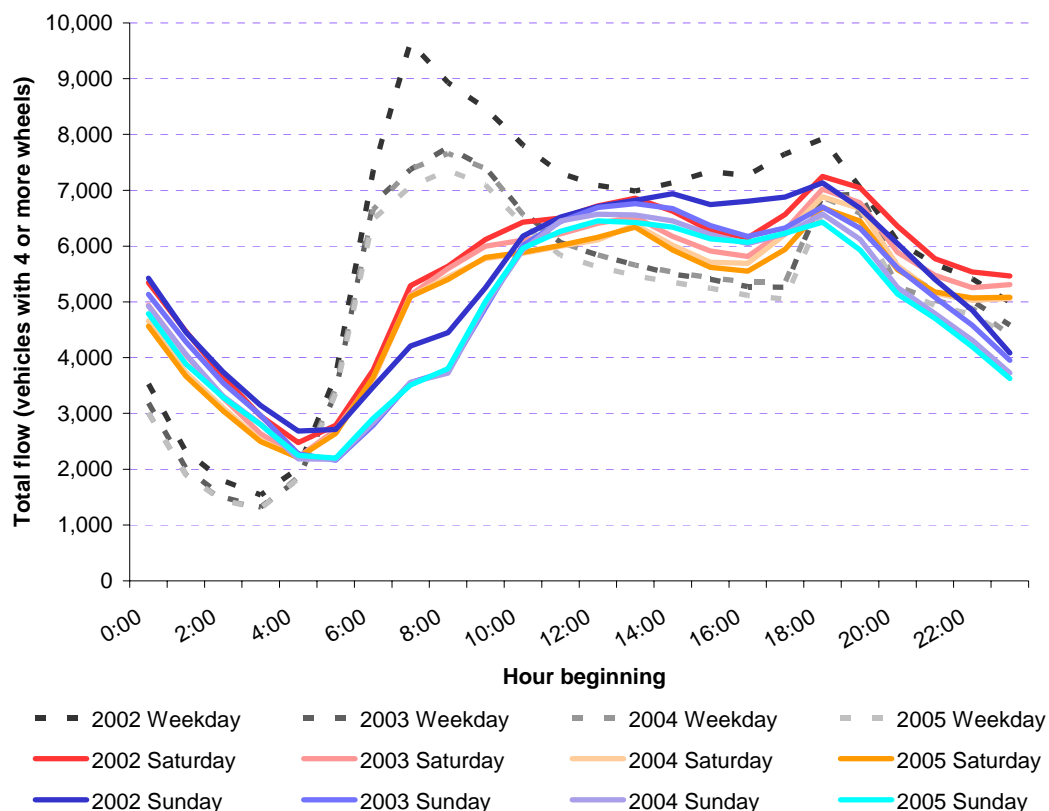
2. Traffic patterns

Sundays for each year from 2002, before charging, to 2005. Weekend data are overlaid on equivalent weekday data for comparison, although the weekday profile will differ in detail from that shown in Figure 2.3, because it only relates to a sub-sample of continuously-monitored entry points.

The following features are notable from Figure 2.6:

- Total inbound flows for both Saturdays and Sundays are generally lower than on post-charging weekdays, but peak inflows during the afternoon period on both days are actually higher than on post-charging weekdays. This also applies to the overnight period on both weekend days.
- As reflected elsewhere in the data, a small but consistent year-on-year reduction to traffic volumes is evident for all days, reflecting an apparent slow 'background' decline in traffic.
- There are no obvious effects in the weekend data that reflect the introduction of congestion charging in 2003, such as a transfer of trips from weekdays to weekends.

Figure 2.6 Traffic entering the congestion charging zone across nine busier inbound entry points. Weekdays and weekend days compared. Vehicles with four or more wheels.



2.3 Traffic circulating within the charging zone

TfL initially reported a decrease of 15 percent in vehicle-kilometres driven within the charging zone (vehicles with four or more wheels, during charging hours), comparing annualised estimates for 2003 with equivalent estimates for 2002. This was towards the top of the range of TfL's prior expectation of between 10 and 15 percent.

Counts during 2004 suggested further decreases in traffic circulating within the charging zone, although the available indicators were somewhat inconsistent. TfL's best estimate for 2004 was therefore that the original reductions of 15 percent had been maintained, and had probably intensified slightly during the year.

The findings for 2005 for vehicle-kilometres driven within the charging zone are shown in Table 2.2. The table also includes the percentage of total traffic accounted for by each of the main vehicle types as well as 2003 and 2004 results for comparison. Table 2.3 summarises the year-on-year changes. Note that these are central estimates, subject to significant sampling error.

Table 2.2 Vehicle-kilometres driven within the charging zone during charging hours, including percentage share of traffic. Annualised weekdays for 2002, 2003, 2004 and 2005.

Vehicle Type	2002 vkm		2003 vkm		2004 vkm		2005 vkm	
	(millions)		(millions)		(millions)		(millions)	
All vehicles	1.64	100%	1.45	100%	1.38	100%	1.40	100%
Four or more wheels	1.44	88%	1.23	84%	1.16	84%	1.16	83%
Potentially chargeable	1.13	69%	0.85	58%	0.80	58%	0.79	56%
- Cars and minicabs	0.77	47%	0.51	35%	0.47	34%	0.47	33%
- Vans	0.29	18%	0.27	19%	0.26	19%	0.25	18%
- Lorries and other	0.07	4%	0.07	5%	0.06	5%	0.07	5%
Non chargeable	0.51	31%	0.60	42%	0.58	43%	0.61	44%
- Licensed taxis	0.26	16%	0.31	21%	0.29	21%	0.30	22%
- Buses and coaches	0.05	3%	0.07	5%	0.07	5%	0.07	5%
- Powered two-wheelers	0.13	8%	0.14	9%	0.13	10%	0.13	10%
- Pedal cycles	0.07	4%	0.09	6%	0.09	7%	0.10	7%

2. Traffic patterns

Table 2.3 Year-on-year percentage change in vehicle-kilometres driven within the charging zone during charging hours, annualised weekdays for 2002, 2003, 2004 and 2005.

Vehicle type	2003 versus 2002	2004 versus 2003	2005 versus 2004
All vehicles	-12%	-5%	+1%
Four or more wheels	-15%	-6%	0%
Potentially chargeable	-25%	-6%	-1%
- Cars and minicabs	-34%	-7%	-1%
- Vans	-5%	-4%	-4%
- Lorries and other	-7%	-8%	+8%
Non chargeable	+18%	-3%	+4%
- Licensed taxis	+22%	-7%	+5%
- Buses and coaches	+21%	+5%	-1%
- Powered two-wheelers	+6%	-2%	0%
- Pedal cycles	+28%	+4%	+14%

For 2005, this indicator suggests continuing stability in the volume and composition of traffic circulating within the charging zone, all key indicators being closely comparable to 2004. Features of note for 2005 include: small decreases in vans, small increases in lorries and licensed taxis, and a more pronounced increase in pedal cycles. However, with the exception of pedal cycles, none of these changes is statistically significant at the 95 percent level.

The indicated changes span the whole year, including periods of charging at £5 and at £8, since the available precision of these indicators does not allow more disaggregated analysis at this level. However, there are indications in the disaggregated data, comparing Autumn 2005 with Spring 2005, of reductions of around 4 percent in potentially chargeable vehicles (cars, vans and lorries), being counterbalanced by increases of a similar magnitude in non-chargeable vehicles, particularly taxis and two-wheeled vehicles.

TfL's *Third Annual Monitoring Report* observed that this indicator was suggesting decreases in traffic circulating within the zone for 2004 that were larger than those suggested by the other available indicators of circulating traffic for that year. TfL concluded that this indicator was probably understating vehicle-kilometres in 2004, and that the true decrease in that year was rather smaller (between 1 and 2 percentage points). The July 2005 Variations would have been expected to lead to observable further decreases in vehicle-kilometres, and any under-estimation by this indicator in 2004 may be an explanation of why they are not immediately apparent in the aggregated data for 2005. The indicated statistically non-significant increase of 1 percent in total circulating traffic for 2005 should therefore be interpreted in this context.

Figure 2.7 Traffic circulating within the congestion charging zone across a sample of 15 permanent counting sites. Average weekly flows, charging hours, vehicles with four or more wheels.

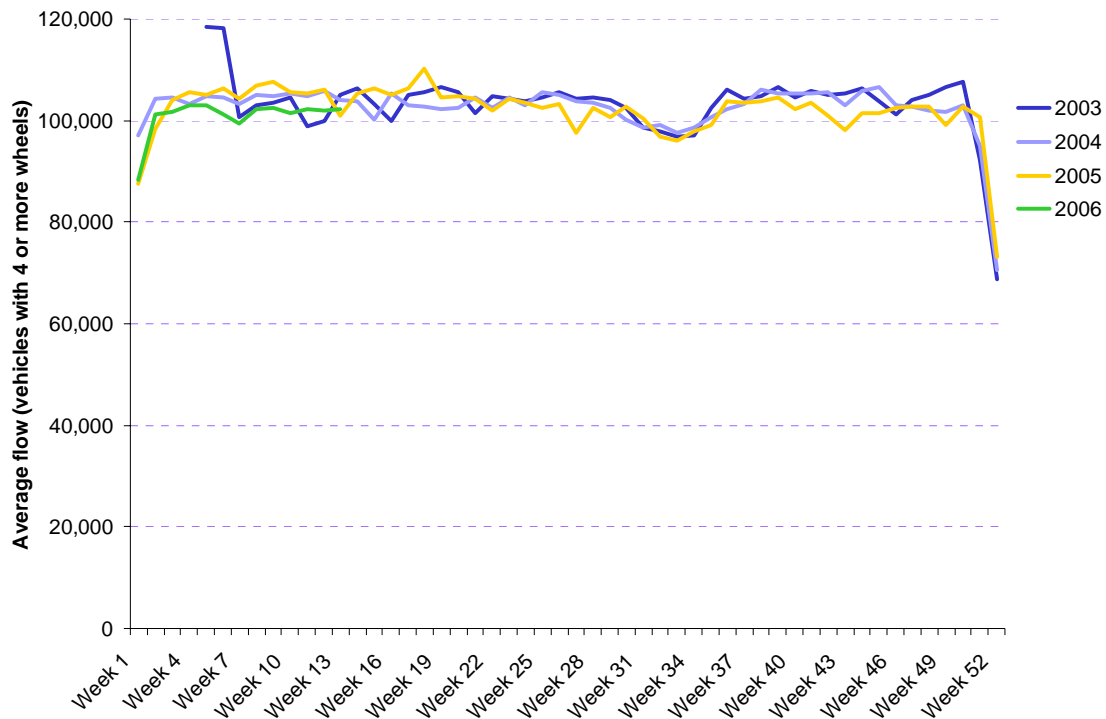


Figure 2.7 shows data from permanent automatic traffic counters located at a representative selection of sites within the charging zone. These again demonstrate the general stability of post-charging traffic levels. The impacts of the July 2005 Variations in reducing overall traffic levels is again visible in late 2005 and early 2006, albeit to a lesser extent than for entering traffic (Figure 2.5). Traffic flows for non-holiday weeks in early 2006 are an average of between 3 and 4 percent lower than for comparable weeks in 2005.

Other indicators of traffic within the charging zone are provided by counts of traffic across the six Thames bridges inside the charging zone (the Thames screenline), and also in relation to the portion of the 'northern screenline' that lies within the charging zone to the north of the Thames. Unfortunately, latest results from both of these counts are potentially unrepresentative. The Thames screenline count may have been affected by the closure of Battersea Bridge in the Autumn of 2005, and the northern screenline counts were particularly affected in January 2006 by road works at several locations. Nevertheless, bearing these limitations in mind, the data do provide some useful insights.

2. Traffic patterns

Table 2.4 Flows across the Thames screenline within the charging zone. 2005 counts compared with 2004 (1,000s of vehicles).

Vehicle type	2004			2005			Annual 2005 vs Annual 2004	Autumn 2005 vs Spring 2005
	Spring	Autumn	Annual	Spring	Autumn	Annual		
All vehicles	106	122	114	112	116	114	0%	+4%
Four or more wheels	86	102	94	94	94	94	0%	0%
Potentially chargeable	54	64	59	56	57	57	-4%	+1%
-Cars and minicabs	34	42	38	36	36	36	-6%	+1%
-Vans	16	17	16	16	17	16	-1%	+3%
-Lorries and other	4	5	4	4	4	4	+3%	-1%
Non chargeable	53	58	56	56	59	57	+3%	+6%
-Licensed taxis	24	28	26	29	28	29	+10%	-3%
-Buses and coaches	9	10	10	9	9	9	-7%	+3%
-Powered two-wheelers	10	11	11	10	11	10	-3%	+10%
-Pedal cycles	10	9	9	8	11	9	-1%	+34%

Summary results for the Thames screenline are shown in Table 2.4. Again, the overall picture is one of relative stability. Annualised total flows for 2005 are identical to those for 2004. As observed elsewhere, there is evidence of a reduction in potentially chargeable vehicles, offset by increases of a comparable magnitude in non-chargeable vehicles. Looking at the comparison between Autumn 2005 and Spring 2005, the overall picture is of small increases for Autumn 2005, which is an unexpected outcome. It is clear that much of the indicated increases here are accounted for by two-wheeled vehicles, which might have been attributable in part to the favourable Autumn 2005 weather and the July 2005 London bombings. Volumes of potentially chargeable vehicles are effectively unchanged.

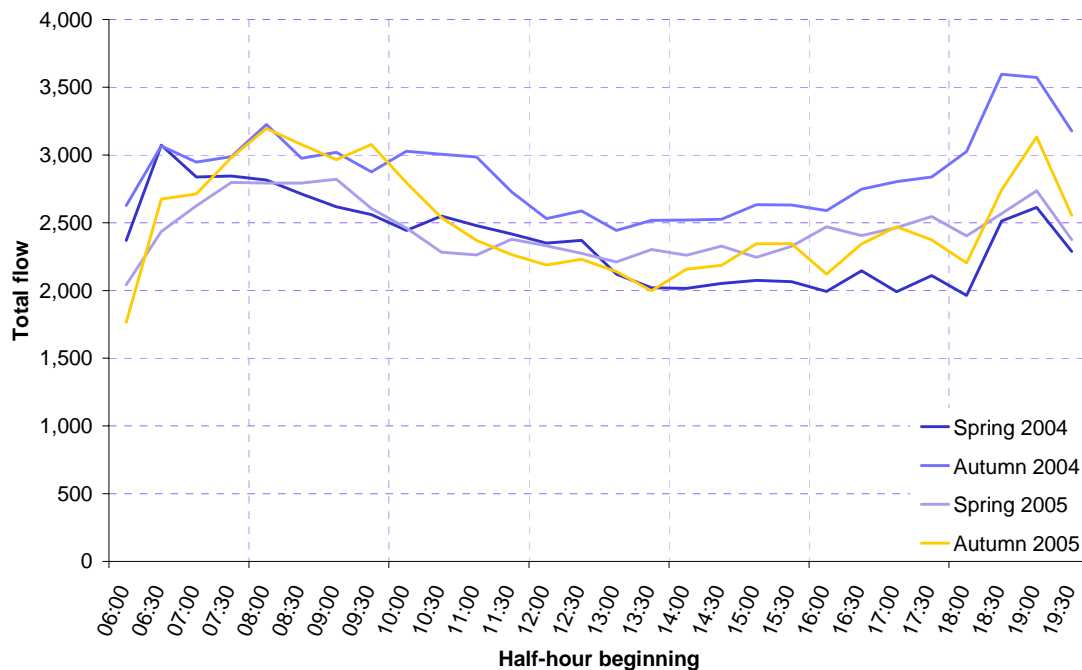
The comparison between Autumn 2005 and Spring 2005 at this screenline does not therefore show evidence of reductions in potentially chargeable vehicles that might have been expected to result from the July 2005 Variations. However, other research indicates that traffic levels in central London in the Autumn counting window of each year are typically some 2 percent higher than in the Spring (a 'seasonal' effect), which may be obscuring any change. It is also possible that the closure of Battersea Bridge in Autumn 2005 may have caused some traffic to divert into the charging zone, in particular non-chargeable vehicles and chargeable vehicles that had already paid the charge.

A more appropriate comparison is between Autumn 2005 and Autumn 2004. This shows a 5 percent decline in all vehicles, an 8 percent decline in vehicles with four or more wheels, an 11 percent decline in potentially chargeable

vehicles and a 14 percent decline in cars. These reductions would be consistent with a response to the July 2005 Variations, albeit that they are subject to wide statistical uncertainty.

The variability between recent counts at this screenline is illustrated in Figure 2.8, for potentially-chargeable vehicles (cars, including minicabs, vans and lorries) only.

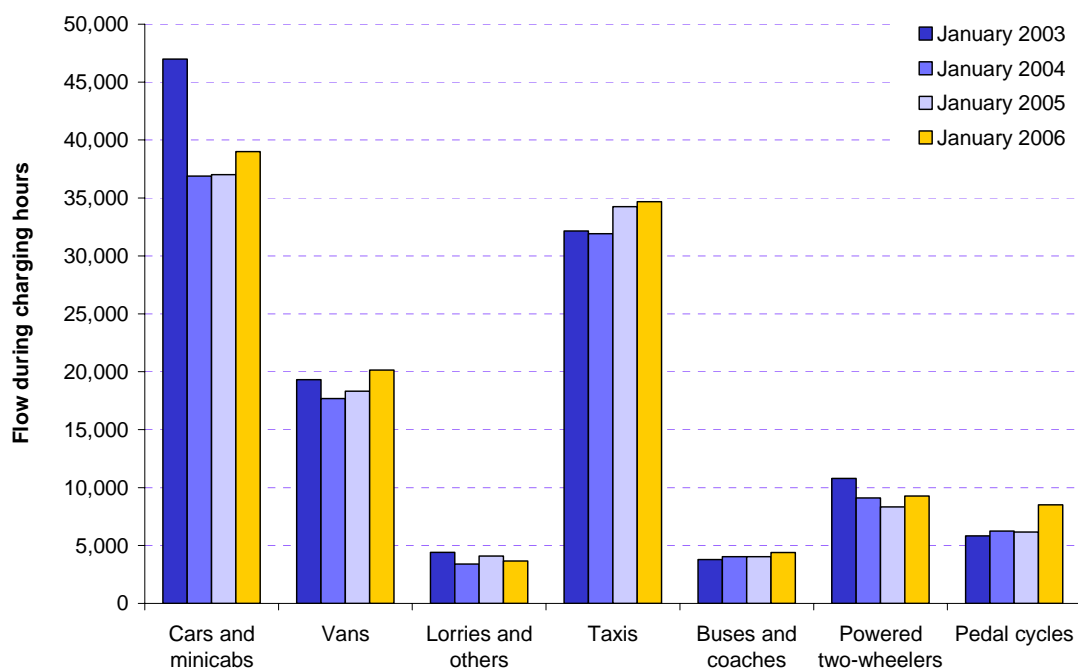
Figure 2.8 Potentially chargeable vehicle flows by time of day across the Thames screenline within the charging zone. Spring and Autumn counts for 2004 and 2005 compared.



Counts of traffic crossing the northern screenline, which runs from the Victoria Embankment to near St Pancras station, are taken in January of each year. The observed trends are summarised in Figure 2.9. These exclude flows on the Inner Ring Road itself at St Pancras. The counts for 2006 suggest small increases in most vehicle types compared to equivalent counts in 2005 and 2004. Examination of the site-by-site data reveals that almost all of these increases were attributable to Victoria Embankment and Strand, which together account for about 45 percent of traffic on this screenline. At the time of this survey road works were being undertaken in this area which may have caused atypical flows on these links. In turn, small percentage increases on these links may have disproportionately affected the screenline total. TfL therefore considers that the 2006 counts here do not provide wholly a valid comparison with earlier years.

2. Traffic patterns

Figure 2.9 Flows across the TfL northern screenline within the charging zone. January 2003, 2004, 2005 and 2006 compared.



As in 2004, available indicators of traffic circulating within the charging zone for 2005 provide a mixed picture. Based on the available evidence, TfL concludes that:

- Circulating traffic within the charging zone during 2005 was broadly comparable overall to that in 2004. Therefore, the traffic reductions seen with the introduction of congestion charging have been maintained.
- There is evidence of small reductions in traffic associated with the July 2005 Variations, through reductions in potentially-chargeable vehicles, although these are largely offset by increases in non-chargeable vehicles.
- Owing to seasonal differences in traffic levels and road closures affecting the Autumn and Winter 2005 counts, a definitive assessment of the impacts of the July 2005 Variations on circulating traffic within the charging zone is not yet possible.

Private hire vehicles

There are various references in this report to 'minicabs'. Strictly, these are London licensed private hire vehicles that must be booked in advance. Their operation is licensed by TfL's Public Carriage Office and they are exempt from the congestion charge. Most are conventional cars though they are required to display an identifying disc in the front and rear windscreens.

They are referred to in this report as 'minicabs' as this is the largest group of these vehicles. Minicabs are typically used within Greater London for journeys to destinations such as airports, stations, hospitals and entertainment events. However, some of the private hire vehicles that operate in central London are routinely used by companies as transport for their senior executives.

Separate identification of private hire vehicles is not easy to achieve in traffic counts and therefore in the survey results presented in this report they are not distinguished from 'cars' more generally. Other evidence suggests that there may have been 5,000 to 10,000 individual licensed private hire vehicles present in the charging zone during charging hours on a typical day in early 2006, out of a total of 40,000 London licensed private hire vehicles.

London taxis are also licensed by the Public Carriage Office and again are exempt from the charge. There are around 21,000 taxis in London. Of these, 10,000 to 15,000 came into the charging zone during charging hours in a typical day in early 2006.

2.4 Traffic on the Inner Ring Road

The Inner Ring Road forms the boundary of the congestion charging zone and is the most obvious alternative route for through traffic wishing to avoid the zone. TfL expected that congestion charging might lead to some increases in traffic on this route, but that any such increases could be dealt with by better operational management.

Comparing 2003 (after charging) with 2002 (before charging), TfL had previously reported overall increases in vehicle-kilometres of 4 percent for all vehicles, and 1 percent for vehicles with four or more wheels. It was noted that these measured changes were towards the lower end of TfL's range of expectation, and that congestion on the Inner Ring Road had actually reduced, due primarily to the implementation of effective traffic management on this key route.

Measurements taken during 2004 suggested that traffic on the Inner Ring Road during weekday charging hours declined very slightly overall compared to 2003. Comparing 2004 with pre-charging values in 2002, net increases of 2 percent for potentially-chargeable vehicles were recorded, with reductions of 1 percent for vehicles with four or more wheels and 2 percent for all vehicles. These changes were not statistically significant overall despite some greater indicated changes for certain individual vehicle types and at specific sites.

Measurements for 2005 suggest that overall traffic continues to be unchanged from 2004, but with indicated small (statistically non-significant) reductions to vans, lorries, buses and coaches and two-wheeled vehicles.

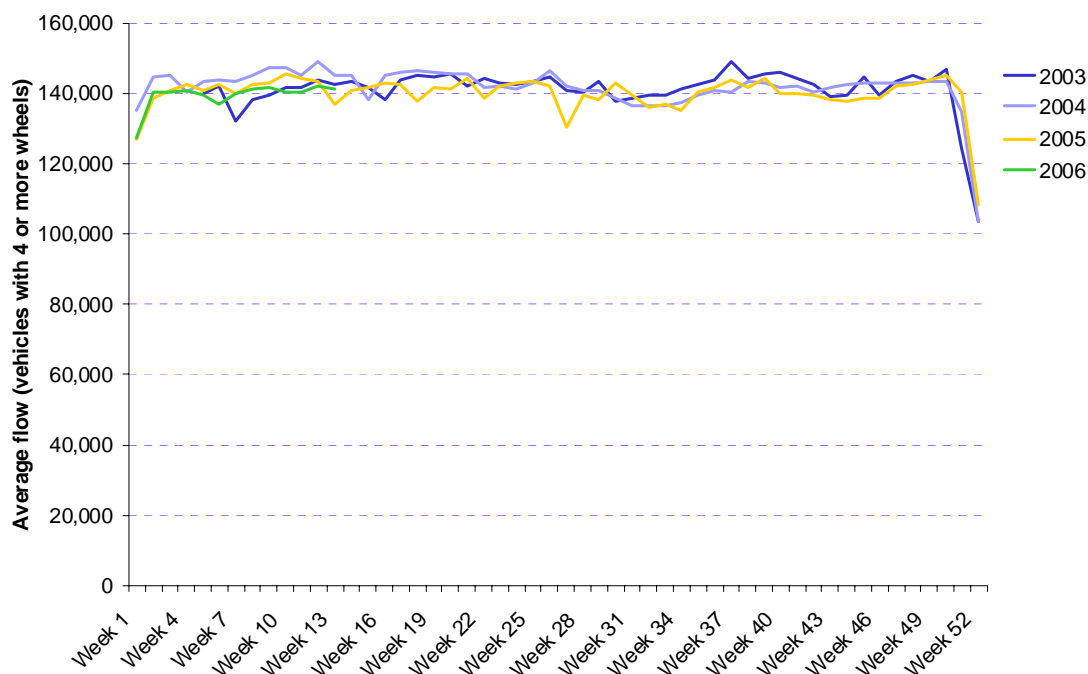
2. Traffic patterns

Table 2.5 Key changes in vehicle-kilometres driven on the Inner Ring Road during charging hours. Annualised weekday for 2002 (pre-charging) compared to 2003, 2004 and 2005 (post-charging).

Quantity	2002 vkm (millions)	2003 vkm (millions)	2004 vkm (millions)	2005 vkm (millions)	2005 versus 2004
All vehicles	0.65	0.68	0.66	0.66	-1%
Four or more wheels	0.61	0.62	0.61	0.61	0%
Potentially chargeable	0.51	0.50	0.51	0.50	-1%
-Cars and minicabs	0.37	0.35	0.35	0.36	0%
-Vans	0.10	0.12	0.12	0.11	-4%
-Lorries and other	0.04	0.04	0.04	0.03	-6%
Non chargeable	0.14	0.17	0.16	0.15	-2%
-Licensed taxis	0.08	0.09	0.08	0.08	+8%
-Buses and coaches	0.02	0.03	0.03	0.03	-9%
-Powered two-wheelers	0.03	0.04	0.04	0.03	-15%
-Pedal cycles	0.01	0.01	0.01	0.01	-8%

Data from permanent automatic counters located around the Inner Ring Road show a very similar picture, of continuing stability in total traffic flows (Figure 2.10).

Figure 2.10 Traffic volumes on the Inner Ring Road. Average weekly flows, charging hours, vehicles with four or more wheels.



TfL therefore again concludes that, although congestion charging and related infrastructure changes clearly resulted in some re-distribution of traffic on individual links during 2003, traffic volumes as a whole on the Inner Ring Road continue to be closely comparable to conditions before charging started in 2002, with no evidence of adverse traffic impacts.

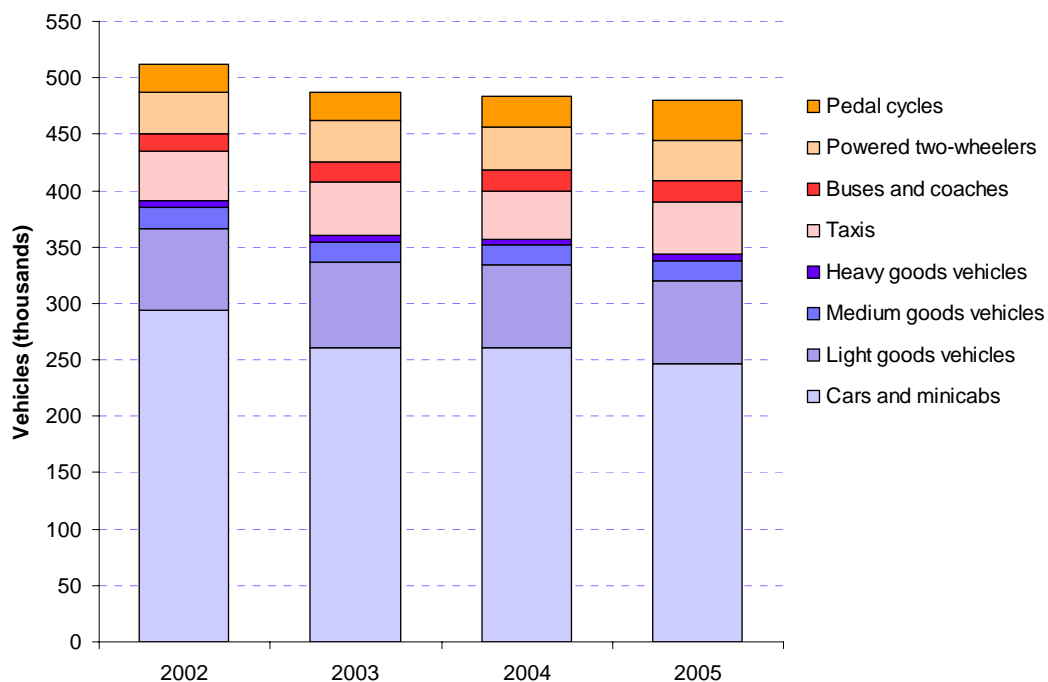
2.5 Radial traffic approaching the charging zone

Transport for London expected that congestion charging would lead to some reduction in radial traffic on routes in inner London approaching the charging zone, particularly by cars. This would be due to fewer journeys between other parts of London and the charging zone. The primary indicator of this impact is TfL's central London cordon. This cordon was modified for congestion charging monitoring purposes in 2002 to lie wholly outside of the charging zone. The following comparisons are based on this modified version of the cordon, which is counted once per year in the Autumn.

For 2003, TfL had reported overall reductions of 5 percent in inbound traffic with four or more wheels during charging hours against pre-charging levels in 2002. It was noted that cars and minicabs had reduced by 12 percent. Equivalent changes for the outbound direction were again 5 percent and 12 percent. For 2004, this indicator showed a 1 percent decline in total traffic crossing this cordon during charging hours in both directions in relation to 2003. This was again indicative of the overall pattern of small declines in traffic observed elsewhere, but was not statistically significant itself.

Figure 2.11 summarises the changes observed at this cordon between 2002 and 2005. In the inbound direction during charging hours for 2005, traffic with four or more wheels reduced by 2 percent in relation to 2004. In the outbound direction, there was a 1 percent increase. Given the statistical limitations associated with these data, the overall conclusion would be that traffic crossing this cordon was effectively unchanged in 2005.

Figure 2.11 Traffic changes at the TfL central London cordon (extended version wholly outside the charging zone). Inbound direction only, charging hours. Autumn surveys.



2.6 Traffic on selected local roads

Traffic on selected roads surrounding the charging zone has been monitored at the request of individual boroughs. These sites do not provide statistical indicators of overall traffic change within a borough or more widely, and will be affected by factors other than charging. However, they are collectively a useful indicator of traffic change on local roads surrounding the charging zone that were potentially likely to experience additional traffic as a result of the scheme.

For 2003 following the introduction of charging at £5, TfL had reported a mixed picture, with groups of sites in each of five individual boroughs collectively registering either increases or decreases lying in the range plus or minus 6 percent. In 2004, TfL reported that the overall picture was one of small declines in traffic against 2003. There was no evidence from these data of significant adverse traffic impacts on local roads that might have resulted from charging.

Seasonal adjustment factors applied to these previous estimates have since been re-calculated, resulting in a comparable overall picture, but differing in some respects from figures previously reported. New data are available for 2005, and the revised time-series is summarised in Table 2.6. The overall assessment remains one of continuing stability in traffic on local roads surrounding the charging zone but, as seen elsewhere, with evidence of small and continuing declines in traffic from pre-charging levels.

Table 2.6 Traffic changes on selected local roads surrounding the charging zone. Vehicles with four or more wheels, weekday charging hours.

Borough and number of sites	2003 versus pre-charging	2004 versus pre-charging	2005 versus pre-charging	2004 versus 2003	2005 versus 2004
Southwark (3)	+1%	+1%	0%	0%	-1%
Kensington and Chelsea (10)	0%	+1%	-2%	1%	-3%
Tower Hamlets (6)	-8%	-10%	-6%	-2%	+4%
Camden (3)	-9%	-10%	-12%	-2%	-2%
Westminster (7)	-2%	-2%	-3%	0%	-1%
All sites (29)	-3%	-3%	-4%	0%	-1%

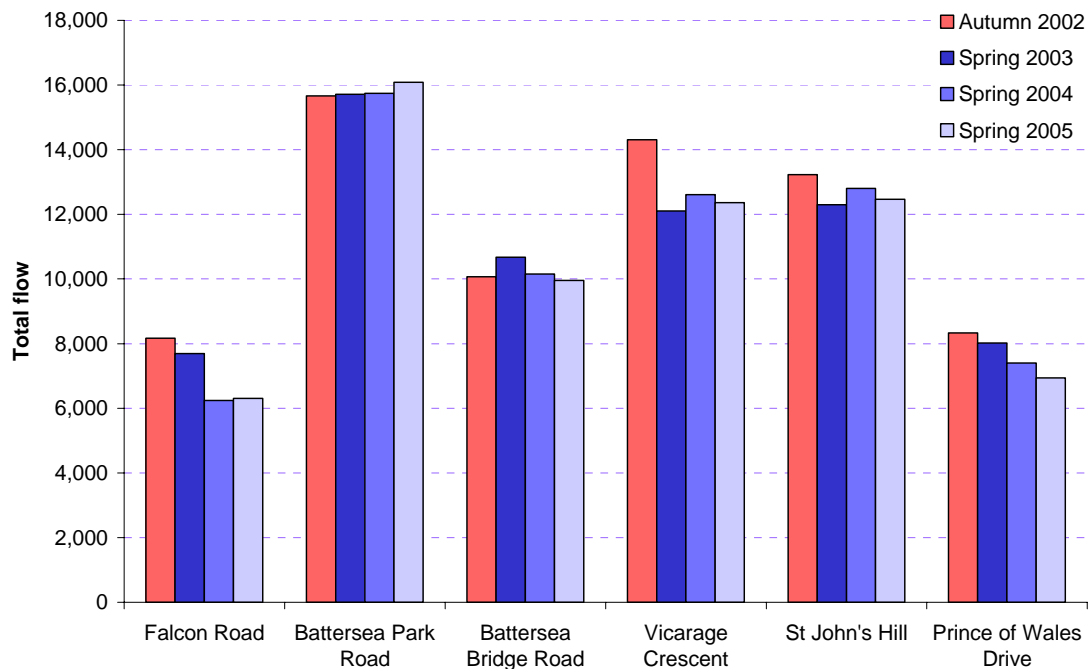
There have also been a number of sites monitored periodically in the boroughs of Wandsworth, Lambeth and Hackney. Data for these sites showed that, after charging, there was no net change in traffic levels on monitored roads in Lambeth, with net decreases of 6 percent on monitored roads in Wandsworth and 8 percent in Hackney.

Equivalent figures for 2004 at those sites showed very little change over 2003, with no net change from 2003 on monitored roads in Hackney, and further net decreases of 2 percent over 2003 on monitored roads in both Lambeth and Wandsworth.

Of these three boroughs, only Wandsworth was monitored in 2005. Results show a decrease of 1 percent overall compared with 2004, and an 8 percent

overall decline compared with pre-charging conditions measured in Autumn 2002. This is again indicative of overall 'background' declines in traffic in the area surrounding the charging zone since the introduction of charging. Data for each of the individual monitored sites in Wandsworth is shown in Figure 2.12.

Figure 2.12 Traffic changes on local roads in Wandsworth. Vehicles with four or more wheels. Weekday charging hours.



Overall, these results continue to show no indication of adverse traffic impacts on local roads surrounding the charging zone resulting from congestion charging.

2.7 Wider orbital traffic in inner London

Some traffic previously making through journeys across the charging zone may have elected to divert to the wider network of orbital routes in inner London following the introduction of charging, potentially giving rise to small increases in traffic on these roads. To detect any changes, TfL established four radial screenlines extending outwards from the Inner Ring Road.

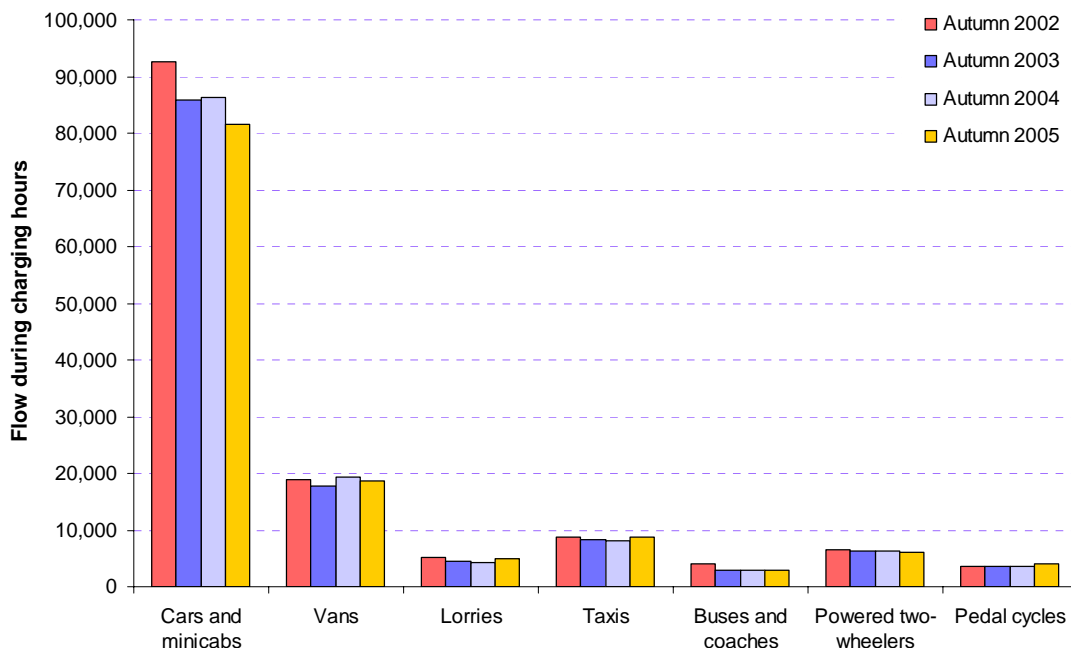
These were comprehensively monitored in the Autumn of both 2002 and 2003, and revealed stable or declining traffic flows, again with no indications of adverse traffic impacts from charging.

In view of this finding, and emerging proposals for a possible western extension to the charging zone, only the western screenline, running between West Carriage Drive in the City of Westminster and Paddenswick Road in the London borough of Hammersmith and Fulham was surveyed in the Autumn of

2. Traffic patterns

2004 and 2005. An updated time-series for this screenline is shown in Figure 2.13.

Figure 2.13 Traffic change across the western radial screenline. Autumn 2002, 2003 2004 and 2005 compared.



The overall picture is of fairly uniform and relatively modest declines across all vehicle categories between 2002 (pre-charging) and 2003 (post-charging), and comparative stability between 2003 and 2004. The apparently large decline in buses and coaches recorded across this screenline between 2002 and 2003 has been attributed to technical issues relating to the 2002 (pre-charging) bus count at a specific site. TfL therefore concludes that the 2002 count for buses at this screenline is atypical, and that results from this screenline for 2003 and 2004 indicated generally-stable orbital traffic in this part of west London.

Results for 2005 show further small overall declines in total traffic across this screenline, a finding that is again consistent with wider observed trends in traffic surrounding the charging zone.

2.8 Summary of key points

There is now a substantial body of evidence characterising the traffic impacts of congestion charging in central London and the key short and medium-term impacts are now quite clear.

Traffic patterns adapted quickly to the introduction of the scheme. The post-charging period has been characterised by remarkable stability in overall traffic patterns, with evidence of further small 'background' declines to traffic levels in and around central London. Initial assessments of traffic responses to the July 2005 charge increase suggest further declines in traffic within the

charging zone of a comparable magnitude to those forecast by TfL. There remains no evidence of significant traffic-related problems arising from the scheme.

The traffic reduction impacts of charging have therefore been maintained and have intensified during 2005.

3 Congestion

3.1 Introduction

The principal objective of congestion charging is to reduce traffic congestion in and around the charging zone, mainly by reducing the amount of traffic moving to, from or through the charging zone. This section describes and updates trends in key congestion indicators to early 2006.

Key findings from previous reports

The *Third Annual Monitoring Report* described TfL's findings to the beginning of 2005, drawing principally on moving car observer surveys of congestion in and around the charging zone. It was reported that:

- Within the charging zone, the average of available post-charging surveys showed reductions of 30 percent in congestion over representative pre-charging conditions. This was towards the top of TfL's expected range of between 20 and 30 percent.
- Later surveys of congestion within the charging zone were, however, showing evidence of greater variability, and a re-weighting of the time series (a necessary statistical process to take account of changed traffic patterns) effectively disguised a small 'real' increase in congestion during 2004 relative to 2003.
- During 2003, congestion reductions had also been recorded on the Inner Ring Road – the most obvious diversionary route around the charging zone. This was somewhat contrary to TfL's expectation, but seemed to reflect both comparatively small net increases in traffic and the successful implementation of traffic management measures to cater for diversionary traffic. Later results for 2004/5 were, however, indicating similar values to those observed before charging in 2002, reflecting the broadly neutral changes in overall traffic levels on this route.
- Radial routes approaching the charging zone in inner London had also demonstrated reduced congestion during 2003, although again 2004 conditions were more comparable to pre-charging conditions in 2002.
- More general surveys of traffic speeds and congestion on main roads in inner London showed a relatively stable situation between 2002 (pre-charging), 2003 and 2004 (post-charging).

It was also noted that:

- The majority of the congestion gains were in terms of reduced queueing time at junctions, rather than increases in driving speeds.
- Charging appeared to be delivering decongestion benefits outside charging hours, during the morning and evening 'shoulder' periods. This reflected reduced traffic flow at these times, an important consequential impact of charging on overall traffic patterns.

- Attitudinal and other travel surveys of Londoners suggested that congestion gains were being recognised, and demonstrated in analyses of journey times and reliability.

Key findings for 2005

The overall picture for congestion in 2005 has been more mixed:

- Measurements of congestion within the charging zone during 2005 have begun to reflect the long-term 'background' evolution of the road network, with the continuing adjustment of effective network capacities to meet a wider range of traffic and transport priorities.
- Taking the 18 available bi-monthly post-charging survey measurements, average post-charging reductions in congestion inside the charging zone compared with representative pre-charging conditions in 2002 are now 26 percent during charging hours. Taking only the surveys from 2005 and comparing to pre-charging conditions in 2002, the equivalent reduction is 22 percent.
- These are lower reductions than those applying in 2003 and 2004 (30 percent), but are still within TfL's range of expectation of between 20 and 30 percent. Typical delay values are now 1.7 minutes per kilometre, compared with 1.6 minutes per kilometre previously reported and 2.3 minutes per kilometre for representative conditions before the introduction of charging.
- The results need to be understood in the context of longer-term trends to congestion in central and inner London. These suggest that competing demands on road network capacity have meant continuing adjustments to capacity, leading to increasing delays for traffic inside and outside the charging zone. Inside the zone these adjustments would have had a broadly similar effect on network traffic speeds with or without congestion charging.
- These adjustments, in pursuit of other Mayoral transport priorities, have resulted in, for example, improved safety and amenity and increased priority for buses, taxis and cyclists. In simple terms, the moving-motor-vehicle capacity of the network has been adjusted in favour of the people-moving capacity of the network.
- Therefore, comparison against a 'static' baseline for 2002 is increasingly inappropriate. Comparisons based on a projection to 2005 of the long-term trend, in the notional absence of congestion charging, suggest that road users in the charging zone are probably still experiencing reduced congestion of the order of 30 percent.
- TfL continue to record overall reductions in congestion on both the Inner Ring Road and on the main radial routes approaching the charging zone. Conditions in 2005 have shown similar conditions to those previously reported for 2004, and there are still gains compared with pre-charging conditions on these routes in 2002.
- Measurements of congestion on main roads in inner London for 2005 show increases in congestion compared with previous surveys, both

3. Congestion

before and after the introduction of charging, with average delays of 1.5 minutes per kilometre, compared to 1.3 minutes per kilometre in 2002.

3.2 Congestion within the charging zone

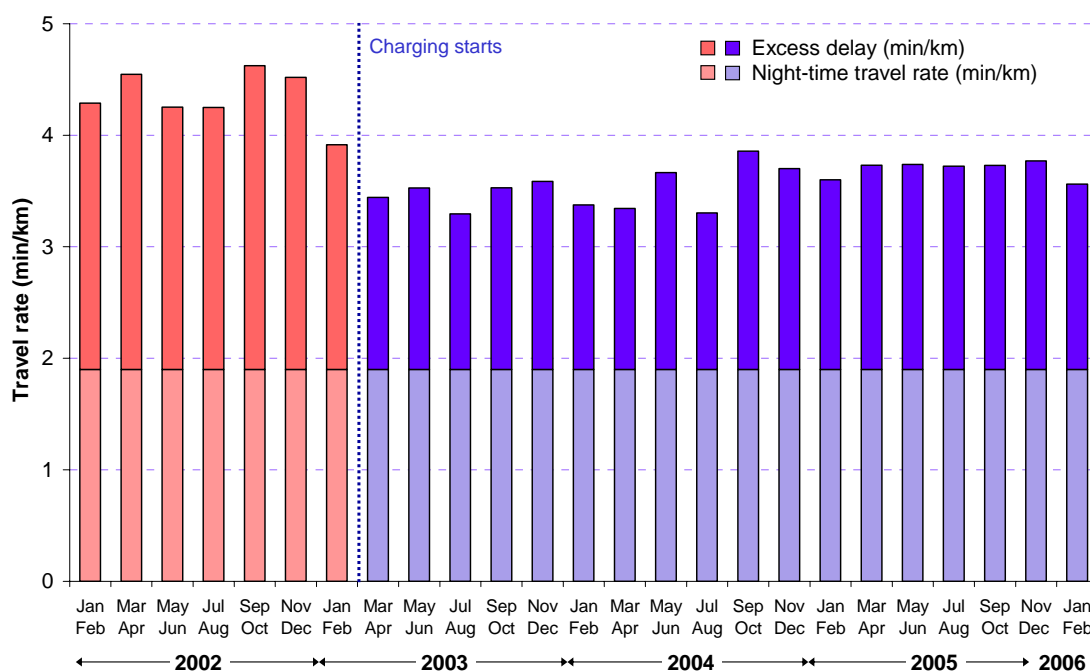
TfL's *Third Annual Monitoring Report* described average reductions in congestion within the charging zone of 30 percent against a pre-charging reference value of 2.3 minutes per kilometre. This figure was measured by regular bi-monthly moving car observer speed surveys, which have continued throughout 2005 and into 2006.

Congestion in this context is defined as the 'excess delay' (expressed in minutes per kilometre) over and above that which would be experienced under 'uncongested' conditions (ie in the early hours of the morning). This 'uncongested travel rate' in the charging zone has been measured as 1.9 minutes per kilometre, both before and after charging started. TfL's *First Annual Monitoring Report* gives a fuller explanation of these indicators. The uncongested travel rate should not be seen as a target – it is simply a convenient reference level from which to measure congestion.

The *Third Annual Monitoring Report* also described the effect of a re-weighting of the congestion time series to take into account changed traffic patterns within the charging zone following the introduction of charging. The congestion surveys are 'flow-weighted' with reference to observed traffic volumes on each road.

Figure 3.1 shows the updated and re-weighted time-series, extending to the end of 2005, and including data from the first two months of 2006. Observed excess delays during charging hours for 2005 have typically been around 1.8 minutes per kilometre, compared to a typical value of 1.6 minutes per kilometre for 2003 and 2004. Both of these values need to be set against the pre-charging reference value of 2.3 minutes per kilometre.

Figure 3.1 Congestion in the charging zone during charging hours.



Notes: The January-February 2003 survey was undertaken wholly before the introduction of charging on 17 February 2003.

Taking all of the eighteen available post-charging surveys, average delays are 1.7 minutes per kilometre, giving a reduction of 26 percent over pre-charging conditions in 2002. Taking only the six surveys conducted in 2005, the equivalent average delay is 1.8 minutes per kilometre, giving a reduction of 22 percent against pre-charging values. Equivalent delay values for 2003 (post-charging) and 2004 were 1.6 minutes per kilometre, equating to reductions of 30 percent over pre-charging conditions in 2002.

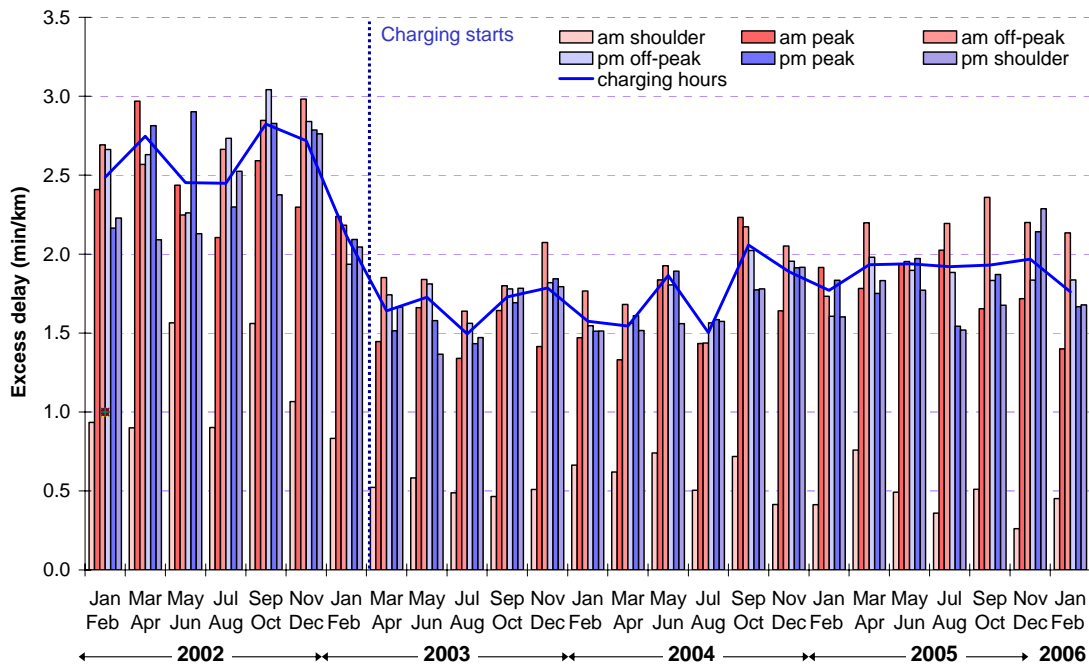
In terms of network average speeds, and referring to observed values rather than the 'representative' travel rate used to characterise pre-charging conditions, the equivalent values are 13.6 kilometres per hour in 2002, 17.3 kilometres per hour in 2003 post-charging, 17.0 kilometres per hour in 2004, and 16.2 kilometres per hour in 2005. Note that these values reflect speeds that would be experienced by a typical vehicle driving around central London, ie they are weighted to take account of differing link lengths and traffic flows, rather than a simple average of speed measurements on a basket of individual road links.

There are now three representative surveys of congestion relating to the period following the July 2005 Variations. These are not yet sufficient to indicate a clear trend that might reflect a response to these changes.

The relatively even distribution of congestion across the various time periods of the day, and the secondary decongestion impacts of charging in the time periods immediately before and after charging hours, are shown in Figure 3.2.

3. Congestion

Figure 3.2 Excess delays by time period within the charging zone.

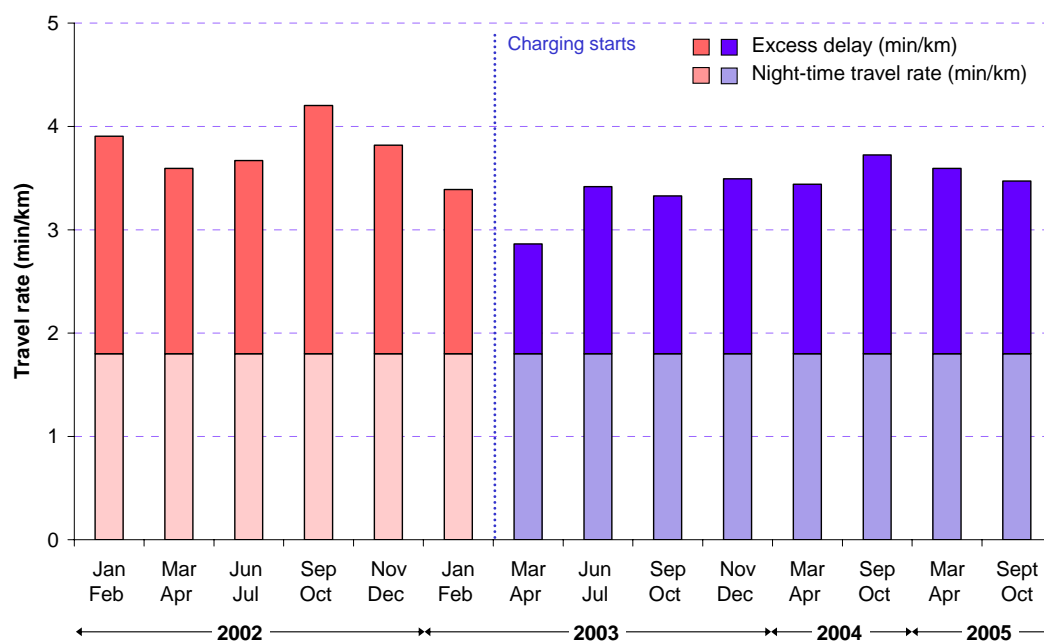


Notes: The January-February 2003 survey was undertaken wholly before the introduction of charging on 17 February 2003. Excess delay is measured relative to the night-time travel rate. The night-time travel rate is 1.9 min/km

3.3 Congestion on the Inner Ring Road

The Inner Ring Road forms the boundary of the congestion charging zone. No charge applies to vehicles using this route. Concerns were raised before the introduction of charging that traffic diverting on to the Inner Ring Road to avoid paying the charge could lead to increased congestion. TfL expected that with the implementation of improved traffic management arrangements, there would be no overall increase in congestion on this route, and data previously reported by TfL appeared to confirm this expectation.

Congestion on the Inner Ring Road has been measured by dedicated speed surveys, which have been carried out at intervals since 2002. Eight surveys have now been completed since the start of charging, and comparisons can be made with the six surveys that were carried out before charging was introduced (Figure 3.3).

Figure 3.3 Congestion on the Inner Ring Road during charging hours.

Notes: The January-February 2003 survey was undertaken wholly before the introduction of charging on 17 February 2003. These data have been re-weighted, in accordance with conventional practice, to reflect updated data on traffic flows (the data are 'flow weighted' with reference to observed traffic volumes on each road). This means that values for individual surveys may differ slightly from those previously published.

The measured uncongested travel rate on the Inner Ring Road is 1.8 minutes per kilometre. Observed levels of congestion have fluctuated considerably over the review period. An excess delay of 1.9 minutes per kilometre was taken as representative of pre-charging conditions in 2002.

Excess delay values for the surveys following the introduction of charging in 2003 were typically between 1.5 and 1.7 minutes per kilometre, representing reductions of between 10 and 20 percent in congestion against pre-charging conditions. Values for 2004 varied between 1.6 and 1.9 minutes per kilometre, the latter value being identical to the pre-charging reference value. The two surveys undertaken during 2005 return values of 1.8 and 1.7 minutes per kilometre. TfL's assessment is therefore that conditions on the Inner Ring Road continue to show small reductions in congestion of up to 10 percent relative to 2002.

3.4 Congestion on radial routes approaching the charging zone

Congestion on main radial routes approaching or leaving the charging zone has been surveyed in both directions as part of the intensified moving car observer survey arrangements for the Inner Ring Road. These surveys cover a representative selection of main radial routes up to a distance of three to five kilometres from the charging zone. TfL's *First Annual Monitoring Report* includes a map of the networks covered by these surveys. For the purpose of this report, the measured night-time travel rate for major roads in inner London of 1.5 minutes per kilometre is used to represent uncongested

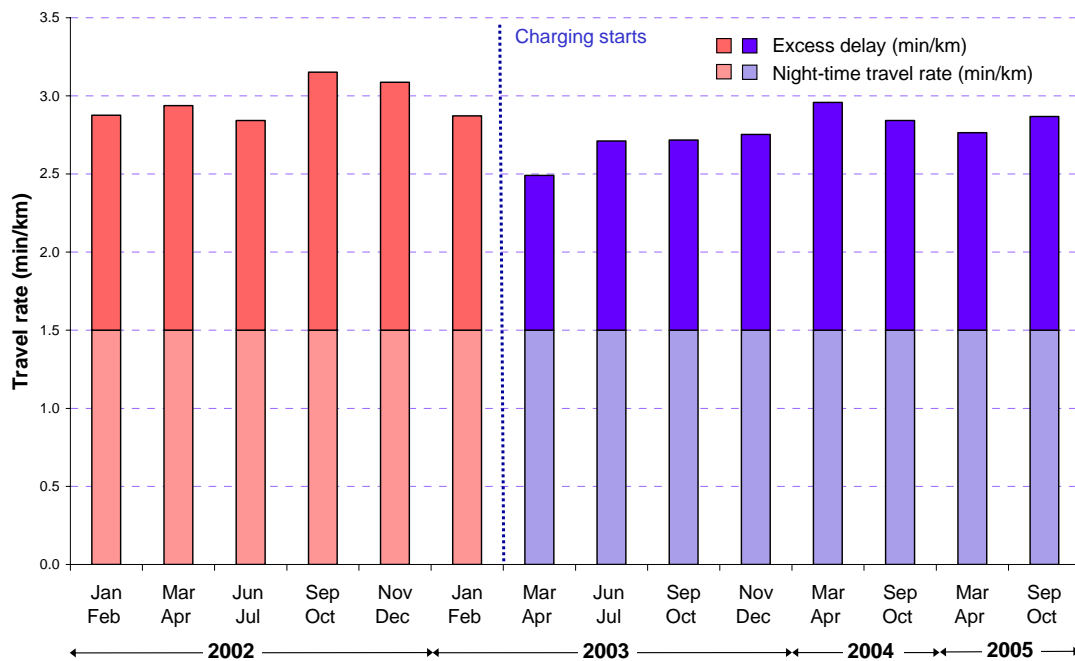
3. Congestion

conditions, giving a representative value for congestion (ie excess delay) before charging, during charging hours, of 1.5 minutes per kilometre.

The 2003 surveys following the introduction of charging saw decreases in congestion on the main approach roads to the zone averaging 0.3 minutes per kilometre (reductions of up to 20 percent), with typical excess delay during charging hours then averaging 1.2 minutes per kilometre.

Surveys undertaken during 2004 and 2005 have produced mixed results, but all measurements remain below the representative pre-charging value for delays of 1.5 minutes per kilometre, indicating continuing gains on these roads (Figure 3.4).

Figure 3.4 Congestion on main radial routes approaching the charging zone during charging hours.



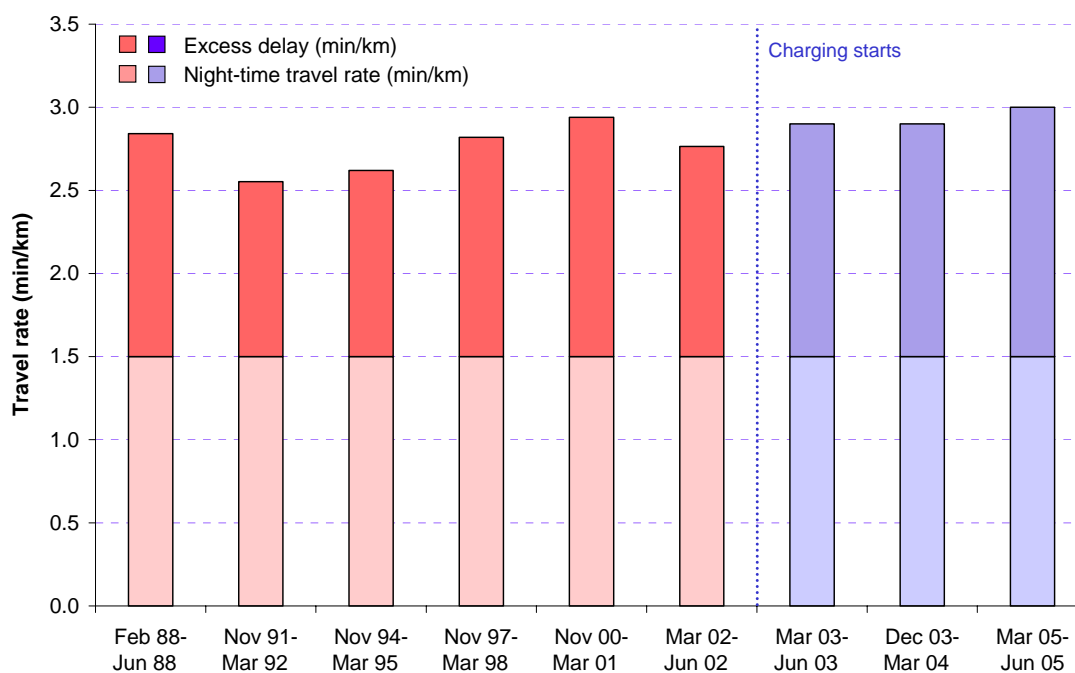
Notes: The January-February 2003 survey was undertaken wholly before the introduction of charging on 17 February 2003. These data have been re-weighted, in accordance with conventional practice, to reflect updated data on traffic flows (the data are 'flow weighted' with reference to observed traffic volumes on each road). This means that values for individual surveys may differ slightly from those previously published.

3.5 Congestion on main roads in inner London

Inner London in this context covers the network of main roads outside of the Inner Ring Road and its immediate environs, but within the North and South Circular Roads. TfL expected some reductions in congestion in inner London outside the congestion charging zone. These would arise from reduced overall traffic volumes, reflecting lower volumes of travel to and from the zone.

The Department for Transport has measured night-time travel rates in inner London at 1.5 minutes per kilometre. TfL estimated representative pre-charging levels of congestion (ie excess delays) during charging hours to be 1.3 minutes per kilometre. Since the introduction of the scheme, three further inner London speed surveys have been carried out, during Spring in 2003, 2004 and 2005.

Figure 3.5 Congestion on main roads in inner London 1988 to 2005. Charging hours equivalent.



The 2003 and 2004 surveys returned identical values for congestion in inner London, at 1.4 minutes per kilometre, both slightly higher than the pre-charging reference value. The 2005 survey returned a value of 1.5 minutes per kilometre, indicating some further deterioration in congestion in inner London (Figure 3.5).

Observed traffic volume changes in inner London following the introduction of charging have been broadly consistent with TfL's expectations and have shown overall reductions. It is therefore unlikely that traffic changes associated with charging have been a primary factor in determining these out-turn congestion trends on major roads in inner London. TfL is investigating the causes of these trends.

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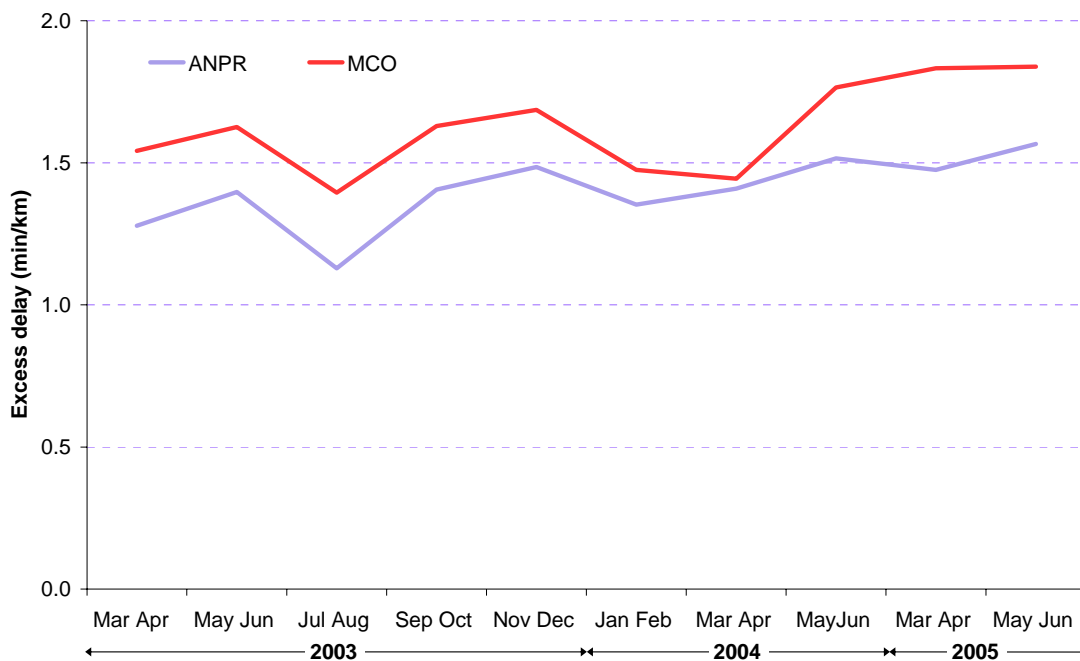
3.6 Congestion data from number plate reading cameras

Automatic number plate reading (ANPR) cameras are located in and around the charging zone and provide secondary indicators of trends in average traffic speeds and congestion. These cameras provide data for a skeletal network of the more major roads, and work by matching observations of the same vehicle between pairs of cameras, where elapsed time and distance can be measured. This processing takes full account of the data protection principles concerning personal information.

Figure 3.6 shows a comparison of equivalent data from both moving car observer and ANPR camera surveys for the area inside the central London charging zone.

The comparison is in terms of excess delays for time periods where comparable data from both sources are available, as this provides the most consistent view of trends in network performance. It should also be noted that the comparison does not show the impact of introducing the congestion charge as insufficient ANPR camera data are available for the year 2002. It also does not show values for the period following the July 2005 Variations. These are considered in Section 8.

Figure 3.6 Trends in excess delays within charging zone during charging hours. Moving car observer surveys (MCO) and data from ANPR cameras compared.



The figure shows a very close correspondence between the indicated trends. Although the indicated absolute excess delays are also quite similar, this is not necessarily to be expected as the two sources relate to different survey networks and methodologies.

3.7 Recent trends in congestion

Long-run trends in congestion observed in both central and inner London suggest gradual deterioration over the last 10-20 years. The introduction of congestion charging in 2003 interrupted this trend in central London, reducing congestion by 30 percent almost overnight, but the observations for 2004 and 2005 described above imply that the long term trend is reasserting itself, even if current levels of congestion are substantially lower than would otherwise have been the case.

Within the charging zone, although the reduction in congestion during 2005 compared to pre-charging conditions in 2002 is still within TfL's range of expectation, average delays during 2005 of 1.8 minutes per kilometre compare with 1.6 minutes per kilometre during the first 18 months of charging. This re-emergence of a trend of increasing congestion inside the charging zone appears to have started in the second half of 2004.

On the Inner Ring Road the data for 2005 suggest small improvements over 2004, but congestion remains higher than that observed in 2003 following the introduction of the scheme. On main radial routes approaching the charging zone congestion is effectively unchanged, if somewhat variable between individual surveys.

Recent data for main roads in inner London show a similar trend to that observed in the charging zone of gradually increasing congestion since the early 1990s, although the available time-series of measurements is less comprehensive.

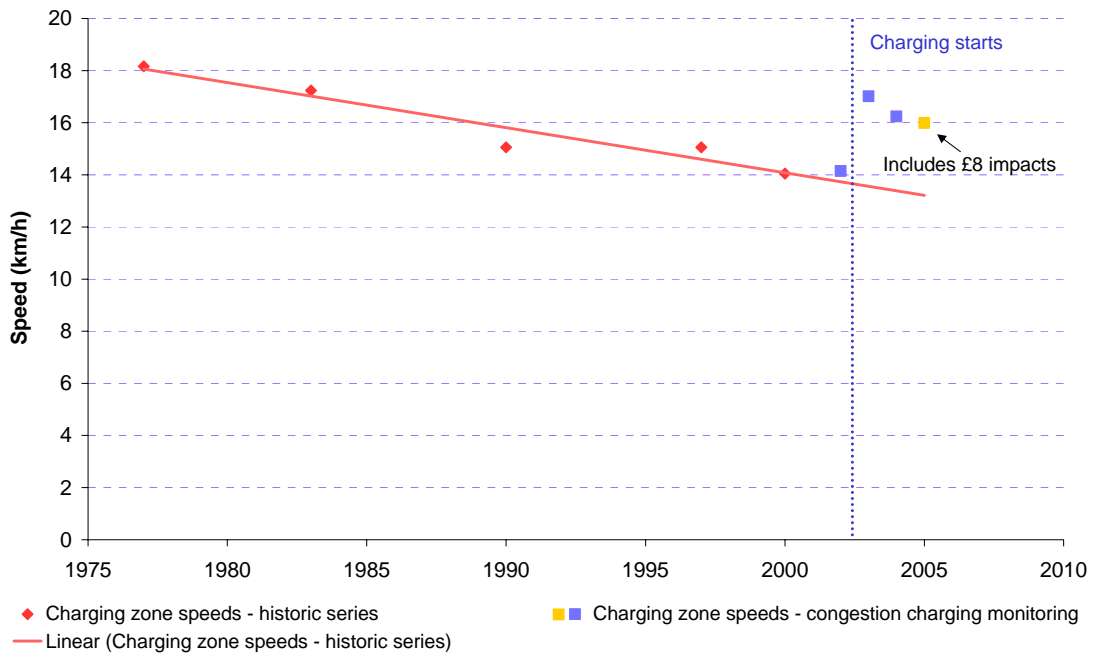
It is clear from Figure 3.7 for the charging zone and Figure 3.8 for main roads in inner London that in both cases the congestion measurements for 2005 suggest the continuation of established long-term trends going back several decades.

For the charging zone, a clear and persistent downward trend in average speeds has been apparent since 1975, reflecting increased congestion. Average charging-hours-equivalent speeds fell from about 18 kilometres per hour in 1975 to about 14 kilometres per hour in 2002 just before the start of charging.

For main roads in inner London the pattern is very similar. Average speeds declined from about 23 kilometres per hour in the early 1990s to about 20 kilometres per hour in 2005.

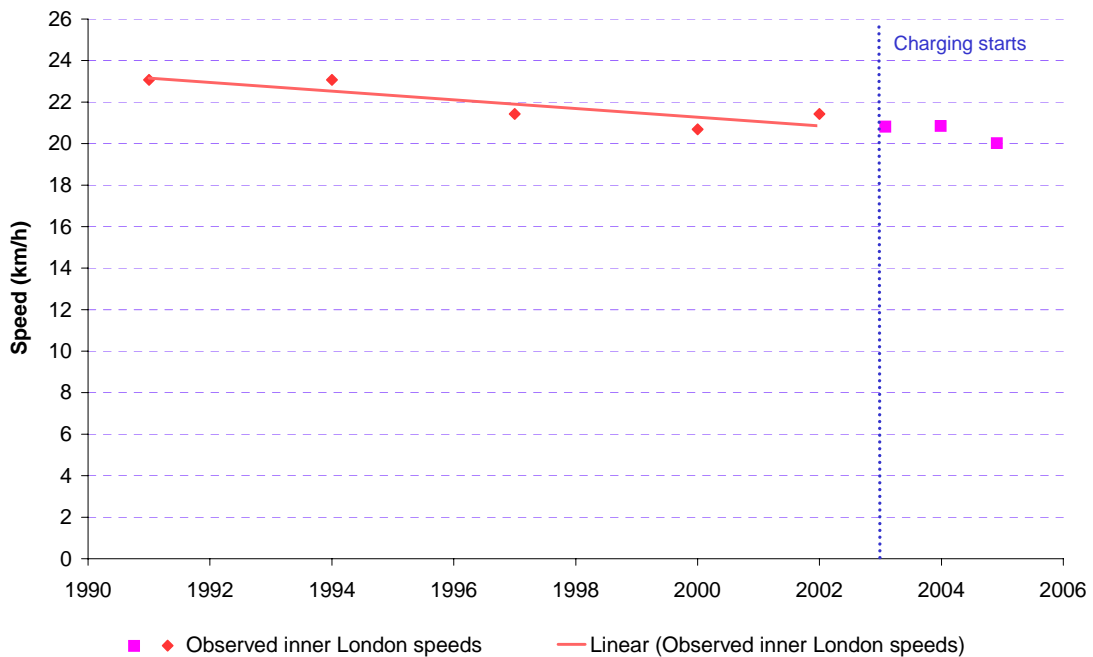
3. Congestion

Figure 3.7 Long term trend in traffic speeds inside the central London congestion charging zone.



Notes: Values up to 2001 are from individual surveys conducted in May/June of each year. Values from and including 2002 are annual averages based on six bi-monthly surveys. The pre-charging comparator value of 2.3 min/km for excess delay inside the charging zone is a 'representative' pre-charging value (see TfL's First Annual Monitoring Report) and does not therefore correspond exactly to observed average network speeds.

Figure 3.8 Long term trend in traffic speeds on main roads in inner London.



In interpreting these trends it is necessary to bear in mind that:

- Each individual moving car survey has a typical statistical error of plus/minus 1 km/hr at the 95 percent level. In broad terms, this translates to about 0.1 min/km of the excess travel rate, although this range narrows as more surveys are compared.
- There is evidence from the available data of a seasonal pattern to congestion, which can affect short-term comparisons.
- A more intensive survey regime was put in place for congestion charging monitoring from 2002. One consequence of this is that congestion will appear to be more variable than previously appreciated, simply because it is being measured more often.

Nevertheless, the available time-series for the charging zone in particular suggest that the observed changes in 2005 can be regarded as being statistically significant.

Declining traffic speeds and increases in congestion have therefore been a persistent and long-term feature of the road networks in central and inner London. In this context, the trend shown by recent surveys in central London following the introduction of charging is not out of line with the longer term trend. The implication of the long-term trend is that conditions would have continued to deteriorate in the charging zone in the absence of congestion charging. A more appropriate assessment of the impacts of charging would therefore be against equivalent conditions in 2005 without charging, projecting the long term trend forwards.

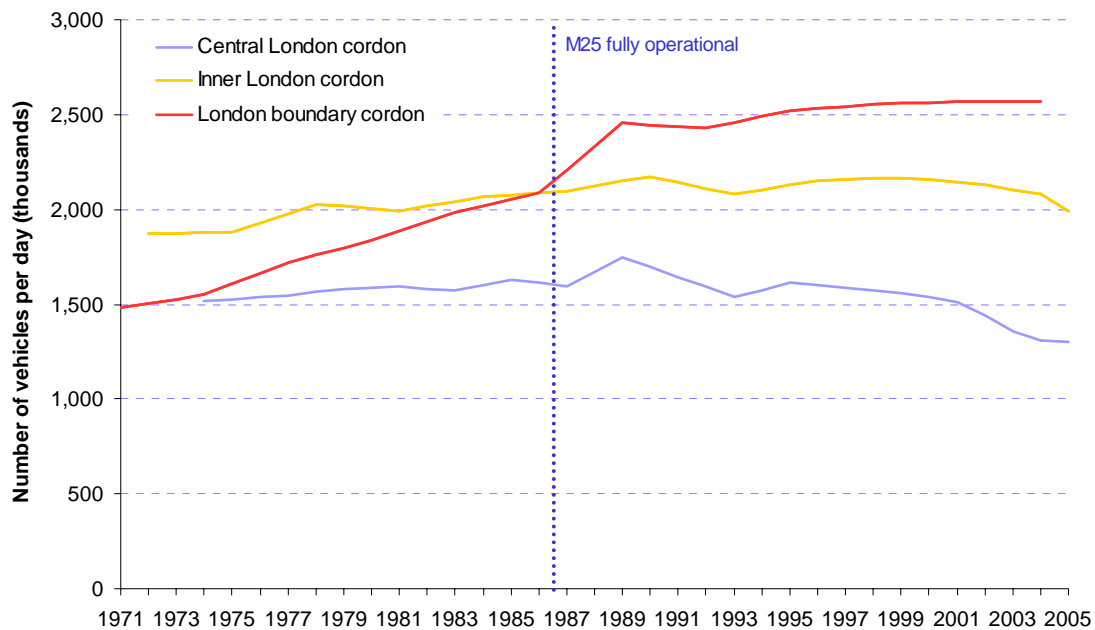
It can therefore be seen from Figure 3.7 that average network speeds in 2005 remain some 20 percent higher than would have been the case had charging not been introduced, which is a similar scale of impact to that reported immediately after the introduction of charging in 2003. Furthermore, the equivalent reduction in congestion remains about 30 percent, comparing measured values in 2005 with a projection of the long-run pre-charging trend to this year.

Increased congestion over recent years has also taken place in the context of decreases in traffic volumes. Figure 3.9 shows long-run trends for the volume of traffic crossing three strategic cordons in London. The first (central) cordon encloses an area of central London somewhat larger than the charging zone. The second (inner) cordon broadly follows the alignment of the North/South Circular roads bounding inner London. The third (outer) cordon broadly follows the administrative boundary of Greater London.

Whilst none of these cordons are ideal proxies for total traffic flows in the areas of interest, the overall picture of slowly-declining traffic coupled with increased congestion in central and inner London is clear. This is not what might have been expected, given steady-state network conditions, and appears to point to reductions to the effective capacity of the road network.

3. Congestion

Figure 3.9 Long term traffic trends across three strategic cordons in London.



Many aspects of road network planning and operation on behalf of all of the authorities variously involved over recent decades may have contributed to this. The main aim of these interventions has been to bring about a better balance between all users of the road network. They fall into four broad groups:

- widespread use of traffic control and road safety related measures on major and minor roads, having impacts on traffic levels and speeds;
- measures to assist pedestrians and cyclists at junctions;
- bus priority measures and increased bus activity and patronage;
- increased frequency of street works, particularly associated with increased activity by utilities and high technology communications.

Most of these interventions have been valuable and beneficial, either directly to selected users of the road network or more generally.

Beneficial effects include the dramatic reductions to road accident casualties referred to in Section 6 of this report, alongside improved travel choice and greater sustainability. The 20 percent reduction in the rate of personal injury accidents on London's roads since 2001 can be readily quantified and valued. The 32 percent increase between 2002 and 2005 in the number of people using the bus to travel to central London during the weekday morning peak (see Section 4) is another major achievement. Other benefits are not so readily quantifiable but are nonetheless real, such as the amenity benefits and reduced carbon dioxide as a consequence of reduced congestion. Most, however, would also have the effect of reducing the effective capacity of the road network for general traffic.

In simple terms, the moving-motor-vehicle capacity of the network has been adjusted in favour of the people-moving capacity of the network.

The Mayor's Transport Strategy places importance on these policies, alongside the priorities to reduce congestion and improve journey time reliability. It is therefore likely that recent trends will continue, and the challenge will be to continue to achieve optimal balance between needs of all road users. TfL is continuing to develop road network management plans and procedures to address these challenges.

3.8 Congestion data from satellite vehicle tracking systems (ITIS)

A new source of traffic data has been made available to TfL from a GPS satellite vehicle tracking system operated by a company called ITIS Holdings. ITIS place vehicle tracking devices in their customers' vehicles which enable vehicle movements to be tracked.

The data are supplied to TfL as part of a wider agreement with the Department for Transport whereby local authorities are supplied with processed data for agreed geographical areas, primarily for assessing traffic speeds and congestion levels in relation to Local Transport Plans. This agreement covers data over the period 2001 to end of 2006, although at the time of writing validated data are only available for analysis for the period between January 2003 and April 2004.

Data are supplied to TfL in the form of vehicle speeds for 50 metre segments of an agreed road network. Vehicle type is provided but individual vehicles are not identified. Although the vehicles tracked by ITIS are not necessarily representative of general traffic composition, speed data based on them are considered to be broadly representative of general traffic conditions.

TfL has undertaken analysis of these data to establish their characteristics and possible uses. Key findings from this exercise were:

- The distribution of observations of participating vehicles is evenly spread across networks used in analysis of traffic in London.
- On a monthly basis there are enough observations to separately analyse trends for cars alone, in addition to all vehicles.
- On a daily level there are adequate observations on key networks to allow analysis by standard time periods.
- Comparison of this data source with traditional moving car observer speed surveys indicated a reasonable correlation, with ITIS reporting speeds around 5 to 12 percent faster, which may reasonably be accounted for on the basis of the differing methodologies.

An example plot illustrating the data available from ITIS is shown in Figure 3.10. This graphic illustrates congestion levels during the morning peak period on each section of road for a network of interest in and around central

3. Congestion

London. TfL has used data for the period between 22.00 and 06.00 to represent 'uncongested' conditions. This means that indicated excess delay values would tend to be consistently lower than those shown by the moving car observer surveys described above, and the two indicators are therefore not directly comparable (see also below).

On this map, darker colours indicate the greatest congestion; the yellow stretches are the least congested. Particularly of note is the facility to examine congestion trends by direction on the same physical road link.

Figure 3.10 Example plot using ITIS satellite-based congestion data, within and around the central London congestion charging zone, 07.00 to 10.00 Monday to Friday, October 2003.



Source: Produced by TfL based on information derived from data provided by ITIS Holdings obtained from vehicles fitted with satellite tracking devices.

Note: Delay measurement is morning peak travel rate compared to travel rate between 22.00 and 06.00 in min/km (a different definition of excess delay to that used for moving car observer surveys elsewhere in this report). Links with two or more observations are shown.

Analysis of this data set to consider its potential future application in providing standard indicators is underway within TfL. As a separate exercise initial analysis has been completed to look more specifically at areas of interest in relation to the central London charging zone and the forthcoming western extension. This involved comparing travel rates from ITIS data to those from moving car observer surveys. Some preliminary findings from this work are outlined below.

ITIS and moving car survey data will differ in several respects and this needs to be recognised when comparing indicators. These include some differences in the time periods of the day used for analysis. More fundamental are differences in the definition of notionally 'uncongested' conditions, against which travel rates recorded during other time periods are compared. ITIS data for daytime periods are compared against conditions applying between 22.00 and 06.00 overnight, whereas moving car observer surveys use data from a much narrower time band, typically 02.00 to 05.00. This has particular implications in central and inner London where high activity levels in the late evening period would cause ITIS to over-state uncongested travel rates relative to moving car surveys, and consequently understate daytime congestion. However, both ITIS and moving car observer data are weighted to traffic flows ('flow weighted') on a comparable basis.

These characteristics are reflected in the comparisons that have so far been made. When travel rates throughout the day from the two sources were compared, ITIS data indicated faster travel rates than moving car observer surveys, by between 5 to 15 percent. Comparing travel rates during the two different night-time periods, ITIS data indicated slower rates than those measured by the moving car surveys, by up to 15 percent. As congestion is calculated as the difference between the daytime and night-time travel rate, and as the variation between ITIS and moving car observer indicators is in different directions for the daytime and night-time, the measure of congestion from ITIS data is less than that from moving car observer surveys, in some cases by up to 50 percent.

The daytime travel rate indicators are reasonably consistent in their variation from moving car observer survey indicators, suggesting that factors can be applied to render the two indicators more directly comparable. As would be expected this resulted in indicated congestion in levels much closer to the moving car observer surveys, with differences of between 1 percent and 10 percent (Table 3.1).

Initial conclusions are that ITIS data, or similar GPS-based indicators, will prove a useful addition to existing methods of measuring congestion. Particular advantages are the volumes of data potentially available; the ability to cover arbitrary networks of interest; and comparable coverage across different networks and time periods.

3. Congestion

Table 3.1 Example comparisons between ITIS data and moving car observer (MCO) surveys data. Charging hours equivalent.

	ITIS (min/km)	MCO (min/km)	Difference (min/km)	% Difference
Central zone				
Travel rate	3.1	3.4	-0.4	-11
Congestion	0.9	1.5	-0.6	-42
Factored congestion	1.4	1.5	-0.2	-10
Inner Ring Road				
Travel rate	3.3	3.4	-0.1	-4
Congestion	1.4	1.6	-0.2	-14
Factored congestion	1.6	1.6	0.0	-1
Inner London				
Travel rate	2.8	2.9	-0.2	-5
Congestion	1.1	1.4	-0.3	-22
Factored congestion	1.3	1.4	-0.1	-6

Note: Factored congestion values for ITIS data are multiplied by the global difference between available observations of uncongested travel rates from both ITIS and moving car surveys. This renders both sources compatible for the purposes of this comparison. It reflects the different definitions of uncongested travel rates currently used by TfL, and does not reflect upon the appropriateness of either data source for measuring trends in congestion.

3.9 Summary of key points

Congestion charging continues to deliver significant reductions in congestion in central London. Average delays in the charging zone since charging began are now 1.7 minutes per kilometre, compared to a representative value of 2.3 minutes per kilometre before charging began. This is an average reduction of 26 percent – within the range of TfL’s expectation prior to the implementation of the scheme.

Although congestion surveys during 2005 have tended to indicate higher levels of congestion than similar surveys during 2003 and 2004, both inside the charging zone and more widely in inner London, the early indications are that this reflects a much longer-term ‘background’ trend associated with the management of available road space to better reflect the needs of all road users. Against this background trend, congestion charging continues to deliver reductions in congestion in central London towards the top end of TfL’s prior range of expectation.

4 Public transport

4.1 Introduction

The congestion charging monitoring programme covers aspects of bus, Underground and rail passenger levels and service provision in and around the central London congestion charging zone. It is also being adapted to cover the future western extension to the central London congestion charging zone, as described in Section 11.

Previous Impacts Monitoring reports have described the substantial changes in the performance of the central London bus network over recent years, some of which were enabled by the congestion charging scheme. Further enhancements to bus operations are planned to complement the forthcoming western extension to the central London charging zone.

Key findings from previous reports

- In the first year after charging there was an increase of 37 percent in the number of passengers entering the charging zone by bus during charging hours. Around half of this was assessed to have been as a result of the scheme, and the other half due to a background trend of growth.
- This background growth continued into 2004 resulting in a further increase of passengers entering central London by bus of 12 percent in the morning peak period, across a cordon similar but not identical to the charging zone boundary.
- Bus reliability improved on routes in and around the charging zone after the introduction of the scheme. Excess waiting time fell by 30 percent in the first year and by a further 18 percent in the second year after the introduction of congestion charging.
- There was a similar improvement in the indicator of bus kilometres not operated because of traffic congestion on routes affected by the charging zone. This fell by 20 percent in the first year after charging, and was maintained at this level during the second year after charging.
- After an initial drop in the number of Underground passengers exiting stations in and around the charging zone in 2003, reflecting external factors unconnected with charging, there was a recovery, so that travel by Underground to the charging zone in the second year after charging was similar to that in the year before the scheme.
- The overall number of passengers using National Rail to travel to or from the charging zone remained stable over the period spanning the introduction of the scheme.

Key findings for 2005

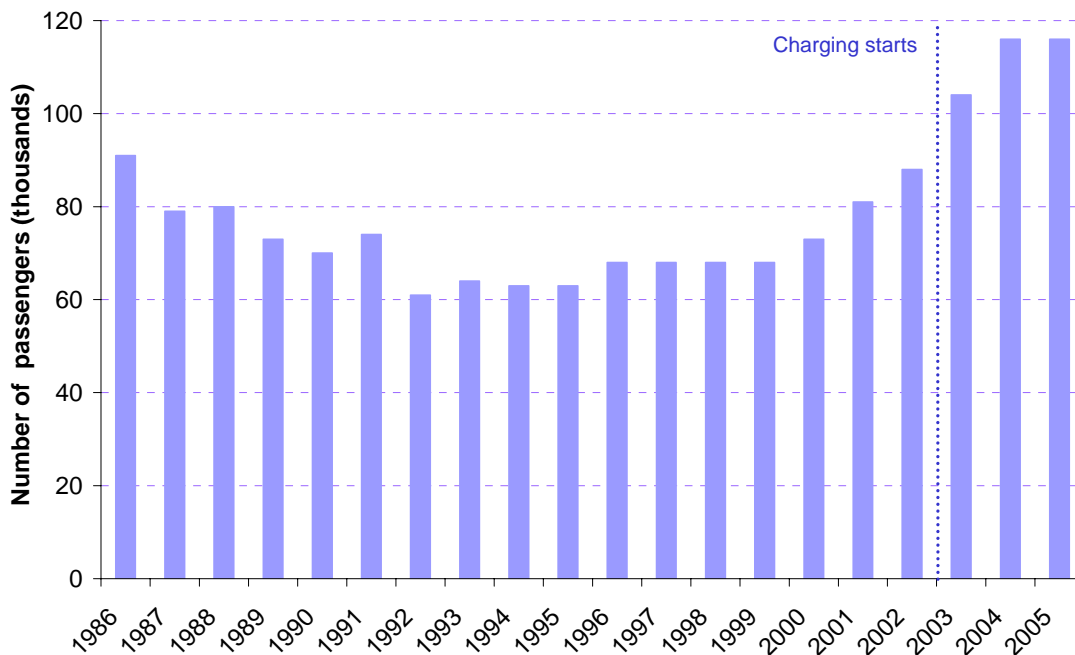
- Numbers of passengers entering the charging zone by bus were not measured directly in 2005. However, the number of bus passengers entering a wider definition of central London in the weekday morning peak was comparable to 2004, at 116,000.
- The availability of bus services continues to satisfactorily accommodate patronage.
- Reliability of bus services in and around the charging zone remained broadly unchanged in 2005, reflecting established gains from both congestion charging and other improvements to bus operations.
- However, there was an increase in the amount of bus kilometres lost due to traffic congestion, of 13 percent. These trends are generally reflected across the wider bus network, and may reflect the wider congestion trends discussed in Section 3.
- Although 52 people were killed and 700 were injured and there was considerable short term disruption, the London bombings of July 2005 had little long-term impact on Underground travel. The number of passengers entering central London by Underground increased overall in comparison with both 2003 and 2004, usage in 2005 overall being comparable to pre-charging conditions in 2002.

4.2 Buses

The regular Autumn survey of bus passengers entering the wider central London area during the morning peak period, part of the Central Area Peak Count, was completed in Autumn 2005. This survey was undertaken during the period after the congestion charge increase to £8 and at a point when the more immediate impacts of the July 2005 bombings in central London had largely diminished.

Figure 4.1 illustrates these counts over the last 20 years and shows the strong trend in growth over recent years. In the first year after charging there was an increase of 18 percent in passengers entering central London during the weekday morning peak period, followed by a further increase of 12 percent in the following year. In 2005 the estimated number of bus passengers remained very similar to those recorded in 2004, at around 116,000.

Figure 4.1 Bus passengers entering central London, 07.00 to 10.00, Autumn counts, 1986 to 2005. TfL Central Area Peak Count.



The substantial increases in bus passenger numbers (about one third) over 2000-2004 was driven by a number of factors including congestion charging, additional bus kilometres operated (up by one quarter) and fares (down by 16 percent in real terms).

Since 2004, bus kilometres operated have stabilised and bus fares have been significantly restructured. Whilst there have been significant increases in the price of cash fares, these have been substantially offset by the move away from single fares to off-bus tickets, including Oyster pay as you go fares so that, after allowing for inflation, the average bus fare per journey is now close to what it was in 2000. Free bus travel has also been introduced for the under-16s.

July 2005 Variations

In July 2005 the daily congestion charge was increased from £5 to £8. TfL projected that there would be an increase of around 1 to 3 percent in the number of bus passengers entering the charging zone during the morning peak period as a result of this change. In the same week, the bombings in central London occurred, complicating assessment of the impact of the charge increase.

Early analysis of the impact on the bus network suggested that in the three weeks after the bombings bus journeys to the charging zone were estimated to be about 6 percent up year-on-year. This was around 2 to 3 percent above the previous trend and although it may have been partly contributed to by the charge increase, it appeared to be largely a result of passengers switching away from the Underground in the immediate aftermath of the bombings.

4. Public transport

However, the increase was short term and declined over time as passengers returned to the Underground.

Bus reliability

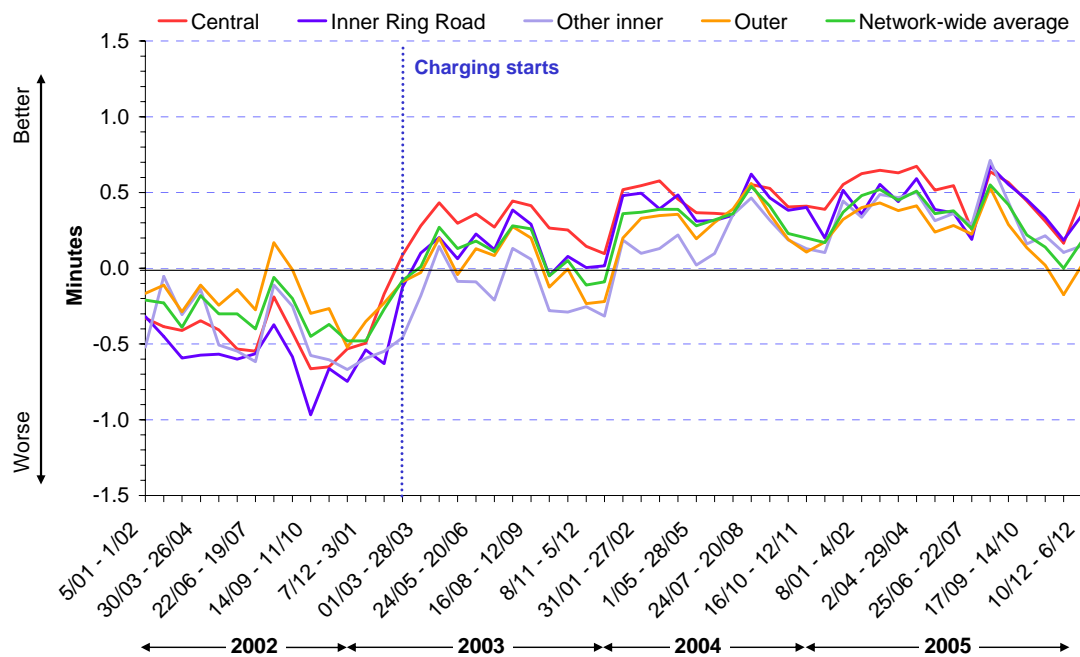
As well as changes to the service provision and patronage of the central London bus network in the period since 2002 there have also been significant improvements to the reliability of bus services. These have reflected a variety of factors, which have included increased investment in robust schedules, enhanced route supervision and the introduction of Quality Incentive Contracts, as well as the introduction of congestion charging that has reduced congestion in and around the charging zone.

One measure of bus service reliability is 'excess waiting time', reflecting the additional waiting time at bus stops experienced by passengers caused by service irregularity or missing buses. In the first year after charging there were improvements in bus service reliability for passengers in and around the charging zone of around a 30 percent reduction in excess waiting time. This was greater than the network wide average of around 20 percent for the same period. In the following year TfL recorded a further improvement of 18 percent in the charging zone. This was similar to the network wide average for the year of around 20 percent, as would be expected given that the 'step' change represented by charging did not apply in 2004.

In the most recent year bus service reliability has been maintained, and with a further fall in excess waiting time of 4 percent within the charging zone compared to the same period the previous year. This comparative stability is also reflected in the network wide change in 2005.

London Buses sets the bus operators performance standards for excess waiting time based on the characteristics of the route. Figure 4.2 shows the change in measured excess waiting time relative to the minimum standards. This illustrates the ongoing improvements to bus reliability in central London, and across the wider bus network.

Figure 4.2 Difference between excess waiting time standards and actual excess waiting time (weekday charging hours).



In addition to improvements in passenger waiting time there were also improvements measured directly from reduced traffic congestion. This is reported in terms of bus kilometres not operated compared to that scheduled. Routes operating in and around the charging zone saw the biggest improvements in this indicator in the first year after the introduction of charging of around 60 percent. The picture in 2004 was relatively stable, with gains seen in 2003 being maintained.

In the most recent period there has been a slight reduction to the gains recorded in 2003 and 2004. The proportion of scheduled bus kilometres lost to traffic congestion increased by 13 percent in 2005 compared to 2004. This trend is generally reflective of routes across the entire London bus network. Despite this recent change, routes in central London are still performing considerably better overall than they were before the introduction of congestion charging.

4.3 Underground

Underground patronage

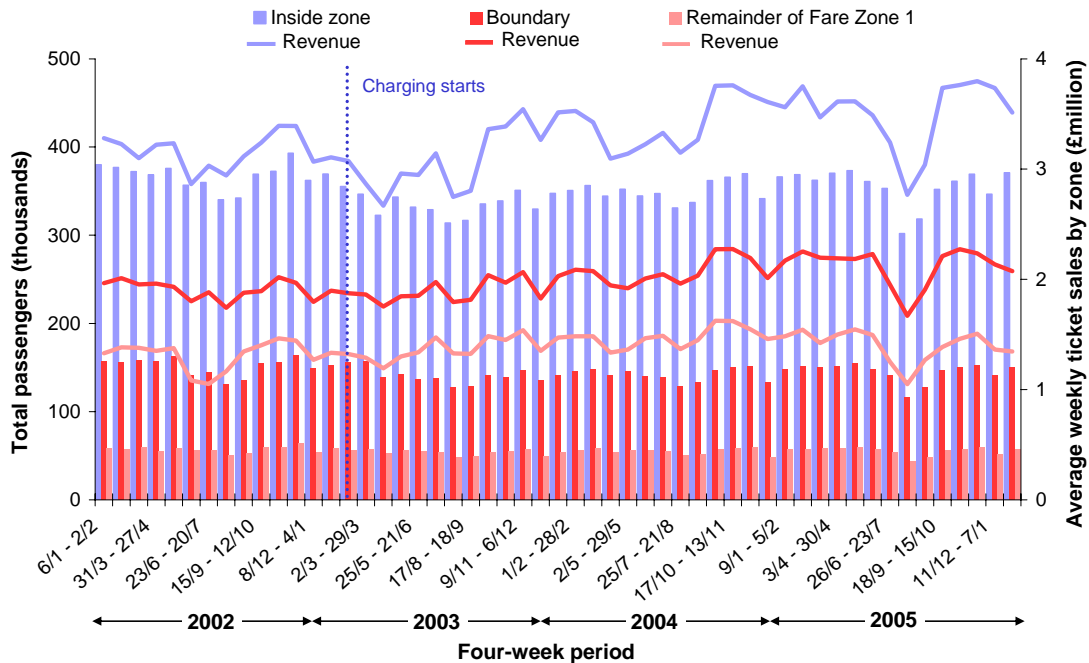
The *Third Annual Monitoring Report* described how Underground patronage in and around the charging zone had actually reduced in the first year after charging, recovering somewhat in the second year. These trends were largely as a result of prolonged closure on the Central line as well as wider economic factors during 2003. They meant that volumes of Underground travel to and from the charging zone during 2004 were slightly lower than in 2002, the year before the introduction of the scheme. This was contrary to TfL's expectation of a small net increase (of the order of 1 percent) in Underground travel during

4. Public transport

2003, reflecting a complex pattern of mode share adjustments as a response to congestion charging.

Figure 4.3 updates the recent trend in Underground patronage in and around the charging zone (with Underground Fare Zone 1 divided into three sectors), looking at estimates derived from passenger exits through automatic ticket gates at stations, and revenue taken.

Figure 4.3 Passengers exiting Underground stations and revenue trends in and around the charging zone and within the rest of Fare Zone 1, during the morning peak period (07.00 to 10.00).



Generally the trends in the number of passengers exiting stations inside the charging zone are similar to those on the boundary of the zone and in the rest of Fare Zone 1. On average in the first 12 four-week monitoring periods following the introduction of congestion charging there was a reduction in the number of passengers exiting stations during the morning peak period of between 6 and 9 percent. In the equivalent period in 2004 there was an increase of between 2 and 5 percent. In the most recent equivalent period in 2005, there was very little change compared to the previous year, with an increase of up to 1 percent in the number of passengers exiting stations during the morning peak period.

The transitory impact of the disruptions caused by the July 2005 bombings is evident from Figure 4.3, as is the general similarity of trends across each of the 'baskets' of stations being considered.

In the weekday morning peak period during 2005, there were on average around 498,000 passengers exiting stations in and around the charging zone each day. This compares with around 494,000 exiting passengers in the

previous 12 four-week monitoring periods in 2004 and 473,000 in the first 12 monitoring periods after charging, 2003. These compare to a value of 516,000 prior to the introduction of charging during 2002.

Considering patronage throughout the charging day at stations in and around the charging zone there is a very similar trend. However, in the most recent 12 four-week monitoring periods (2005) there has been a slight decrease of 2 percent in the number of passengers exiting stations compared to the previous year (2004). This may reflect reduced 'discretionary' travel, given the security situation.

During charging hours there are on average 1,226,000 passengers exiting stations in and around the charging zone. This again compares with 1,247,000 in the previous 12 four-week monitoring periods, 1,181,000 in the 12 periods after the introduction of charging, and 1,275,000 prior to the introduction of charging. Overall in 2005 there were 4 percent fewer passengers exiting stations during the charging day compared to before the introduction of congestion charging in 2002.

Comparing trends for central London with those across the whole of the Underground network, it is clear that there has been greater growth in passenger usage outside central London. During the most recent 12 four-week monitoring periods there was an increase in patronage on the whole Underground network of 3 percent during the morning peak, and of 1 percent during charging hours compared to the previous year. Overall in 2005 there was an increase in patronage of up to 2 percent on the whole Underground network, compared to before the introduction of charging in 2002.

Underground revenues

Trends in revenue taken at stations follow a similar pattern to those of patronage, although there has been a general rise in the absolute value of fare revenue taken.

In the first 12 four-week monitoring periods after the introduction of congestion charging there was little change in the fare revenue taken at stations in the charging zone compared to the same periods the year before. In the subsequent year, 2004, there was a significant increase in the value of revenue taken, by 10 percent, linked to fare changes in that period and recovery from the Central Line closures of 2003. In the most recent year, 2005, there has been a continued increase in the value of revenue taken, although of just 2 percent. This includes the short-term 4 percent year-on-year reduction to revenue recorded in the period after the bombings in July 2005.

TfL consider that the changes in fares have not had a significant impact on the level of usage as overall fare increases have been close to the rate of inflation, albeit with various internal adjustments reflecting the move towards Oyster Cards. The revenue figures illustrated above were partly boosted in 2004 by recovery from the Central Line problems the previous year. They also benefited from switching of Travelcard season ticket sales from the train

4. Public transport

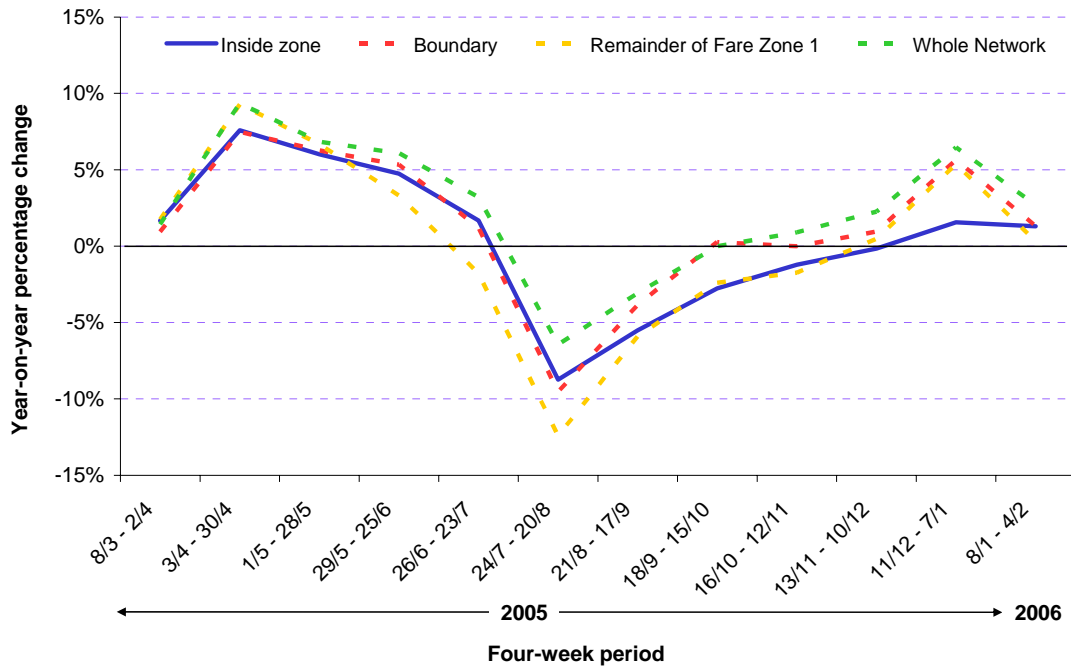
companies to Underground stations to allow them to be issued in Oyster format. This will not have been reflected to the same extent in actual journeys as the same journeys would have been made regardless of where the ticket was bought.

July 2005 Variations

In July 2005 the daily congestion charge was increased from £5 to £8. TfL considered that there would be little impact from this change on the number of passengers using the Underground and that any changes would not be expected to be detectable within the trend data. In the event, any adjustment was completely obscured by the impacts of the central London bombings.

Trends for 2005 can be analysed in more detail to understand these impacts. Figure 4.4 shows the year-on-year changes for each of the most recent 12 four-week monitoring periods. This indicates that prior to the July 2005 bombings there was a general increase in the number of passengers exiting stations during the weekday morning peak period at stations in and around the charging zone as well as across the whole network. In the periods immediately following the bombings there was a pronounced decrease in the number of passengers, which slowly began to recover over more recent periods. Generally, year-on-year changes for late 2005 and early 2006 do not indicate any visible trend that can be attributed to the July 2005 Variations.

Figure 4.4 Year-on-year changes in passenger exits from Underground stations in and around the charging zone, the rest of Fare Zone 1 and across the whole network, during the morning peak (07.00 to 10.00).



4.4 Summary of key points

Bus patronage and service provision in relation to the charging zone were not measured directly in 2005. However, equivalent measurements looking at bus travel to a wider definition of central London suggested that both patronage and service provision during 2005 remained at levels comparable to 2004. These, in turn, reflected improvements to bus service provision and increased patronage in the previous years.

Bus service reliability, as measured by excess waiting time, continued to show sustained improvement compared with pre-charging conditions, although there was some suggestion that increased traffic congestion was beginning to impact on service performance, both within the charging zone and more widely across London.

Although the July 2005 bombings in central London caused substantial immediate disruption to the public transport networks, all the indications are that this was short-term. Patronage on the Underground to central London recovered, both from this and from the comparative declines described in earlier reports, to stand in late 2005 only marginally below that seen in 2002 before the start of charging.

5 Business and economic impacts

5.1 Introduction

This section reviews and updates the available evidence relating to the impacts of congestion charging on business and economic activity. It presents the results of four years of research and monitoring of scheme impacts, undertaken by Transport for London and Greater London Authority Economics. A wide range of available data sets and techniques have been utilised to establish and support the evidence base relating to the impacts of the scheme on business and economic activity in and around central London.

In contrast to the more immediate impacts of the scheme on traffic and travel patterns, any effects on businesses would take some time to manifest themselves and should not be considered in isolation from wider economic trends and influences. A recent example was the July 2005 bombings in central London that had impacts, albeit mostly short term, on many economic activities. However, three years after the introduction of the scheme, no significant consequences of the charge on business activity in aggregate have so far been identifiable in the available data.

Quantitative assessments of scheme impacts are critically limited by the quality and quantity of the available input data and the technical assumptions that need to be made. Furthermore, the business impacts of congestion charging are a mixture of both positive and negative effects, and disentangling these creates further complexities. TfL have therefore used the widest possible range of evidence to build as full and comprehensive assessment as is currently possible.

This has been recognised in an independent review of the economic and business impacts monitoring work that was undertaken by Ernst & Young. Having reviewed the underlying data and methodology employed by TfL and the GLA, Ernst & Young concluded that the assessment is reasonable that congestion charging, with a £5 charge, has had a broadly neutral impact on the business economy of central London.

Key findings from previous reports

TfL's *Third Annual Monitoring Report* concluded that:

- The introduction of congestion charging in February 2003 coincided with a temporary economic slowdown, as well as a wider set of local, national and international conditions that were not favourable to general economic performance.
- Analysis of several different indicators of economic performance, including measures of business population and turnover, profitability and property market trends did not reveal evidence of a significant congestion charging impact.
- There was evidence of a recovery in the economic performance of central London during 2004, in line with wider national trends.

- Studies of retail trends and an econometric analysis of the impact of congestion charging on sales at the Oxford Street branch of John Lewis suggested that the scheme had no measurable effect on central London retail sales.
- Shops in the inner core of the charging zone saw an improvement in their rental values and rental yields fell faster within the zone relative to the rest of Inner London, suggesting a positive outlook for retailing within the zone.
- TfL's business surveys for 2004 showed a continued recognition of the transport benefits associated with the scheme.

Key findings for 2005

- The growth of the London economy remained positive despite the effects of bombings in central London in July 2005.
- Businesses performance in the charging zone was significantly better than in the rest of London, particularly in terms of profitability and productivity.
- Updated analysis of comparative trends in various indicators of business performance, including change in jobs, business populations and turnover continue to show no evidence of differential effects between the charging zone and comparator locations that might be indicative of a congestion charging effect, either positive or negative, on aggregate business performance in central London.
- Trends in business registrations for VAT and appeals relating to business rates in central London do not point to a significant congestion charging impact on businesses in central London.
- Although year-on-year retail sales in central London saw a sharp decline throughout the July to September 2005 period, by early 2006 this trend was reversed resulting in full recovery with annual growth rates above those being seen in the rest of the UK.
- Within the charging zone, the retail sector has increased its share of enterprises and employment since 2003.
- The majority of charging zone businesses continue to recognise that decongestion had created a more pleasant working environment and easier journeys for employees using public transport for work.
- Amongst businesses in the charging zone as a whole, there were more supporters of the congestion charge than opponents.
- An independent review of the monitoring of the economic and business impacts of congestion charging reported that it was reasonable to conclude that the £5 congestion charge had had a broadly neutral impact on the central London economy.

5.2 Ernst & Young review

Ernst & Young were commissioned to provide an independent review of the monitoring of the business and economic impacts of the central London congestion charging scheme to ensure that the conclusions are objective and robust.

The report is available at www.london.gov.uk/mayor/economic_unit.

This independent review is based on the analysis of the business and economic impacts monitoring, as presented in TfL's *Third Annual Monitoring Report*. Their approach was to review the overall economic framework used to guide the analysis, as well as the specific analyses used in the report, to test and populate the framework.

This review found that the conclusion is reasonable that congestion charging with a £5 charge has had a broadly neutral impact on the central London economy. It was also noted that congestion charging had only been in operation for two and a half years (at the Ernst & Young review date), and that it was therefore difficult to make a definitive conclusions on its impact at that stage.

The review also made recommendations as to how the work could be improved in the future. TfL accepts these recommendations, and the planning of future business and economic impact research will follow the recommendations as closely as possible. TfL and the GLA will continue to work closely to ensure that the impact of charging schemes and wider economic trends and influences affecting London's economy are understood as they affect stakeholders and business activities within the central London area.

5.3 Recent trends in the London economy

Recent economic trends show that business performance in London in general has been good over the past two years, albeit with a slowing of growth in 2005 compared to 2004. To better understand the specific impacts of congestion charging, it is necessary to examine the extent to which business performance in the charging zone differs from that in comparable areas and sectors.

The business sector profile of the charging zone compared with that of Greater London as a whole is shown in Table 5.1. This section looks at available indicators of overall economic change across the period considered by the TfL monitoring, making comparisons between the economic performance of the charging zone and that of Greater London as a whole.

Employee jobs and business units

A comparison of employee jobs (self-employed are not included) and business units (sites not companies) in the charging zone and Greater London

is available using data from the Annual Business Inquiry. The latest data for Greater London are for 2004 and were published in December 2005. A postcode based definition was used for the charging zone.

Table 5.1 shows that, for 2004, financial and business services accounted for the highest percentage of jobs in both the charging zone (49 percent) and in Greater London (32 percent). Education and health accounted for the second highest proportion in both areas, although the Greater London proportion was double that of the charging zone.

Other sectors where the proportion was significantly higher in Greater London than in the charging zone included retail, manufacturing, wholesale and construction. Four sectors in the charging zone account for less than 4 percent of total employees, these being manufacturing, wholesale, construction and primary/utilities sectors, whereas only the construction and the primary and utilities sectors fall within this bracket in Greater London.

Table 5.1 Employee jobs by business sector in 2004.

Sector	Charging zone		Greater London	
	Employee jobs	Percentage of zone jobs	Employee jobs	Percentage of jobs
Financial and business services	605,000	49%	1,250,000	32%
Education and health	100,000	8%	666,000	17%
Other services	97,000	8%	275,000	7%
Hotels and restaurants	96,000	8%	289,000	7%
Transport and communication	87,000	7%	305,000	8%
Public administration	86,000	7%	230,000	6%
Retail	74,000	6%	380,000	10%
Manufacturing	41,000	3%	216,000	6%
Wholesale	34,000	3%	212,000	5%
Construction	14,000	1%	119,000	3%
Primary and utilities	3,000	0%	11,000	0%

Source: Annual Business Inquiry, Office for National Statistics, December 2005.

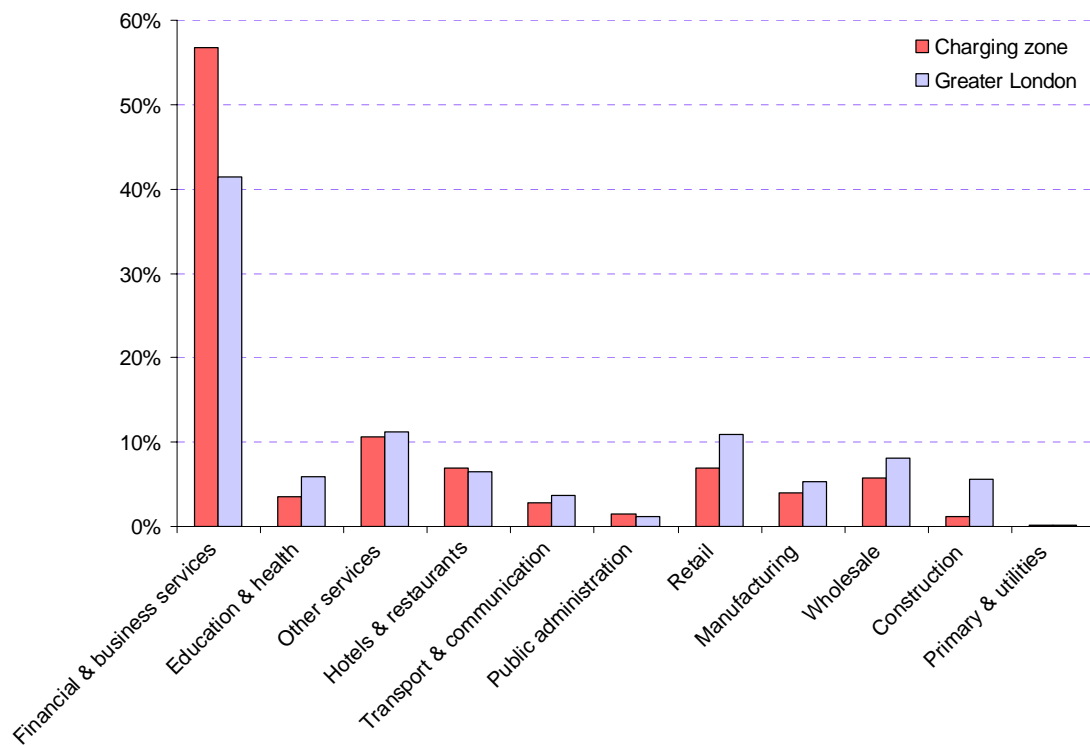
Note: The definitions used above for the charging zone includes postcode sectors that were omitted from previous definitions, such as those sectors which fall partially in the zone. As a result, the 2005 data above are not directly comparable to the data published in TfL's Third Annual Monitoring Report.

Figure 5.1 shows a similar pattern in terms of business units. In 2004 the financial and business services sector accounted for the largest proportion of business in Greater London (40 percent) and even more so in the charging zone (56 percent of business units). 'Other services' was the second most significant sector in both areas, at 11 percent of business units.

5. Business and economic impacts

The retail sector accounted for the third highest proportion of business units in both areas, although the proportion is higher in Greater London (11 percent) than in the charging zone (7 percent). In both areas, each of the education and health, transport and communications, and public administration sectors account for a smaller proportion of total business units when compared to the proportion of total employees. This is not surprising, given that these industries are characterised by a large number of employees per business site.

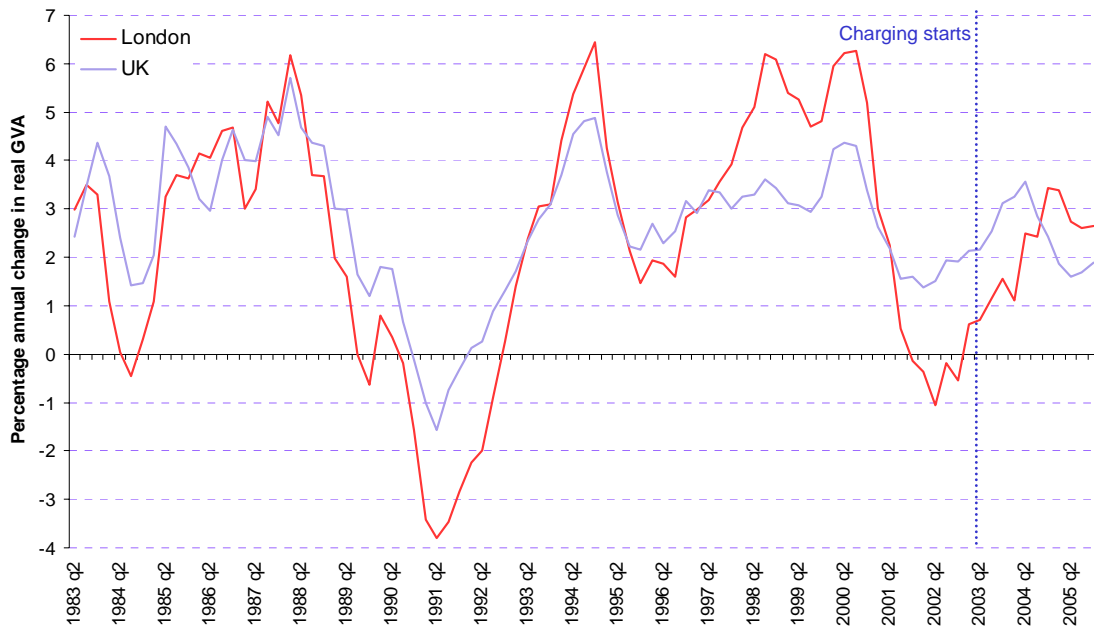
Figure 5.1 Business units by business sector in 2004.



Source: Annual Business Inquiry, Office for National Statistics, December 2005.

Recent economic trends

During 2002, prior to the introduction of congestion charging, London's economy suffered a period of declining output, as shown in Figure 5.2. Since 2003, however, there has been positive economic growth in London and this continued to be the case in 2005.

Figure 5.2 Change in Gross Value Added, Greater London and UK.

Source: Experian Business Strategies.

During 2005, the rate of economic growth in London slowed in comparison to the end of 2004, largely due to a slowdown in consumer spending that occurred both across London and the UK during the year. Lower house price inflation and high levels of consumer debt were key factors in this reduced spending and the Bank of England responded by reducing interest rates to 4.5 percent in August 2005 from the previous level of 4.75 percent.

Table 5.2 Recent economic indicators, percentage change year-on-year.

	2003	2004	2005	2006 projections
London Gross Value Added	1.2	2.4	2.1	2.7
London employment	0.8	-0.6	1.4	0.8
Household expenditure	-0.2	2.9	1.5	1.9

Source: GLA Economics: London's Economic Outlook: Spring 2006.

The London economy in 2005 also had to withstand the impacts of the July 2005 bombings. In economic terms, the consequences were most severe in the tourism sector with a lower than expected number of visits to London during the second half of 2005 from both domestic and international tourists. Despite the bombings, however, international visitor numbers to London over the whole of 2005 still showed a net increase over 2004 and are expected to increase further in 2006.

In the retail sector, meanwhile, the bombings led to retail sales in central London dropping sharply year-on-year throughout the July to September 2005 period. However, this downturn in central London retail was short-lived, and

by early 2006, year-on-year retail sales in central London activity had not only fully recovered but annualised growth rates had risen to significantly above those being seen in the rest of the UK.

The outlook for 2006 is therefore positive, with London currently outperforming the rest of the UK in terms of growth in output, growth in employment and growth in the value of retail sales. One of the reasons for this is that services are outperforming manufacturing, and London has a more service based economy than the rest of the UK. Growth in the financial and business services sector is particularly important for London and this key sector grew strongly in the UK during the fourth quarter of 2005.

5.4 Assessments of business change

A research programme was designed to draw on as many detailed business related datasets as possible to look for signs of impacts from congestion charging. At the level of geographic and business category disaggregation that is necessary to investigate the impacts of congestion charging, no existing single dataset will be able to deliver truly robust results. However, by analysing a number of different data sources, if they show comparable results, we can be more confident that any inferences are correct.

The main data sources used in this research were:

- *The Annual Business Inquiry* – Official data from the Office for National Statistics that enable comparison of employment and business units at a relatively fine level of geographic and business sector disaggregation.
- *The Beta Model* – A private consultancy which uses a proprietary database of businesses based on Yell PLC's Yellow Pages Business Directories. It includes 90 percent of organisations in the UK with a business tariff telephone line.
- *The Dun & Bradstreet database of businesses* – A commercial database containing individual records for most businesses and workplaces in the UK. The database is generated from Companies House and Thomson Directories and is subject to continuous updating through telephone contact.
- *The London Development Agency/Business Link for London/London Annual Business Survey* – First conducted in 2003, this annual survey with an achieved sample size of over 4,000 private sector businesses provides an additional, independent source of data.

The common approach of all these studies has been to compare business performance inside the congestion charging zone with business performance outside the zone, both before and after the introduction of the scheme. This is measured by such variables as number of businesses or sites and numbers of employees, sales and profits.

The conclusion from all the studies, updated for this report to include data for 2004, is that it remains difficult to discern any significant impact on business

performance from congestion charging. Again, as previously reported, given the limitations of the data on the £5 charge and the hypothesis tests these allow, the most reliable conclusion is that overall, in net terms, business has not been measurably affected, either positively or negatively, by congestion charging in central London.

The following summarises the results of the updated studies under this heading.

Annual Business Inquiry

The Annual Business Inquiry is an annual survey conducted by the Office for National Statistics. It has two parts – one which concentrates on employee and site data and another that focuses on financial information. As in previous TfL reports, this analysis restricts itself to the employee and site data since these data can be obtained at a detailed enough geographic level to separate the congestion charging zone from the rest of inner London. Detailed data for 2004 became available at the end of December 2005.

The data were obtained at postcode sector level and a postcode sector based definition of the charging zone was used for this analysis. As postcode sectors change over time, ideally there would be a postcode sector definition for the charging zone for every year of analysis. These data are not readily available, so the approach taken is to use the latest postcode sector definition and fix this for all years. In this report the definition used has therefore included some postcode sectors which were omitted from previous definitions, such as those postcode sectors which fall only partially within the charging zone. As a result, the data look different from last year and therefore the figures published in this report are not directly comparable to previous reports, particularly where percentage changes are considered.

Previous analysis has been developed by extending the period of analysis, which now goes back to 2000 and extends to 2004. In this way, trends in levels of employee jobs and business units can be used to assess whether congestion charging has had any measurable impact on the London economy.

Given that it is difficult to separate out a potential 'congestion charge effect' from any other influence on the economy, the approach here has been to apply a strict test, ie there must exist notable shifts in relative trends around the period of the introduction of the charge in early 2003 in order to say that there is *likely* to have been an impact of the £5 charge on business activity. It should be noted however that even if such notable shifts are observed, they are not a definitive indication of an effect – the shifts in trends could have been caused by some other economic factor. A summary of the analysis is presented below.

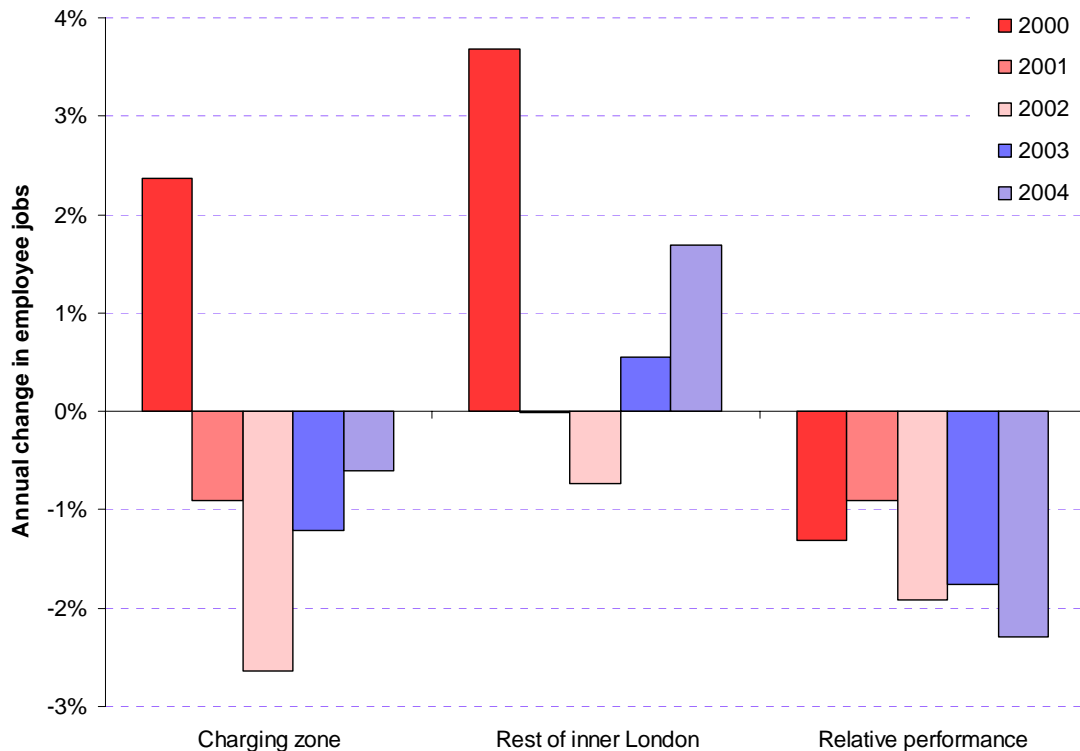
Employee jobs

Figure 5.3 shows annual percentage change in employee jobs compared to one year earlier for the charging zone and a control area, in this case the 'rest of Inner London'.

Figure 5.3 also charts relative performance – the difference between percentage change in the charging zone in employee jobs against the control area for all years. A positive figure means the charging zone out-performed the control area and a negative figure implies the opposite. Annual percentage change begins positively in both areas, growing by 2.4 percent in the charging zone and 3.7 percent in the rest of Inner London in 2000 compared to 1999. However, the figures worsen for both areas in 2001 (-0.9 percent in the charging zone and 0 percent in the control area), and fall further in 2002 (-2.6 percent in the charging zone, -0.7 percent in the control area). From 2003, change in employee jobs becomes positive for the control area, but remains negative in the charging zone.

The control zone has therefore increasingly performed better than the charging zone in terms of employee jobs across the available time-series. This cannot be interpreted as a negative effect of the scheme because the pattern is observed before the scheme was introduced, suggesting that the under-performance is likely to be a result of other factors (such as the economic cycle), and not congestion charging itself. Therefore, there is no evidence from this analysis that the scheme has had a net aggregate impact on employee jobs in the charging zone.

Figure 5.3 Annual percentage change in aggregate employee jobs. Charging zone relative to rest of inner London.



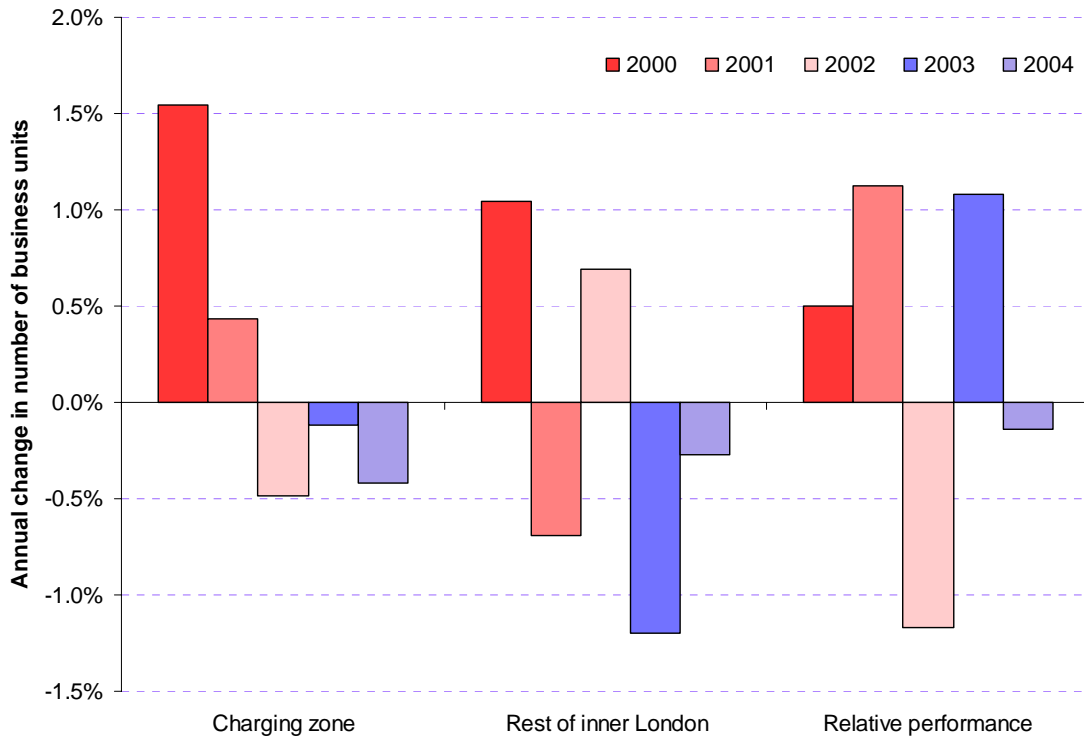
Source: Annual Business Inquiry, Office for National Statistics, December 2005.

Note: 'inner London' was defined as the following boroughs – Camden, City of London, Hackney, Hammersmith and Fulham, Haringey, Islington, Kensington and Chelsea, Lambeth, Lewisham, Newham, Southwark, Tower Hamlets, Wandsworth, and Westminster. The 'rest of inner London' was defined as 'inner London' minus the congestion charging zone.

Business sites

The same analysis has been performed for business sites. Figure 5.4 shows the percentage change in the number of business units for the charging zone and the control area. Prior to the introduction of the scheme in 2000 and 2001, the charging zone performed better than the control area. Although the number of aggregate business sites within the charging zone grew by less in 2001, compared to 2000, the growth rate remained positive. A similar decline in the control area however represented a fall in the number of business sites in 2001. The charging zone under-performed the control area in 2002, but the pattern reversed in 2003, with significantly larger falls in the control area than in the charging zone. In 2004, the relationship switched again, with the control area out-performing the charging zone, despite both changes being negative.

Figure 5.4 Annual percentage change in aggregate number of business sites. Charging zone relative to rest of inner London.



Source: Annual Business Inquiry, Office for National Statistics, December 2005.

Looking at relative performance, the fall in 2004 may be interpreted as a negative effect of the scheme on the number of business units in the charging zone. However, given that a similar pattern existed in 2002 (and that 2003 shows strong relative over-performance), such an interpretation is unlikely to be correct. Therefore, there is no firm evidence here to suggest a significant effect of congestion charging on the aggregate number of business units in the charging zone.

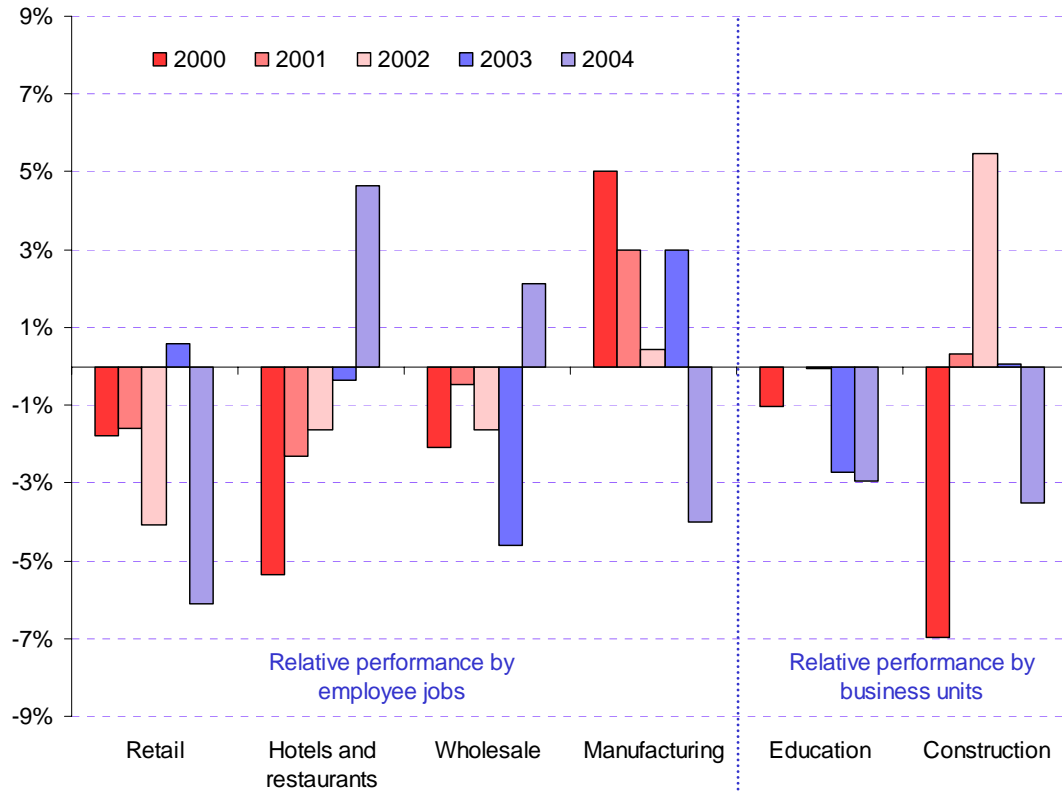
Changes by business sector

Breaking down the data by business sector leads to similar conclusions. Annual changes in employee jobs and business units by business sector have been used to analyse trends in relative performance for all business sectors for the period 2000-2004, using the same approach as above.

For the majority of sectors, there are no patterns that indicate a possible congestion charging effect. Figure 5.5 shows trends in relative performance for the charging zone, compared to the rest of inner London, for six of these sectors. In the retail sector, although the charging zone under-performs the control area in 2004 in terms of change in employee jobs, this trend existed in all the years previous to the introduction of the charge (2000-2002). In the hotel and restaurants sector, the charging zone out-performed the control zone in 2004 in terms of change in employee jobs. However, it is equally unlikely that this improvement is due to the scheme, because 2004 is in line

with the observed trend of improvement in relative performance over the whole period.

Figure 5.5 Relative performance for selected business sectors in the congestion charging zone compared to the rest of inner London.



Source: Annual Business Inquiry, Office for National Statistics, December 2005.

Only four sectors exhibited trends in relative performance that may indicate a possible congestion charging effect. In the education and in the construction sectors, there were switches in trends of relative performance (in terms of business units) after 2002, indicating that negative net impacts cannot be ruled out in these sectors. This could also be said in the wholesale and the manufacturing sectors (in terms of employee jobs), although the patterns are weaker – for the wholesale sector, because of the positive relative performance observed in 2004, and for the manufacturing sector because of the positive performance observed in 2003.

Overall, although negative impacts in some sectors cannot be ruled out from this source, there is no firm evidence in the majority of sectors of any significant congestion charge effect.

Changes by company size

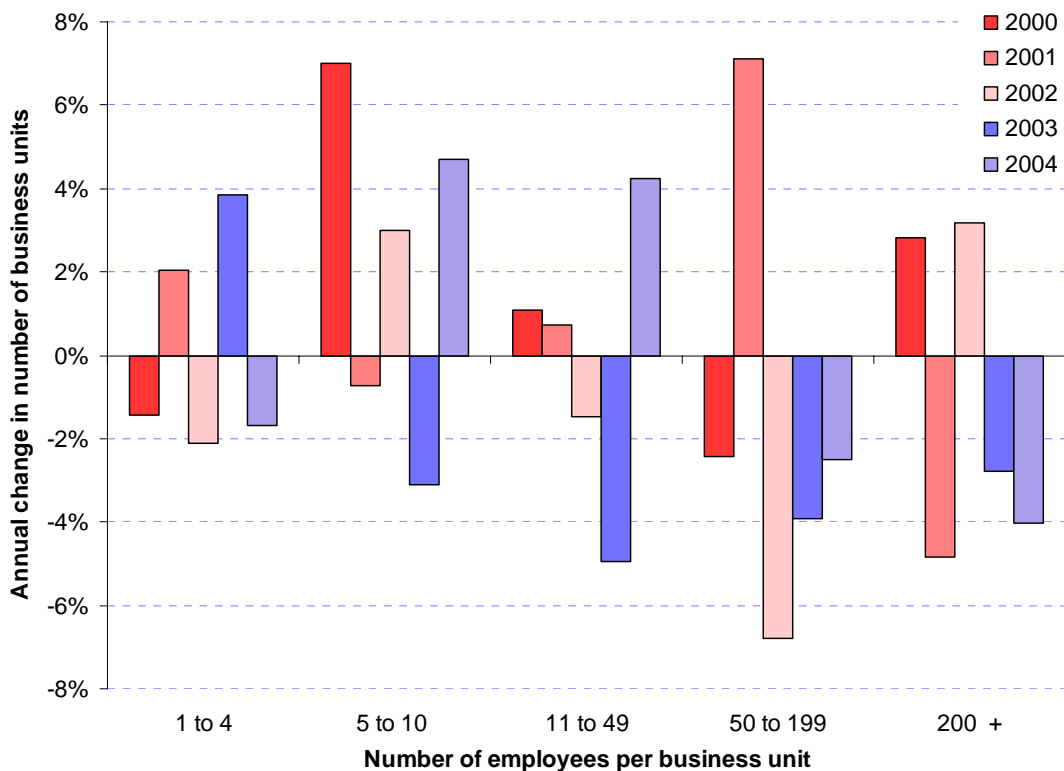
Figure 5.6 charts the relative performance and annual growth in the number of business sites in the charging zone relative to the rest of inner London. The analysis is broken down by company size.

5. Business and economic impacts

Aside from those companies with 200 or more employees, there are no patterns in the trends of relative performance which indicate a possible negative impact of the congestion charge. The switch in the trend for those companies with 200 or more employees may indicate a possible congestion charging effect, although the strong relative over-performance in 2000 and the subsequent downward trend in 2001 do not support this.

The most reliable inference from this analysis – and the similar analysis based on changes in employee jobs – is that, although we cannot rule out negative impacts for those companies with 200 or more employees, for the most part there is no evidence that congestion charging has disproportionately affected any particular size of business in the charging zone.

Figure 5.6 Relative performance in terms of business units, by company size, congestion charging zone compared to the rest of inner London.



Source: Annual Business Inquiry, Office for National Statistics, December 2005.

The Beta Model

The company The Beta Model was again commissioned to update its previous analysis of business turnover and dynamics in the charging zone relative to other areas. The Beta Model uses data from the Experian Business Strategies National Business Database, which includes information on approximately 2.4 million individual UK businesses.

Data for the period April 2004 to April 2005 were compared to data covering the whole period from April 2000 to April 2004 to assess whether recent

changes were part of a longer-term trend, or whether they were potentially new trends which might be an effect of congestion charging. Additionally, the data from the congestion charging zone were compared to other areas, including specific control areas in London and the UK to assess how changes observed in the charging zone compare with those observed in other geographic areas.

Within this analysis the congestion charge could be said to have potentially had an impact on business activity if it has coincided with a departure from longer-term trends and if such a departure had not also been replicated in the rest of the London or UK economy. In other words, this analysis is seeking to identify changes in longer term trends that have occurred specifically within the congestion charging zone and not elsewhere.

The results show that the congestion charge zone had a declining share of enterprise from April 2004 to April 2005 compared to London as a whole. This did not represent any major change in absolute numbers of enterprises in the zone but rather reflected the fact that the rate of business formations in areas of London outside the charging zone was higher than that in the charging zone. This is a continuation of a longer term trend that predates the introduction of the scheme. It is also comparable to the trend in the other UK inner city benchmark area studied. As such, there is no evidence to suggest that the congestion charge has had a measurable effect in either direction upon enterprise in the charging zone since its introduction.

In terms of individual business sectors, financial services in the charging zone had a declining share of overall numbers of enterprises compared to London as a whole and also compared to the UK. This was mainly due to a falling share of formations in small enterprises of one to five employees in this sector within the charging zone. Furthermore, there is some evidence that this fall in share has been higher since April 2003. Another sector that has seen a decline in enterprise not anticipated by previous trends is the bars and restaurants sector, which witnessed a decline in its share of charging zone enterprises in 2005.

By contrast, the retail sector in the charging zone has increased both its share of enterprises and its share of employment over the period April 2003 to April 2005 relative to both the rest of London and the UK. As such, it has been the most successful of the six individual business sectors studied, according to The Beta Model, over the period since the introduction of congestion charging.

Dun & Bradstreet

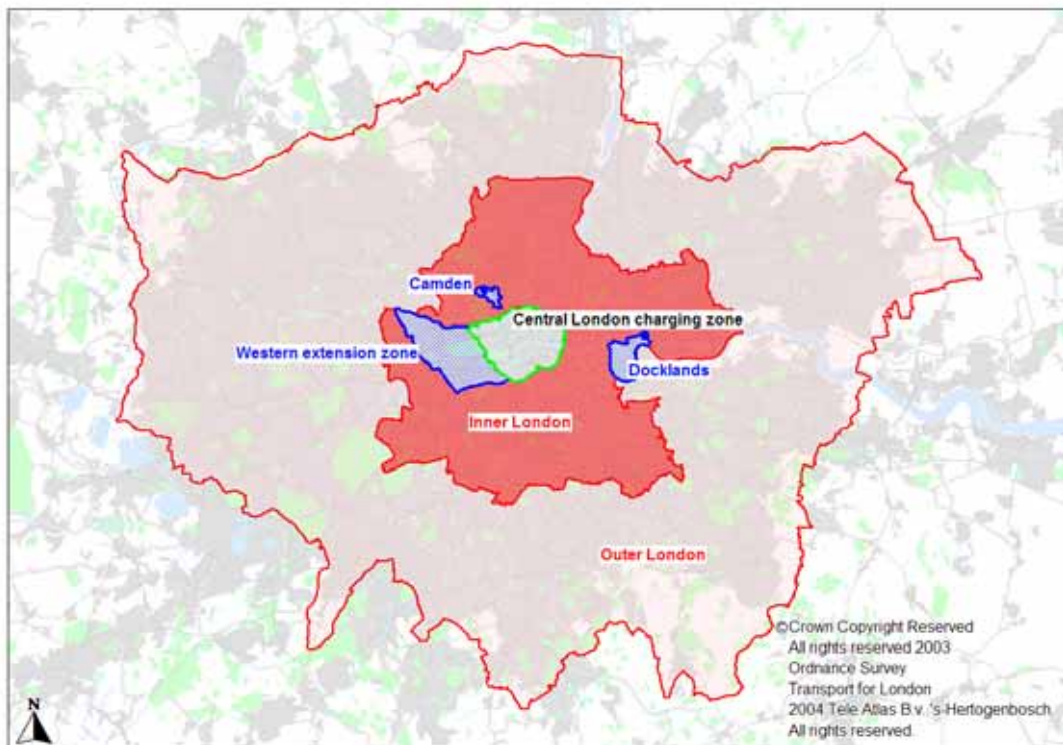
One of the advantages of the Dun & Bradstreet database of businesses is that it contains data on turnover which is difficult to get from other sources at such a detailed geographic level. However, companies report this at a company level and it is not possible to get these data separately for individual sites. Hence, organisations will report turnover for the group as a whole and it is not possible to get separate data on only that portion of turnover that was generated within the congestion charging zone.

5. Business and economic impacts

The strategy adopted to try to get around this problem was to exclude from the analysis companies with a turnover of over £1 million, as separate evidence has shown that most companies below this threshold are likely to be single site companies and so the effects captured would be most closely associated with the charging zone. However, this does exclude quite a large proportion of central London businesses. Also, an analysis of change in profitability is not included this year due to statistical issues with the profitability data in the Dun & Bradstreet sample.

The Dun & Bradstreet cross-sectional analysis focuses on location and business sector to reflect the performance trends of businesses within the charging zone compared with locations outside of the zone. As Figure 5.7 shows, the comparator locations are the forthcoming western extension to the central London congestion charging zone, the rest of inner London and outer London. Camden and Docklands are used as comparator locations for the retail sector and the financial and business services sector respectively.

Figure 5.7 Dun & Bradstreet time-series analysis: area definitions.



One of the factors that affects turnover of individual businesses is corporate restructuring events, such as takeovers or mergers. These can result in very large increases in turnover that do not reflect underlying performance. To minimise these impacts the top and bottom 5 percent of the distribution are also excluded from the analysis.

The results are presented in Table 5.3. These show that, overall, the charging zone with a £5 charge has performed better than comparable areas outside

the zone. Retail activity in the charging zone does better than both the rest of inner and outer London.

Table 5.3 Change in sales (percentage change 2003 to 2004): business with less than £1 million turnover excluding top and bottom 5 percent.

	Charging zone	Other inner London	Other outer London
<i>Number of businesses</i>	1223	1536	1807
Financial and business services	+5.5	+8.7	+2.4
Hotels and restaurants	+0.3	-5.8	-1.2
Manufacturing & construction	+3.0	+1.5	+5.7
Other services	+5.3	+6.4	+4.1
Public administration	+10.2	+1.8	+6.3
Retail	+6.0	+1.9	+0.1
Transport & communications	+8.1	+0.1	+4.0
Wholesale & other distribution	-3.5	+2.5	0.0
Total change in sales	+4.7	+3.7	+2.9

Note: The sample size for the 2003-4 analysis is smaller than that for the previous year because data for the latest year were not available for all businesses.

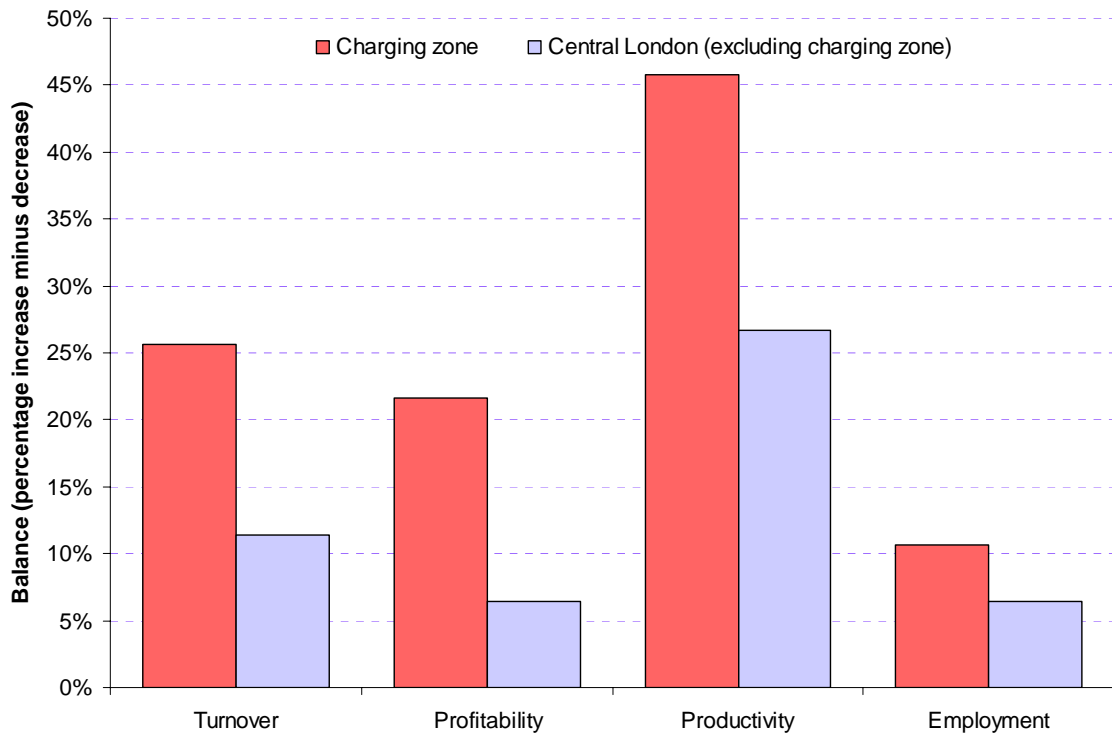
London Annual Business Survey

The London Development Agency and Business Link for London introduced a large scale survey of businesses in London in 2003. The third London Annual Business Survey was conducted in 2005. The survey consisted of telephone interviews with an achieved sample of over 4,000 private-sector businesses.

GLA Economics has again analysed the results, splitting the respondents into those based inside the charging zone and comparing these to businesses based in the rest of central London. The achieved sample for the charging zone was around 480 businesses, whilst that for central London, excluding the charging zone, was around 400.

Figure 5.8 shows the balance of businesses reporting increased versus decreased business performance across indicators such as turnover, profitability, productivity and employment. These data show that businesses within the charging zone appear to have performed significantly better than businesses in the rest of central London, particularly in terms of their ability to increase turnover, profitability and productivity. This suggests that the charging zone was a successful location for business in 2004-2005. No negative effects of the congestion charge can be detected from this particular data source.

Figure 5.8 Business performance in the charging zone and the rest of central London.



Source: London Development Agency and Business Link for London, London Annual Business Survey 2005.

Note: Survey conducted in Summer 2005. Response refers to change over the previous 12 months. Central London is here defined as the eight central boroughs – Camden, City of London, Islington, Kensington & Chelsea, Lambeth, Southwark, Wandsworth and Westminster.

Business rates

Businesses and other occupiers of non-domestic property contribute towards the costs of local authority services through non-domestic rates, commonly known as business rates. The rates are assessed by the Valuations Office Agency, an executive agency of the Inland Revenue, who assess the rental values for commercial properties as a basis for establishing the ‘rateable values’ for individual businesses within specified geographic regions.

The rateable value is based on the rental value of commercial property at a set valuation date, called the ‘antecedent valuation date’. It is then assessed by the Valuations Office Agency and used by Local Authorities to calculate the rates payable by ratepayers. The ratings are assessed every five years and the most recent assessment took place in April 2005.

Appeals for alterations of the ratings assessments of properties can be made where there has been a material change in circumstances which affect the value of a property. This includes changes to the physical state or use of a property, changes in the local area affecting a property, and changes in the use of a neighbouring property.

The Valuations Office Agency has received over 10,000 appeals against the rating assessments of properties potentially affected by the congestion charging zone.

The appeals received to date have largely fallen within three categories, namely appeals from offices, retailers and car parking businesses. As Table 5.4 indicates, the vast majority of these claims are from businesses in the City of Westminster and are primarily appeals from retailers, whilst appeals from businesses in the City of London were received mostly in relation to offices and car parking businesses.

To date, the evidence presented to the Valuations Office Agency has not supported a reduction in the rateable value of properties on the grounds of congestion charging, due to a lack of evidence to support this. As a result, the number of such appeals has significantly fallen, with some businesses choosing to withdraw appeals. The average proportion of all appeals citing congestion charging as a factor for reducing rateable values of business properties has been about 12 percent, with the proportion for individual boroughs varying between 2 and 30 percent.

Table 5.4 Appeals against the rateable value of properties which cite congestion charging as a ground for appeal since 2004.

Borough	Appeals received	Outstanding appeals
City of London	3322	27
Hackney	248	8
Hammersmith & Fulham	112	0
Kensington & Chelsea	265	0
Islington	963	12
Tower Hamlets	474	0
Newham	90	0
Camden	96	2
City of Westminster	4622	118
Total	10192	167

Source: Valuations Office Agency, February 2006.

VAT Registrations

VAT registration data have been analysed for 2003 and 2004 to provide an indicator of the number of new businesses starting up within the congestion charging zone. This analysis looks at business VAT registrations, business deregistrations and the net number of businesses registered in the area since 1994. It considers the hypothesis that a negative impact of congestion charging would be consistent with fewer new business start-ups, resulting in a decline in the net number of registered businesses in the area.

It should be noted that not all businesses are registered for VAT, and that the turnover threshold at which registration is required is adjusted each year.

5. Business and economic impacts

Also, business deregistration may be a consequence of business take-overs and restructuring, not necessarily signifying business closure.

Underlying trends related to the economic cycle in Greater London have been taken into account in this analysis. Additionally, the key business sectors within London are examined to assess differential business performance. To obtain a spatial disaggregation of these data that is appropriate for monitoring the effects of the congestion charging scheme, Greater London has been split into three areas as shown in Figure 5.9.

Figure 5.9 VAT registration data analysis: area definitions within Greater London.

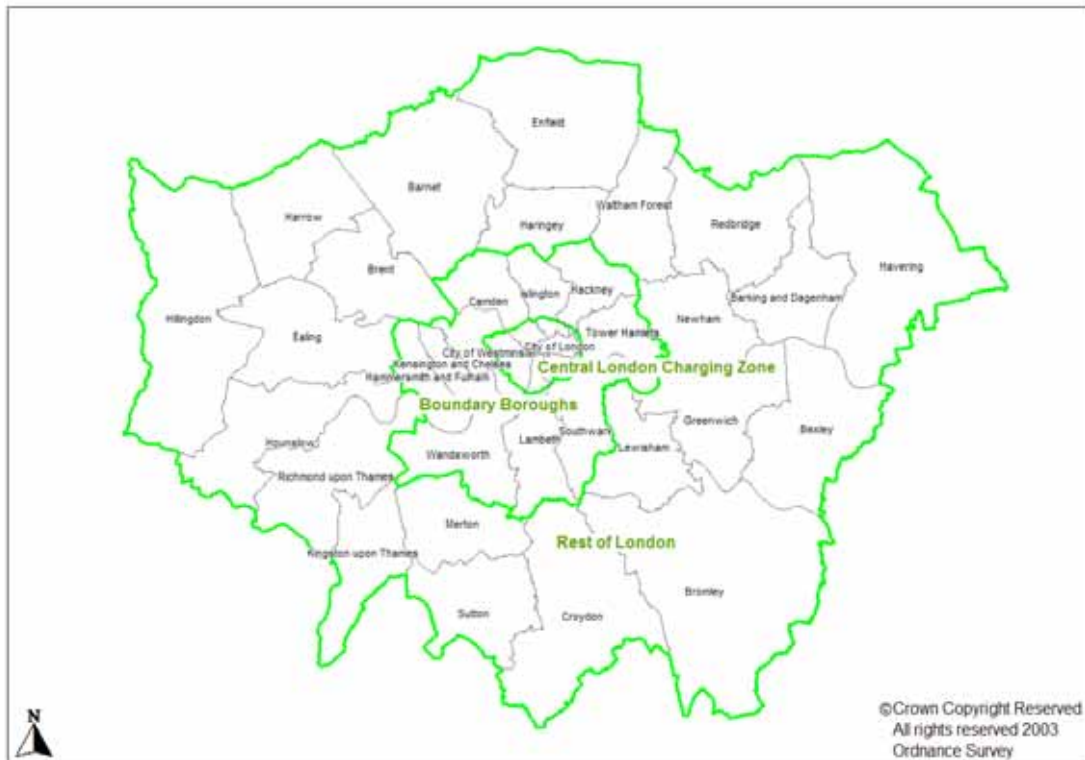
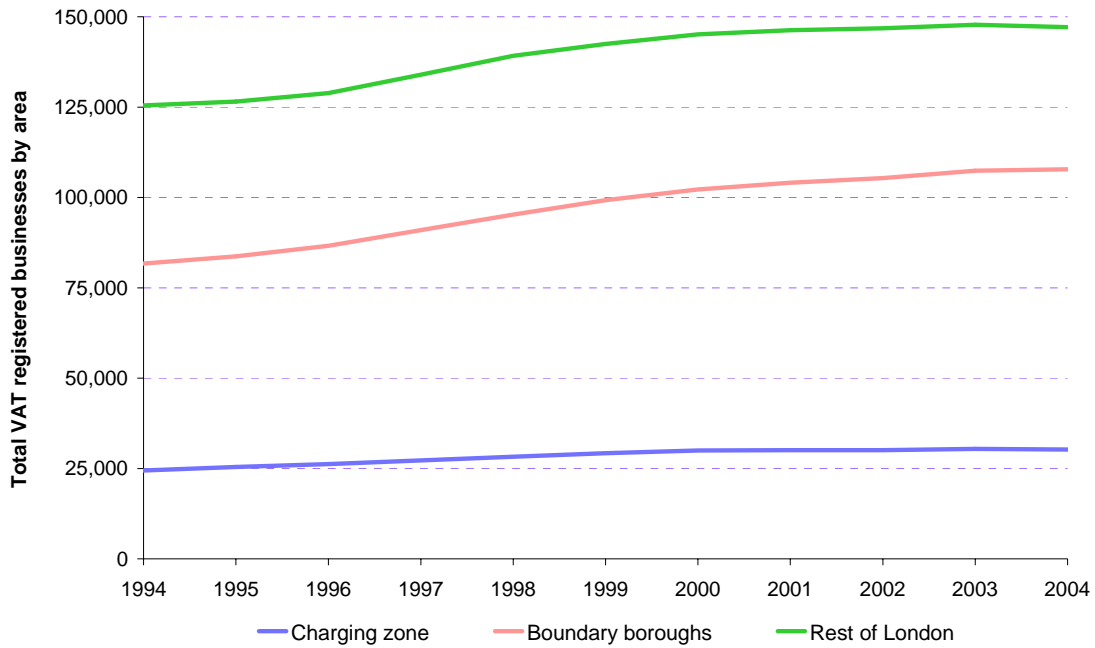


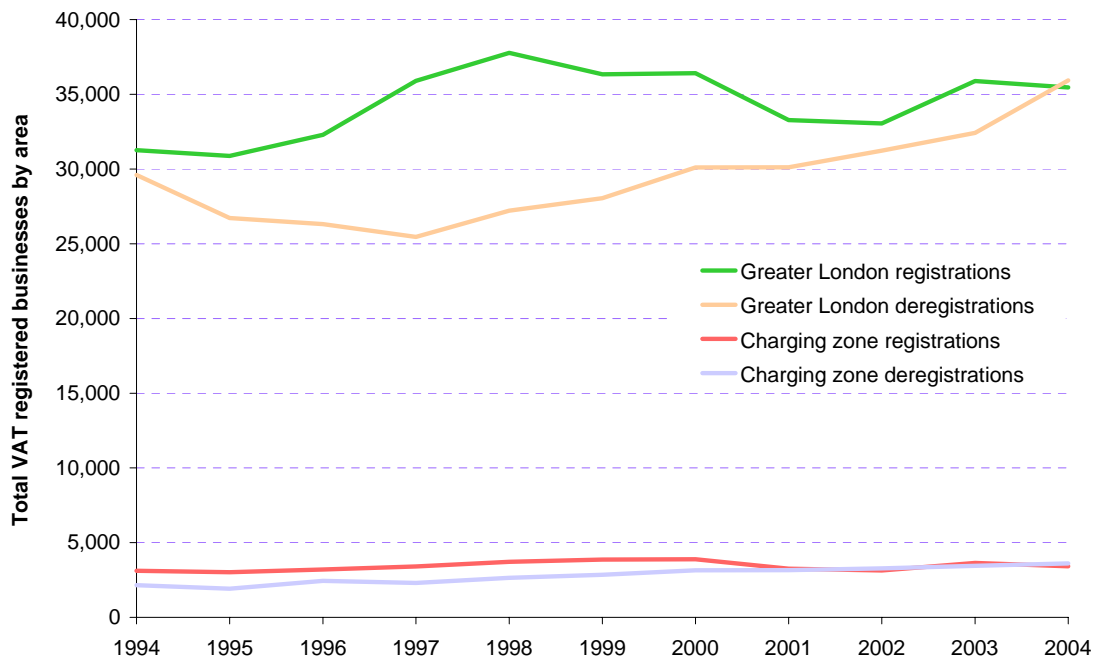
Figure 5.10 shows the total stock of VAT registered businesses in London by area, from 1994 to 2004. Over the 10 year period there has been a steady growth in the number of businesses in all areas. The growth has slowed in recent years, with the total number of businesses remaining constant in both 2003 and 2004. The trends in the number of VAT registered businesses have been similar across all three areas of London.

Figure 5.10 Total VAT registered businesses by area.



Since 1997 business VAT deregistrations in the charging zone have been slowly creeping up. Figure 5.11 also shows that 2004 saw more businesses deregister than register across all of Greater London for the first time in 10 years. This is a culmination of the trend since 1997.

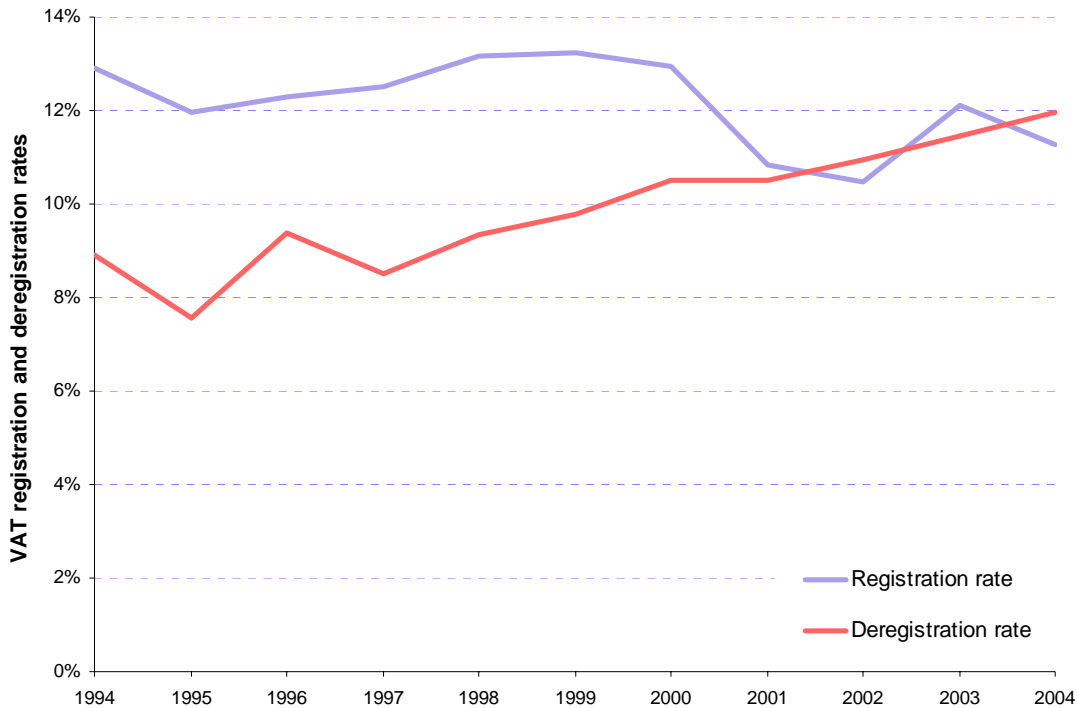
Figure 5.11 Greater London and charging zone business registrations and deregistrations compared.



5. Business and economic impacts

Figure 5.12 shows that in 2004 the deregistration rate in the charging zone had increased to around 12 percent, which was significantly higher than the rate of business registrations in the same period.

Figure 5.12 Charging zone VAT registration and deregistration rates.



In 2004 there was a net change of -0.7 percent for overall business registrations in the charging zone. This represents a net loss of 211 businesses. The net change is calculated by taking the total change in the number of VAT registered businesses as a percentage of total business stock.

Figure 5.13 shows the change in registered businesses by sector in the charging zone and indicates that these losses were largely from the primary industries sector, the wholesale and retail sector and the public service sector. Although the primary industries sector and the wholesale and retail sector saw the highest negative difference in the number of businesses, the relative size of these sectors should be considered. A drop of 9 percent in the primary sector represents a loss of 139 businesses from a total of over 30,000 total businesses within the charging zone.

Figure 5.13 Turnover in VAT registered businesses within the charging zone, by business sector in 2004.

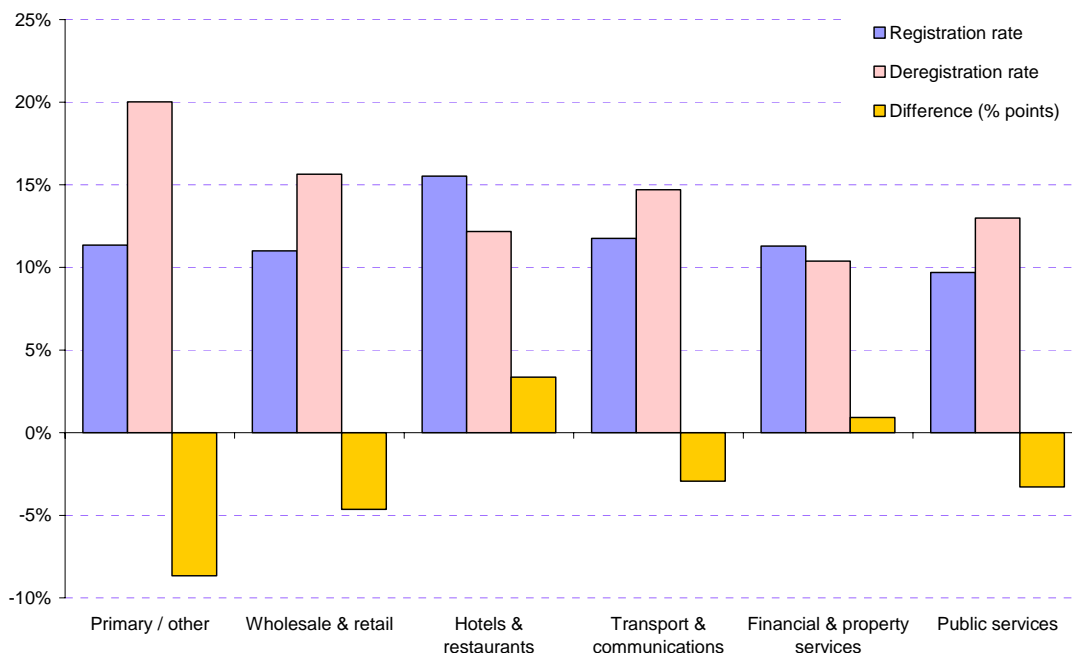
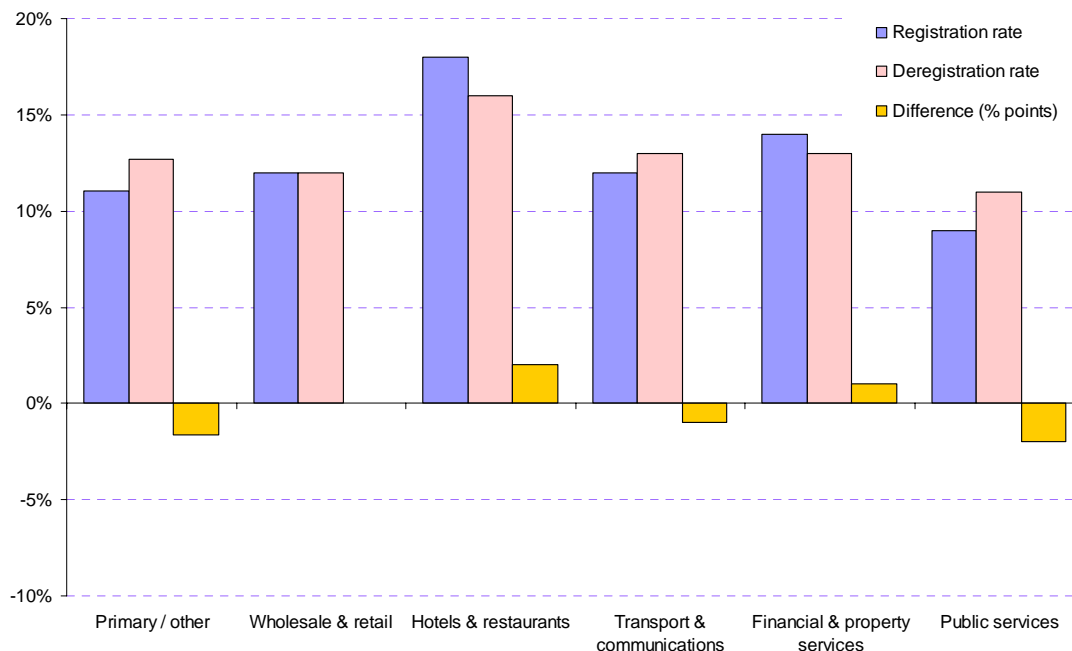


Figure 5.14 Turnover in VAT registered businesses within Greater London, excluding the charging zone, by business sector in 2004.



Overall, the analysis of VAT registration data for 2003 and 2004 suggests that there is no noticeable congestion charging impact on business start-ups and closures within the zone as the performance here has largely mirrored that of businesses in the rest of London.

Recent retail trends

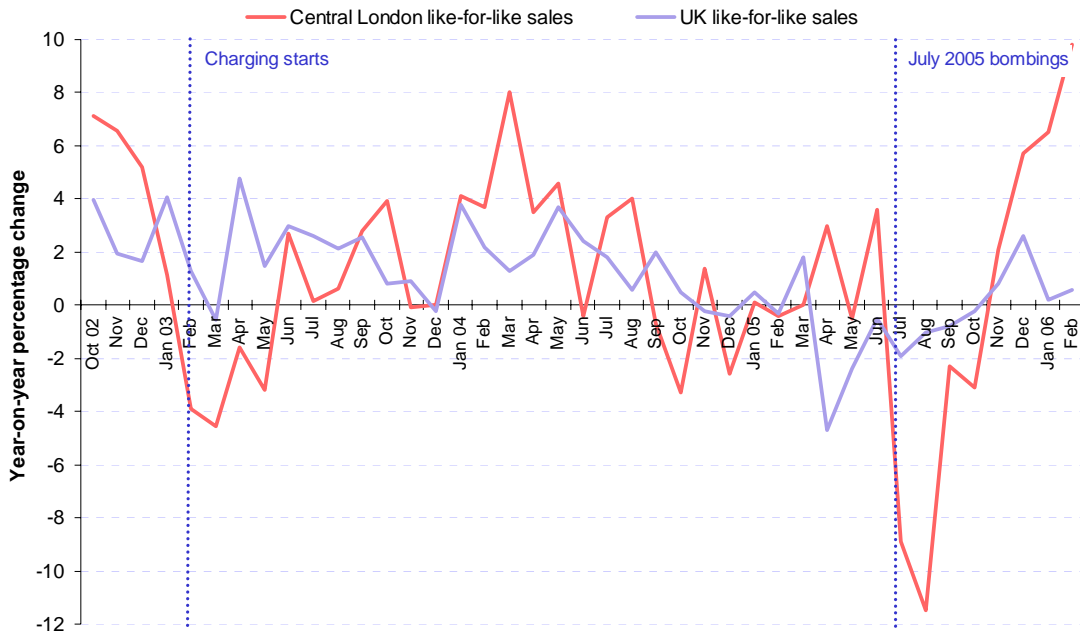
The congestion charging scheme is likely to have both positive and negative impacts on the retail sector in central London. Improvements to bus services to, from and within the charging zone could encourage shoppers. However, some car borne shoppers could transfer to shopping locations outside the zone and the overall effects of the charge will be to reduce the disposable income of a small proportion of those shopping inside the charging zone. Trends in retail activity are also likely to reflect effects such as the growth of internet shopping and the attraction of new shopping locations away from central London.

Figure 5.15 shows the percentage change in year-on-year retail sales value for central London and the UK as a whole to February 2006. It can be seen that retail sales in London are more volatile than in the UK as a whole. Before the introduction of congestion charging, central London retail sales growth declined and became negative. However, this was followed by a recovery and a period of mainly positive annual growth ensued until Summer 2004, with a relatively stable trend thereafter.

The July 2005 bombings in central London caused significant falls in retail sales value in July and August 2005, but this was then followed by a period of strong recovery, suggesting that the bombings have had no lasting effect, in terms of retail sales value.

The relative stability of the trend for retail sales value in London across the period covered by Figure 5.15 suggests that congestion charging has not had a significant effect, as the £5 charge was introduced in February 2003, post-dating the fall which affected central London retail over the Winter of 2002/3. In addition, the strong recovery in year-on year retail sales from September 2005 suggests that any effect of the increase of the charge increase in July 2005 to £8 has been short-lived.

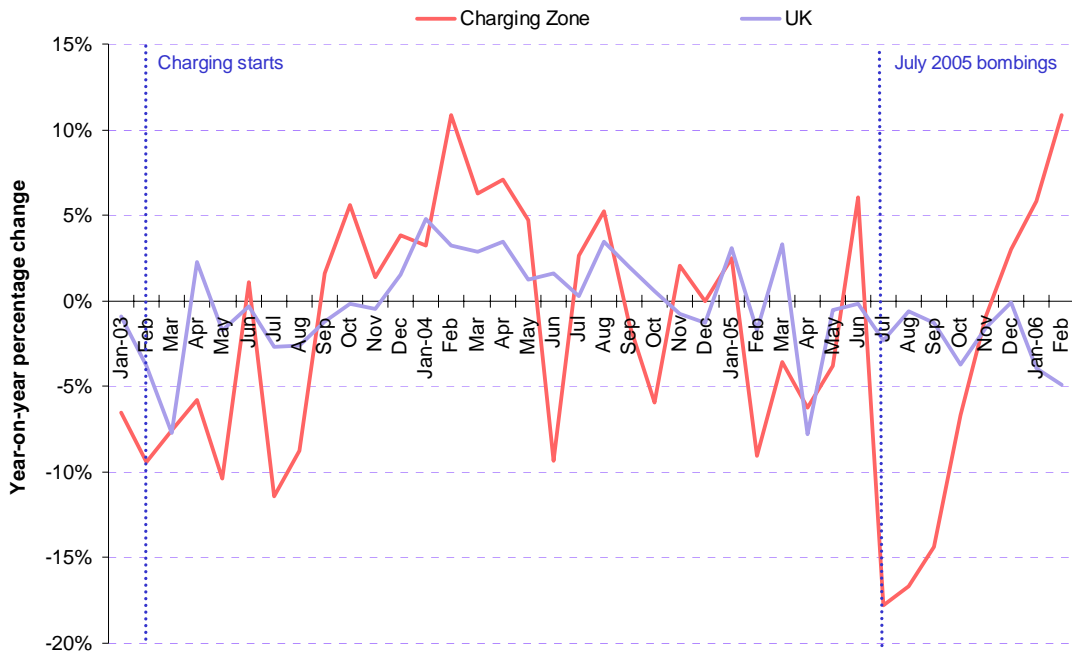
Figure 5.15 Percentage change in year-on-year retail sales value (including weekends).



Source: London Retail Consortium: London Retail Sales Monitor, February 2006.

Figure 5.16 shows trends in retail footfall for the charging zone and the UK as a whole. Retail footfall is a measurement of the number of people passing survey points in a retail area. The index therefore reflects the level of potential shoppers rather than actual retail sales. It is defined as the percentage change in year-on-year retail traffic, as measured by the SPSL Retail Traffic Index.

Figure 5.16 Percentage change in year-on-year retail traffic.



Source: SPSL Retail Traffic Index.

Figure 5.16 shows that:

- Trends in retail footfall are more volatile in the charging zone than in the UK as a whole.
- The charging zone under-performed the rest of the UK for the majority of 2003, but then out-performed the UK towards the end of 2003 and for much of 2004.
- For much of 2005, retail footfall showed a decline for the charging zone as well as for the UK. It should be noted that the big year-on-year drop during the period July to October 2005 almost certainly reflected the July 2005 bombings in central London, rather than the increase of the charge to £8. The strong recovery in year-on-year shopper numbers from November 2005 suggests that the bombings and any effect of the charge increase to £8 have not had a lasting effect on retail trends in the charging zone.
- In early 2006 the charging zone significantly outperformed the UK in terms of growth in shopper numbers.

Recent commercial property price trends

Rental growth and yield movements provide a useful way of estimating the impact of congestion charging on the commercial property market. This is largely a measure of investor sentiment.

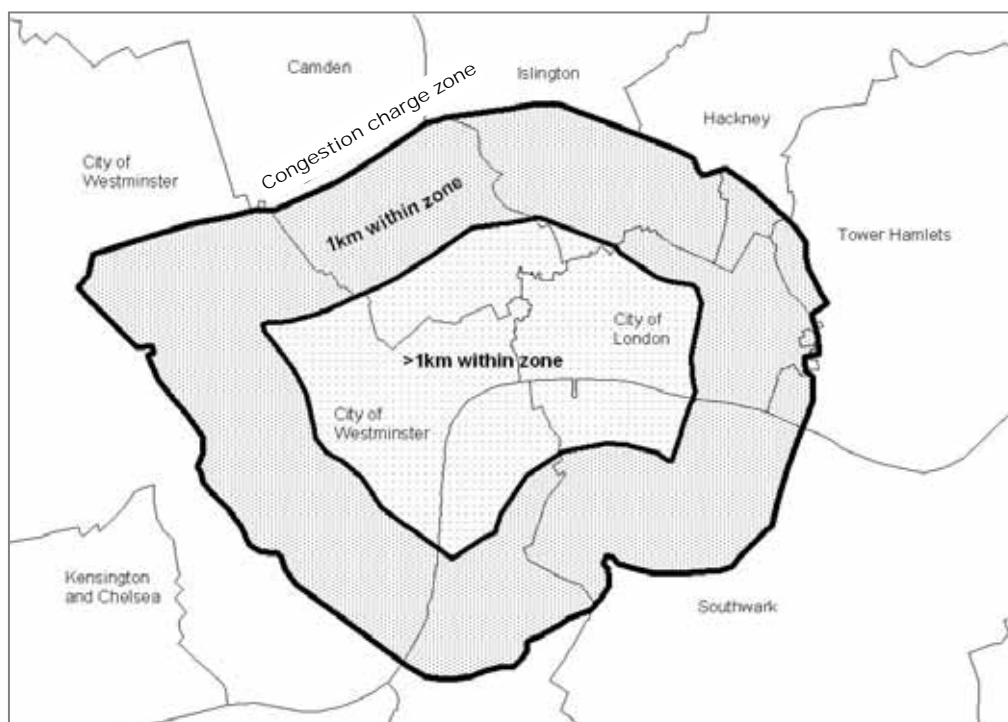
Positive yield movements occur when the growth in the rental value of properties is strong and the rental yields, or rental property stock levels, decrease. This is described as a 'falling rental yield' and it implies an increase in investor optimism as there are less vacant rental properties available,

indicating increased rental demand. If, for example, the congestion charge has had a negative impact on the market and made being based inside the charging zone less attractive, this would be apparent in a fall in rental values and an increase in yields inside the charging zone compared with outside the zone, coinciding with the timing of the introduction of the scheme.

Therefore, to assess whether the congestion charge has had a material impact on either property demand, or sentiment amongst investors, comparisons need to be made against property trends prior to and since the introduction of the scheme and against appropriate control areas. This has been done by the Investment Property Databank who use their database of property prices to monitor relative growth trends.

Retail and office rental growth rates and yield values were examined in two locations – the area situated within 1 kilometre inside the charging zone boundary and the inner core of the zone (1 kilometre or more inside the zone), as shown in Figure 5.17. These are both referred to as ‘inside the zone’. The yield values are the capital values of rental properties in core London markets. These data were then compared with inner London outside the charging zone, referred to as the rest of inner London.

Figure 5.17 Map of analysis areas for commercial property price trends – one kilometre within zone, the inner core and inner London.



Source: Investment Property Databank Ltd (2005).

In 2003 strong investor demand had a powerful influence on retail and office yields. Although retail rental growth in the charging zone was weak in both 2003 and 2004, the analysis suggests that these trends predated the

5. Business and economic impacts

introduction of the scheme by three years, and were primarily due to weak international tourism. Also, the probable causes of weaker rental growth within the zone were differences in occupier demand between the central London business districts and businesses outside the zone in the rest of Inner London, given that businesses outside the zone were less affected by the global recession during 2003. The yield movement trends of 2003 were favourable to properties within the charging zone, particularly for offices closest to the boundary. Therefore, overall the relativities were not considered to be consistent with congestion charging having had an impact on London property prices.

Retail property price trends

Businesses in the inner core of the charging zone saw a small improvement in their rental values in 2004, whilst those just inside the boundary experienced a further small decline. Both areas under performed the rest of inner London. Rental values on properties within the charging zone have under-performed those just outside the zone every year since 2000. This is undoubtedly attributable to the wider difficulties facing central London markets such as the weak US dollar and a fall in international tourism.

The evidence for 2004 continues to be consistent with the previous assessment that congestion charging may have had a small negative effect on retail rental values inside the zone.

Office property price trends

Office rental growth was variable in 2004. The West End experienced positive office rental trends, indicating surprisingly fast growth, in contrast to the decline in the City office rents in the same period. The inner London office market showed the strongest rate of office rental growth in 2004, although the 2003 pattern of falling rental values continued just outside the charging zone. The probable explanation for this variation is the differences in balance between office supply and demand between core and fringe locations in central London.

The central London office market experienced an unusual period of discontinuity between rental values and yield movements in 2004. In recent years central London rental values have fallen yet this has been accompanied by falling yields. This situation has partly arisen due to the renewed attractiveness of commercial properties in central London as an asset class.

Yield movements

Yield movements were promising for both shops and offices in 2004 with yields falling much faster. Positive, or falling, yield movements reflect a decreased level of vacant offices and rental space which is an indicator of productive business activity.

It is not therefore possible to isolate an impact of congestion charging on property prices during 2004. Additional market trends, including investment, tourism and international concerns, must be considered in determining

possible impacts of the congestion charge on property prices within the charging zone.

The 2004 trend suggests that optimism is increasing in central London property markets and rental yields fell faster inside the charging zone relative to the rest of Inner London. The strength of investment demand in 2004 and the targeting of the West End by investors will probably have been a factor as to why capital values in central areas rose faster than the fringe locations. This is consistent with the view that congestion charging did not have an adverse impact on commercial property prices in central London.

5.5 TfL business surveys

The annual TfL London congestion charging business survey seeks to capture and contextualise the reported impacts of congestion charging on a sample of employers within the charging zone. As an integral feature of the business and monitoring framework since 2002, the annual business survey contributes to the assessment of business attitudes towards congestion charging, although does not of itself provide robustly quantitative data on impacts.

In interpreting these findings, it needs to be recognised that at the date of the survey congestion charging had been in continuous operation for two and a half years. This means that reported changes since 2004 were most likely to reflect the operation of external factors. The survey also followed only three months after the July 2005 Variations and the bombings in central London. This was perhaps too early for these effects to have fully worked through in terms of business outcomes, but they probably remained fresh in the minds of respondents.

The Autumn 2005 survey was conducted via telephone interviews with representatives of 1,231 London businesses in the following locations:

- inside the central London congestion charging zone;
- on the charging zone boundary (a 500 metre band both inside and outside the zone);
- Docklands (a 'control' area for the financial and business services sector only);
- Camden (a 'control' area for retail businesses only).

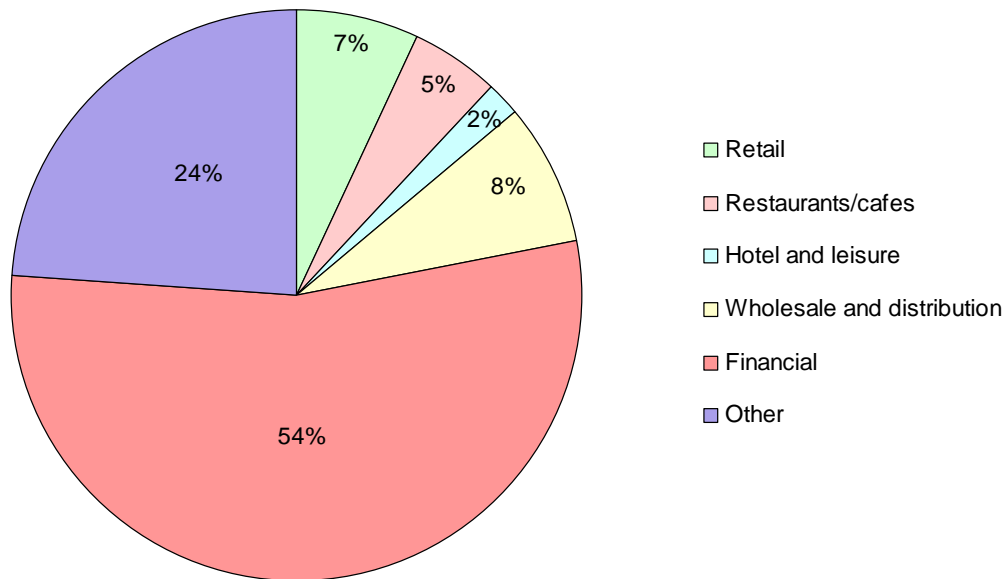
In 2005 the Docklands and Camden control areas were used to help identify general trends experienced by business sectors inside and outside the charging zone. 100 businesses in the specific sector of interest were surveyed in each control area.

The sample within the zone and on the boundary included a cross-section of businesses, but focused on shops, restaurants, leisure businesses and wholesalers and distributors in order to provide robust comparisons for important sectors.

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The sample was further stratified by six business sectors. Over-sampling in some sectors was then corrected by weighting the data at the analysis stage to reflect the actual proportion of business in each sector based within the survey area. Figure 5.18 shows the weightings used for the survey data for each business sector, such that the results quoted are representative of the general business population of central London.

Figure 5.18 Business sector as a proportion of total business population for the TfL central London business survey area.



Key findings from this survey are considered below under the following headings:

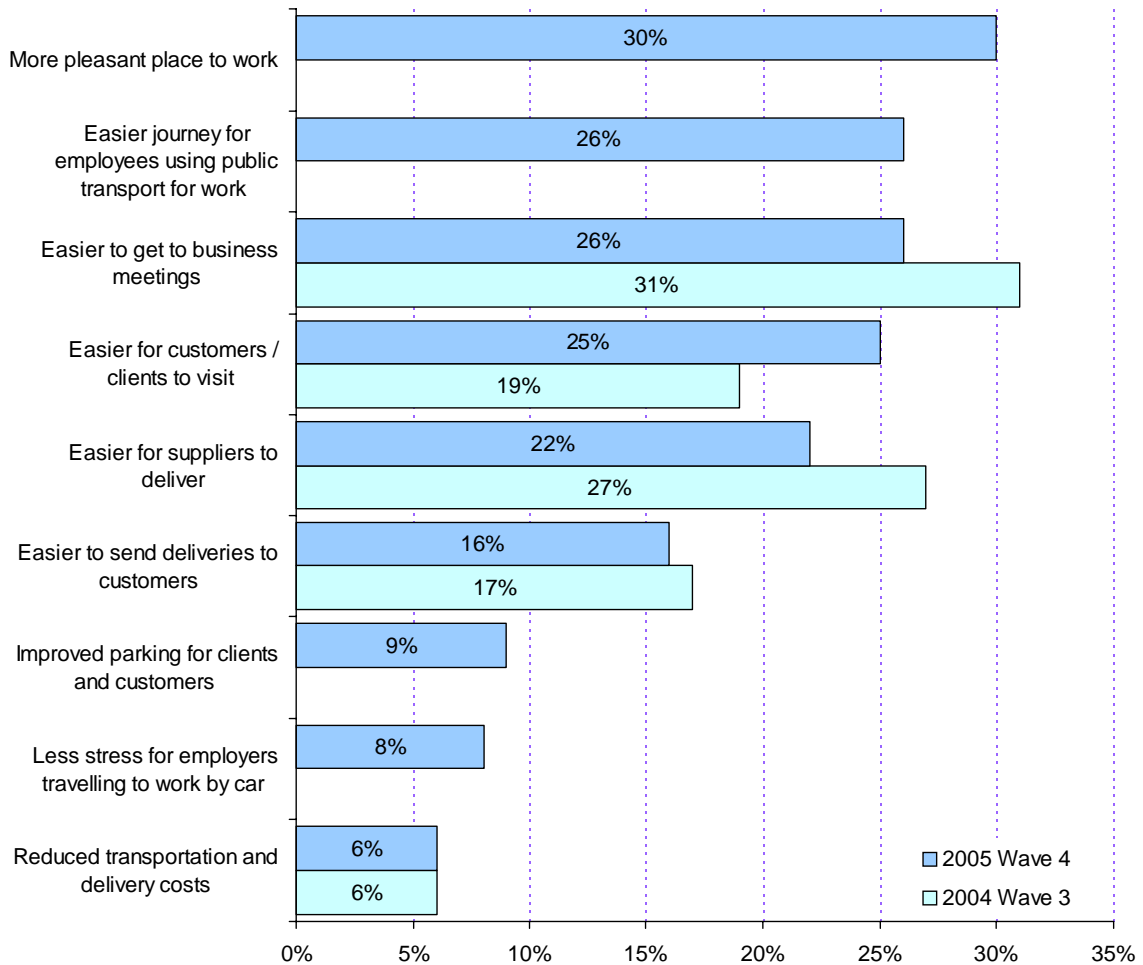
- benefits of decongestion;
- impact of congestion charging on business performance;
- views on costs to businesses;
- attitudes on transport issues;
- attitudes towards the congestion charging scheme.

Comparisons are made against results from previous surveys where appropriate.

Benefits associated with decongestion

Figure 5.19 shows the extent to which surveyed businesses recognised the various benefits of decongestion. Comparisons are made against the 2004 survey where applicable. In general up to one third of businesses recognised benefits such as the creation of a more pleasant working environment, easier public transport journeys for employees travelling to work and better conditions for business-related travel activities, such as attending business meetings, customer and client visits and the transit of goods.

Figure 5.19 Percentage of businesses recognising various benefits associated with reduced congestion, 2004 and 2005.



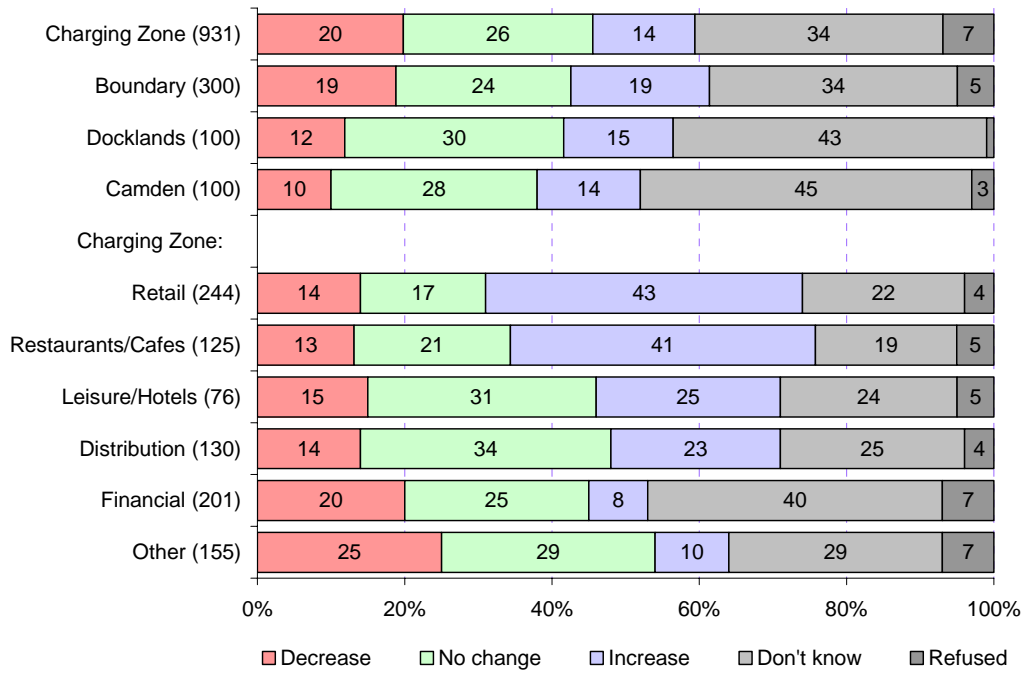
Impact of congestion charging on business performance

Businesses commented on several aspects relating to their general performance over the year, as well as the perceived impact of congestion charging.

The survey sought feedback from commercial businesses in relation to their sales turnover and profitability, costs and key influences on their business performance over the past year. As Figure 5.20 indicates, most of the commercial business sectors within the charging zone stated that they saw an increase in sales that was somewhat greater in 2005 than in 2004. The main beneficiary of this was the financial and business services sector. A notable exception was the leisure and hotel sector which reported deteriorating average sales performance. This contrasts with the more general economic trend data reported earlier, which indicated favourable trends in this sector, and most likely reflected the perceived impacts of the July bombings by survey respondents, which were still relatively recent at the time of the survey.

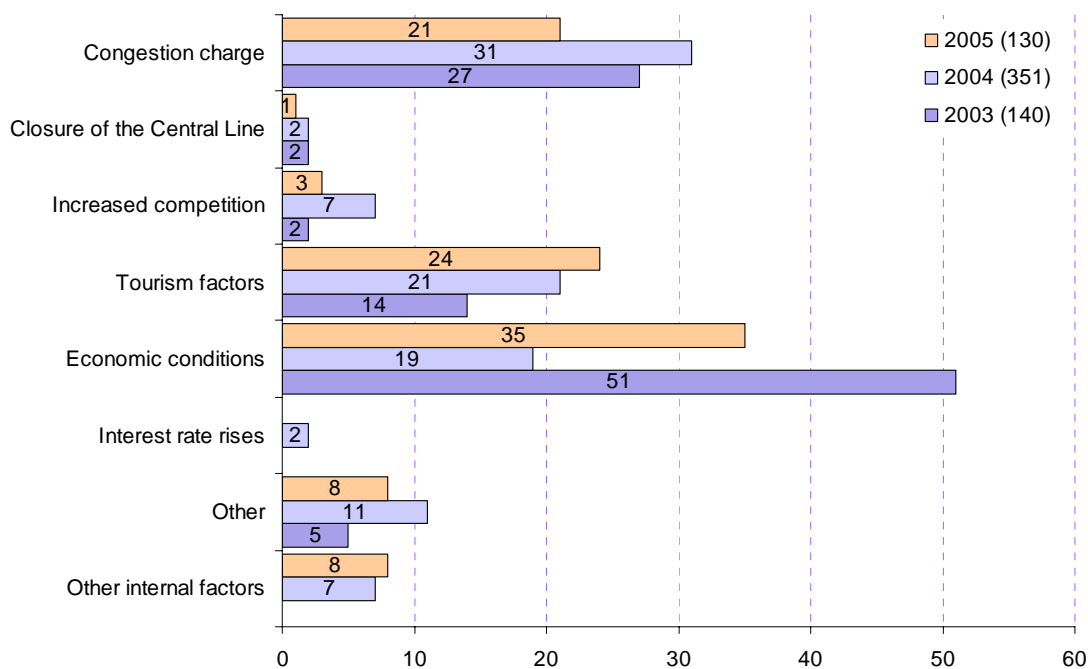
5. Business and economic impacts

Figure 5.20 Change in sales or turnover at site compared with same period last year.



The majority of businesses that reported a decline in performance in 2005, relative to their performance in the previous year, said that this was largely due to general economic conditions. As Figure 5.21 indicates, there was a decline in the proportion of businesses who said that congestion charging had a negative impact on their sales trends. This provides a good indication of the shifting nature of economic influences on businesses and may be an indication of growing acceptance of the scheme.

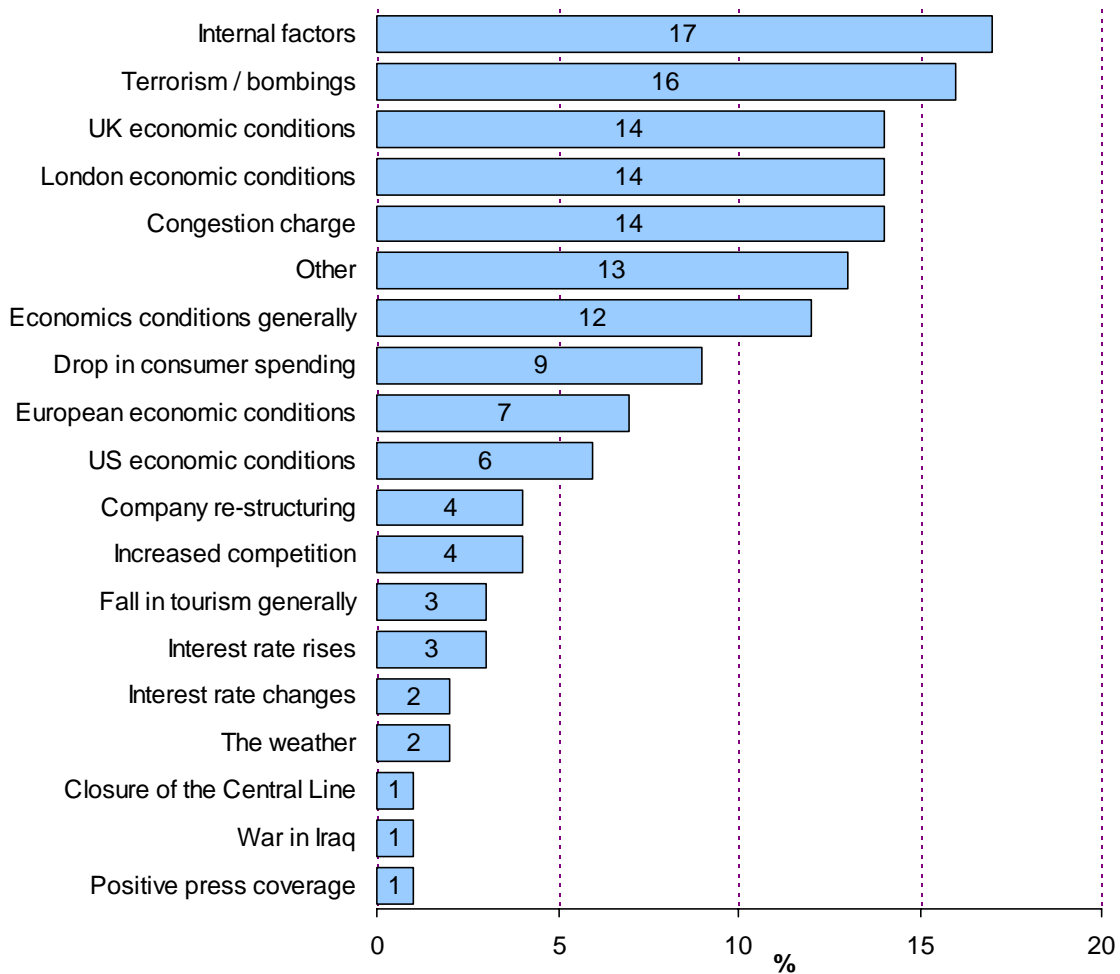
Figure 5.21 Share of influences on businesses reporting decreased sales between 2003 and 2005, unprompted.



Notes: 'Tourism factors' includes terrorism and the war in Iraq. 2004 data have been revised slightly from that previously published in TfL's Third Annual Monitoring Report.

Commercial businesses were asked to identify the key influences on their performance over the last year. The question was asked unprompted and without restrictions on the number of answers given. The range of responses to this question was more extensive than in 2004. Economic conditions and internal factors continue to be common influences on business operations within the charging zone. Congestion charging was identified as an influence by 14 percent of respondents, although both the relative importance and direction (either positive or negative) of these influences were not dimensioned here.

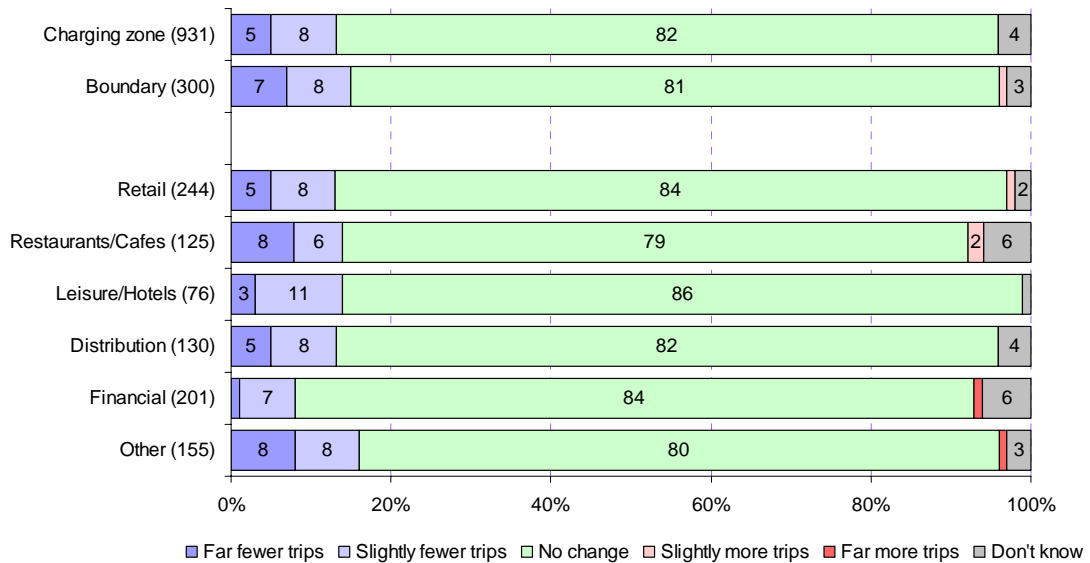
Figure 5.22 Key influences on business performance of commercial businesses within the charging zone.



Note: Responses were unprompted; multiple responses were possible. Influences may be either positive or negative for business performance.

Respondents were also asked whether the increase in the charge from £5 to £8 in July 2005 had contributed to any noticeable changes to the amount of staff or vehicle journeys made within the charging zone. Figure 5.23 shows that the overwhelming majority of businesses (82 percent) did not report any change in the number of trips made. 13 percent of businesses reported that the charge increase had reduced their journeys in the charging zone. This response is broadly comparable to the observed effects of the charge increase on chargeable vehicle traffic within the charging zone.

Figure 5.23 Reported effect of £8 increase to congestion charge on the amount of business trips made by staff or vehicles based at the site.



General business costs

Trends in business costs were more fully explored in 2005 to provide greater insight into the relative financial and administrative cost implications of congestion charging for businesses.

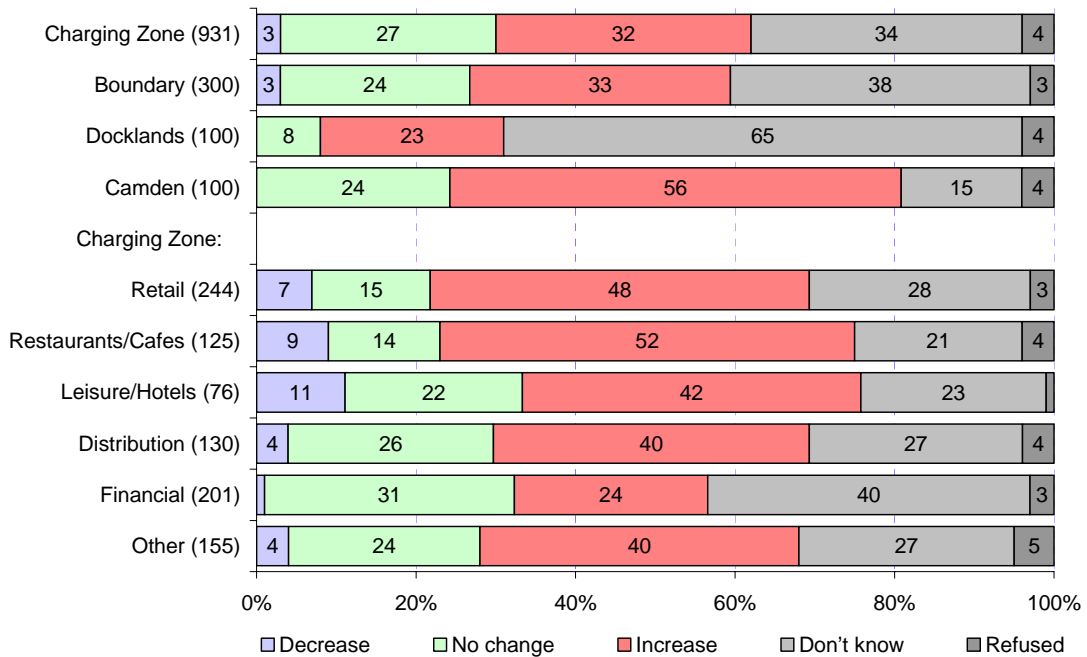
In terms of general business costs, Figure 5.24 shows that around one third of charging zone businesses reported significant cost increases between 2004 and 2005. Interestingly, the proportion for the Docklands and Camden control areas reporting similar increases are quite different, reflecting the sector-specific nature of businesses surveyed in these two locations.

The average annual percentage increase in costs reported by businesses within the charging zone was 4.8 percent, whilst businesses in Camden reported an average increase of 5.2 percent (retail and leisure businesses only). This compares to a value of 2.9 percent for the Docklands control sample (financial and business services only).

In terms of sectors within the charging zone, retail and leisure related businesses tended to report greater cost increases than other businesses, broadly reflecting these 'control' samples.

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Figure 5.24 Change in overall business costs at site compared with same period last year.

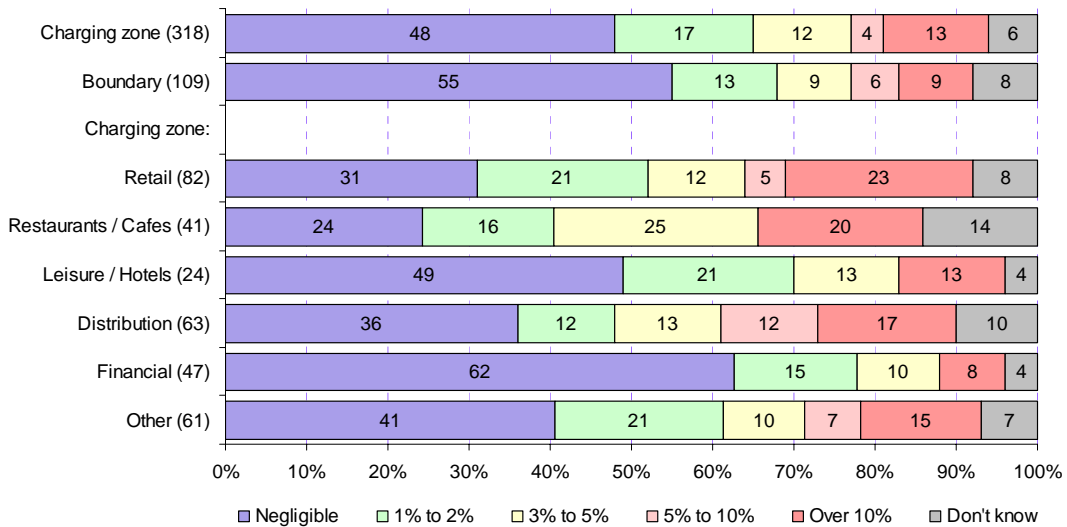


Transport costs and the congestion charge

It is important to note that the direct financial impact of congestion charging on business cannot be greater than the value of charges (and, where applicable, penalty charges) actually paid by businesses. This sets an upper bound that is small when set against the overall value of the London economy.

The TfL business surveys explored this further, by seeking information from respondents on the proportion of their total business costs that were related to transport and, as a further sub-division, the proportion of these transport costs that were directly related to congestion charging. This is based on self assessment by respondents to the survey and needs to be viewed in this context, but does serve to dimension the role of congestion charging in changing business costs.

Figure 5.25 Estimated proportion of business costs that are accounted for by transport.

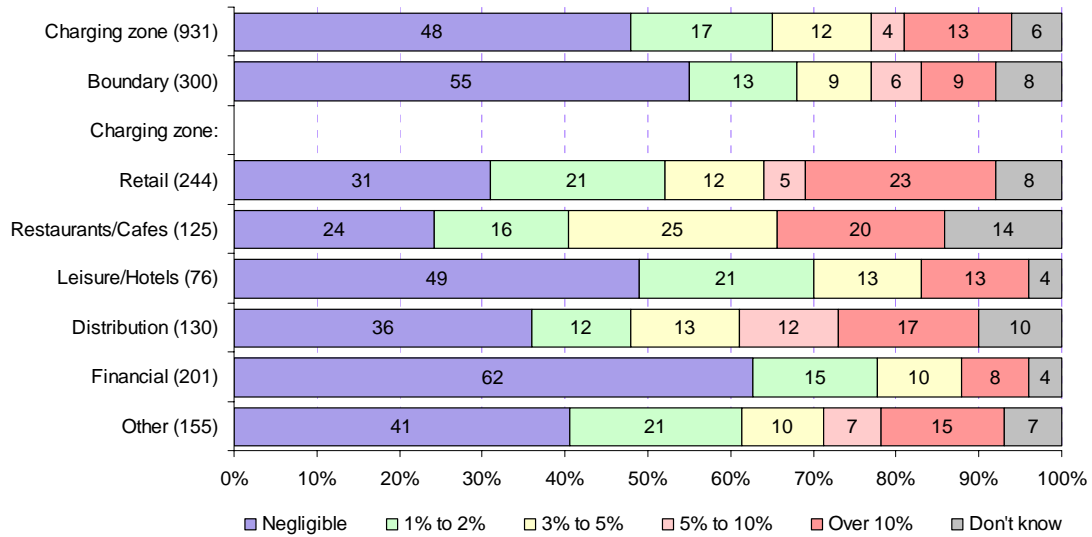


Taking into account an effective non-response rate of about 25 percent to this question, Figure 5.25 shows that, for just under one half of businesses, transport costs are considered by respondents to be 'negligible'. For the remainder, the proportion of total costs that were accounted for by transport ranged up to over 20 percent, with retail and distribution related businesses tending to report the higher proportions. Assuming reasonable mid-point values for the ranges specified, this analysis suggests that, on average for businesses within the charging zone, transport costs typically account for around 5 percent of total business costs.

Respondents were then asked to estimate the proportion of their total transport costs that were directly accounted for by the congestion charge (Figure 5.26). This analysis excludes respondents who did not answer the question on transport costs as a proportion of total business costs, and also those reporting that transport costs accounted for a 'negligible' proportion of total business costs. It therefore relates only to about one third of the total business population of the charging zone. Respondents were asked to consider only the direct financial costs of the congestion charge, excluding the additional 'overheads' associated with paying the charge (ie compliance costs).

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Figure 5.26 Estimated proportion of transport costs accounted for by the congestion charge.



Again, about half of respondents considered that the cost of the congestion charge was a negligible component of their total transport costs. Typically, just over 10 percent of respondents reported that congestion charges accounted for more than 10 percent of their total transport costs, although the distribution of these results between sectors is interesting, with the higher values tending to be indicated by retail and leisure sectors, as well as distribution businesses where such proportions may be more naturally expected. Again, in interpreting these results, it needs to be borne in mind that only those businesses reporting non-negligible transport costs overall are included in this analysis, with only about one half of leisure and retail businesses included.

Making similar reasonable assumptions as for general transport costs above, these results suggest that the congestion charge itself typically accounts for around 5 percent of business transport-related costs for businesses in the charging zone.

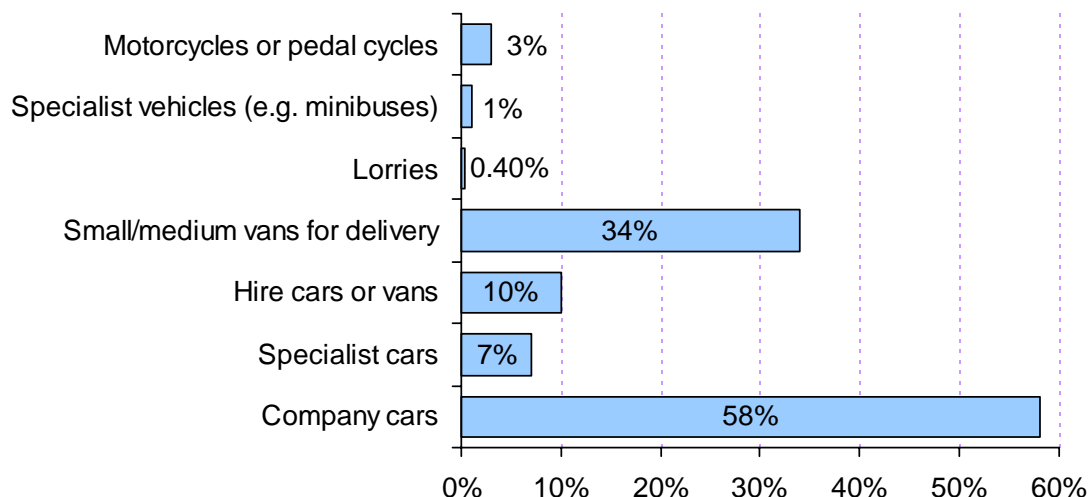
Taking these two values, the direct financial impact of congestion charging on central London businesses is shown to be typically somewhat less than one percent of total business costs. This cannot be considered to be a precise estimate, as it potentially includes periods of charging at both £5 and £8 (£5.50 and £7 for fleets), and it does not consider the distribution of impact on individual businesses. For the business population as a whole, however, it does place the magnitude of the direct financial impacts of congestion charging in context.

Business fleets

Charging zone businesses that operate a fleet of vehicles were asked to describe the nature of their fleet. Eight per cent of businesses surveyed said that they operated a fleet. Unsurprisingly, the distribution sector represented the largest group of fleet operators. The most common fleet type was company cars which were operated by 58 per cent of those charging zone

businesses with fleets, followed by small or medium vans used for delivery, operated by 34 percent of businesses. 22 per cent of charging zone businesses with a fleet said that they participated in the congestion charging automated fleet payment scheme.

Figure 5.27 The nature of vehicle fleets operated within the charging zone – percentage of those respondents operating fleets.



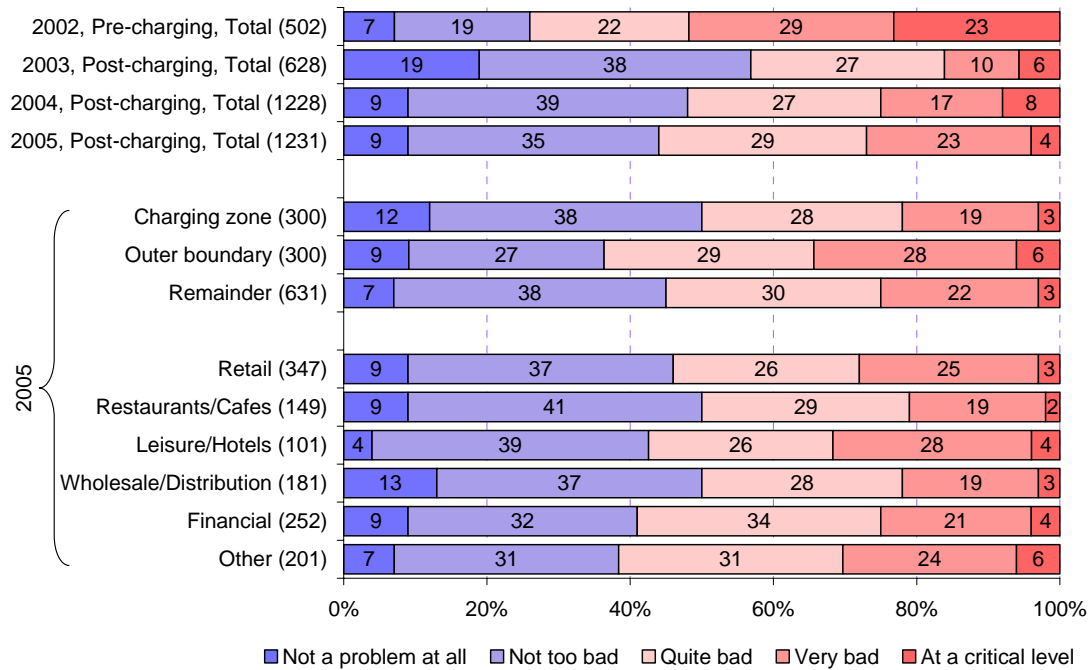
Attitudes to transport issues

Businesses were asked to respond to a number of questions regarding their experiences of transport issues and the travel outcomes of the scheme. The responses to such questions have featured in the TfL Business Survey since 2002 and provide insight into changing trends when compared with time series data since the introduction of the charge.

Figure 5.28 indicates how perceptions of congestion levels during the peak period have changed over the past 4 years. The immediate beneficial impacts from the introduction of the scheme in 2003 are clear. Responses for 2004 and 2005 continue to show recognised benefits over 2002, although there has been a general trend for respondents to perceive small relative increases to the severity of congestion in the peak period. This seems to correspond to the trend in measured congestion levels, as discussed in Section 3.

5. Business and economic impacts

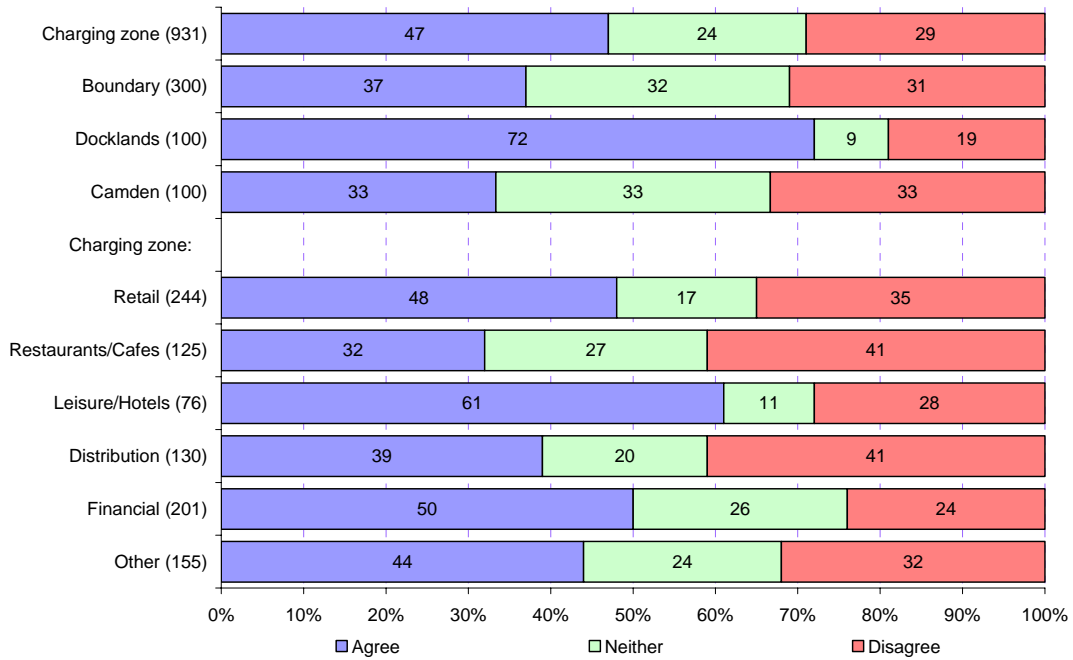
Figure 5.28 Perceived level of congestion during the weekday peak period.



Attitudes towards the congestion charge

Business support for congestion charging continues to be relatively mixed. Businesses were, on the whole, more supportive of the scheme than opposed to it, although this level of support has decreased somewhat since 2004, possibly reflecting a reaction to the £8 increase. When analysed by sector, the leisure, financial and retail sectors were the most supportive of the scheme, whilst the distribution and restaurant sectors were the least positive. The increased level of support from the retail sector in 2005, compared to the previous year, is the most positive trend of all the sectors. Figure 5.29 shows the proportion of respondents indicating support for the scheme providing that there is continued investment in public transport.

Figure 5.29 Support for the current scheme as long as there is continued investment in public transport, Autumn 2005.



5.6 Summary of key points

The growth of the London economy remained positive in 2005 despite the effects of the bombings in central London in July. Businesses performance in the charging zone was significantly better than in the rest of London, particularly in terms of profitability and productivity.

Analysis of comparative trends in various indicators of business performance, including change in jobs, business populations and turnover continued to show no general evidence of differential effects between the charging zone and comparator locations that might be indicative of a congestion charging effect, either positive or negative, on aggregate business performance in central London.

Trends in business registrations for VAT and appeals relating to business rates in central London again do not indicate a significant congestion charging impact on businesses in central London.

The majority of charging zone businesses continue to recognise that decongestion had created a more pleasant working environment and easier journeys for employees using public transport for work. Amongst businesses in the charging zone as a whole, there were more supporters of the congestion charge than opponents.

An audit of the TfL/GLA monitoring of the economic and business impacts of congestion charging as set out in the *Third Annual Monitoring Report* concluded that TfL's assessment that congestion charging has had a broadly neutral impact on the central London economy was reasonable.

6 Accidents and the environment

6.1 Introduction

This section reviews and updates trends in reported personal injury road traffic accidents in and around the congestion charging zone. It considers data for 2005 alongside the accumulating time-series and evidence of wider trends in road traffic accidents across Greater London. TfL's earlier conclusions relating to the impact of congestion charging related traffic changes on road traffic accidents can now be placed on a firmer statistical footing.

It then proceeds to update TfL's assessments of the air quality and noise impacts of the scheme, drawing on updated emissions assessments, air quality monitoring data and new sample surveys of ambient noise.

TfL estimated that congestion charging would lead to between 150 and 250 fewer road traffic accidents per year across the whole of Greater London, resulting primarily from reduced traffic volumes. Perhaps one third of this reduction would have occurred within the charging zone itself, with the remainder reflecting smaller but associated traffic reductions across a much larger area.

It was also expected that reduced volumes of traffic circulating more efficiently would lead to reductions in road traffic emissions within the charging zone, and possibly small changes to the ambient noise climate. However, it was also recognised that changes to both emissions and noise were unlikely to be of a scale that would enable them to be detected against the backdrop of variation caused by other factors over the medium term.

Key findings from previous reports

- Recent years had seen significant year-on-year reductions to personal injury road traffic accidents across London as a whole, reflecting wider TfL and borough road safety initiatives. Against this backdrop, there was evidence that the declines in accidents seen in the charging zone since the introduction of charging were greater than might otherwise have been expected. It was assessed that this 'excess reduction' was between 40 and 70 fewer accidents per year within the charging zone, which was roughly in line with TfL's prior expectation. This 'excess reduction' persisted into 2004, with further incremental reductions in the absolute number of accidents mirroring wider London trends.
- There was no evidence of disproportionate or detrimental changes to the number of reported accidents involving two-wheeled vehicles in or around the charging zone, or to accident trends on the Inner Ring Road surrounding the charging zone.
- By reducing the volumes of traffic circulating within the charging zone and improving the efficiency with which it circulates, it was provisionally estimated that congestion charging had been responsible for reductions of 12 percent in emissions of key pollutants Oxides of Nitrogen (NO_x) and

fine particulate matter (PM₁₀) from road traffic within the charging zone (vehicle tailpipe emissions only). This also took the form of an 'excess reduction' over background trends in 2003 which, given generally similar traffic and speed levels, would have persisted throughout 2004.

- Measurements of actual air quality across London during 2003 and 2004 primarily reflected trends that were attributable to weather patterns, with growing evidence of changes related to trends in the composition and technology profile of the wider vehicle fleet. It was not therefore possible to definitively identify a 'congestion charging effect' on actual measured concentrations of key pollutants in the air.
- Limited sample surveys of ambient noise in and around the charging zone showed a stable overall picture and did not suggest a noticeable impact from congestion charging.
- Surveys of Londoners 'on-street' in and around the congestion charging zone suggested that some beneficial impacts of congestion charging and other initiatives on environmental quality were being recognised.

Key findings for 2005

- 2004/2005 saw substantial further falls in the number of road accidents across Greater London, reflecting wider TfL and borough road safety initiatives.
- Trends in accidents within the charging zone during 2004 have been comparable to those elsewhere in London, reflecting broader trends and continuing road safety initiatives.
- Independent statistical treatment of the accumulating time-series of road traffic accident data confirms that TfL's earlier conclusions regarding the impact of congestion charging on road traffic accidents are reasonable.
- There continues to be no evidence of disproportionate or detrimental impacts on the more vulnerable road users in or around the charging zone.
- A full update of the London Atmospheric Emissions Inventory, for wider use in air quality assessment across London, now allows definitive comparisons between emissions from all road traffic sources on an annual average basis for the whole of 2002, 2003 and provisionally for 2004.
- This update includes several enhancements that put congestion charging impacts into a wider context. Whilst the absolute magnitude of the emissions reductions previously reported are broadly confirmed, the inclusion in the inventory for the first time of additional sources, such as PM₁₀ from tyre and brake wear, together with an updated assessment of the technology profile of the vehicle fleet, reduce the proportionate emissions saving directly attributable to congestion charging traffic changes to 8 percent for NO_x and 7 percent for PM₁₀ (annual average for 2003).
- Vehicle technology improvements are now assessed to be responsible for a larger proportion of the calculated change between 2002 and 2003, meaning that total NO_x emissions within the charging zone fell by 13

6. Accidents and the environment

percent and total PM₁₀ emissions fell by 15 percent, closely comparable to the estimates previously reported.

- This revised assessment confirms that the impact of charging on traffic emissions on the Inner Ring Road has been neutral, with overall savings (mostly reflecting vehicle technology changes) of approximately 7 percent in emissions of both NO_x and PM₁₀.
- The revised assessment also suggests that congestion charging was responsible for a reduction of 16 percent in road traffic CO₂ emissions within the charging zone (annual averages for 2002 and 2003). Both this and the estimated savings for emissions on the Inner Ring Road are broadly comparable to those previously reported.
- In addition to the direct congestion charging impact in 2003, vehicle technology changes are estimated to have led to further reductions of approximately 5 percent to road traffic emissions of NO_x within the charging zone, and 7 percent on the Inner Ring Road, between 2003 and 2004. Equivalent further reductions for PM₁₀ were estimated to have been approximately 9 percent, for both the charging zone and the Inner Ring Road, these particularly reflecting improvements to diesel-engined vehicles.
- Measurements of concentrations of key air pollutants during 2005 reveals some interesting developments. There is some evidence of accelerated declines in concentrations of PM₁₀ within the charging zone, compared to the rest of London, although available data are not sufficient to verify this trend. New data also allow a better approach to the interpretation of trends in NO₂ concentrations, and suggest a strong relationship to changes in the technology and composition of the wider vehicle fleet.
- Limited sample surveys of ambient noise in and around the charging zone continue to suggest an absence of a detectable congestion charging impact.

6.2 Accidents involving personal injury

TfL has previously reported the favourable trend in accident rates across London over recent years, and has identified a differential or 'excess' trend within the congestion charging zone, equivalent to between an additional 40 and 70 accidents involving personal injury 'saved' per year, taking the more general London trend into account. Since congestion charging was responsible for a rapid and sustained reduction in volumes of traffic circulating within the charging zone, these additional reductions will persist from year to year. This means that, although trends in the charging zone for 2005 in relation to 2003 or 2004 would not be expected to differ significantly from the rest of London, central London is still benefiting from significantly fewer accidents in each year than would otherwise be the case.

Table 6.1 provides an update on the number of reported road traffic accidents resulting in personal injury in the charging zone, on the Inner Ring Road and for other parts of London, including two full 12 month reporting periods since the introduction of the scheme.

Table 6.1 Total reported personal injury road traffic accidents by area, 2001 to 2004.

		Charging Zone	Inner Ring Road	Rest of London	Total
2001	Weekdays 0700-1900	1,644	528	18,410	20,582
(Feb '01 - Jan '02)	Weekdays 0000-0700;19.00-00.00	464	207	6,269	6,940
	Weekends all day	490	196	7,979	8,665
	Total	2,598	931	32,658	36,187
2002	Weekdays 0700-1900	1,418	450	16,964	18,832
(Feb '02 - Jan '03)	Weekdays 0000-0700;19.00-00.00	439	174	6,078	6,691
	Weekends all day	439	204	7,588	8,231
	Total	2,296	828	30,630	33,754
2003	Weekdays 0700-1900	1,270	428	16,226	17,924
(Mar '03 - Feb '04)	Weekdays 0000-0700;19.00-00.00	403	185	5,277	5,865
	Weekends all day	430	189	7,037	7,656
	Total	2,103	802	28,540	31,445
2004	Weekdays 0700-1900	1,131	374	14,694	16,199
(Mar '04 - Feb '05)	Weekdays 0000-0700;19.00-00.00	389	172	4,924	5,485
	Weekends all day	345	167	6,200	6,712
	Total	1,865	713	25,818	28,396

The number of accidents continues to reduce across London, year-on-year. In the charging zone during charging hours there have been 11 percent fewer accidents in the second year after charging than during the previous 12 month period. This is similar to the 13 percent reduction on the Inner Ring Road and slightly greater than the 9 percent across the rest of London.

Across the whole week, including non-charging hours, there has been an 11 percent reduction in the number of accidents in the charging zone and on the Inner Ring Road, comparable to the 10 percent reduction across the rest of London.

This similarity would suggest that wider road safety initiatives and other factors are now having a similar impact in the charging zone as across the rest of London, and were the primary determinant of accident trends in 2004. However, the 'base' level of accidents in 2003 and 2004 for the charging zone would include the immediate benefits of charging, and the similarity of recent trends between areas means that these have persisted into 2004 and 2005.

6.3 Pedestrian and non-pedestrian involvement

Injuries caused by accidents can be classified as affecting either pedestrians or vehicle occupants or riders.

Table 6.2 updates the information previously available, which indicated that there had been no significant change in the proportion of accidents affecting pedestrians compared to vehicle occupants or riders in the charging zone during charging hours.

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Table 6.2 Accidents involving personal injury, 07.00 to 19.00, 2001 to 2004.

	Charging Zone		Inner Ring Road		Rest of London	
	Pedestrian	Non-pedestrian	Pedestrian	Non-pedestrian	Pedestrian	Non-pedestrian
2001						
(Feb 2001-Jan 2002)	532 (32%)	1,112 (68%)	111 (21%)	417 (79%)	4,045 (22%)	14,365 (78%)
2002						
(Feb 2002-Jan 2003)	443 (31%)	975 (69%)	99 (22%)	351 (78%)	3,803 (22%)	13,161 (78%)
2003						
(Mar 2003-Feb 2004)	420 (33%)	850 (67%)	79 (18%)	349 (82%)	3,521 (22%)	12,705 (78%)
2004						
(Mar 2004-Feb 2005)	383 (34%)	749 (66%)	77 (20%)	299 (80%)	3,177 (22%)	11,506 (78%)

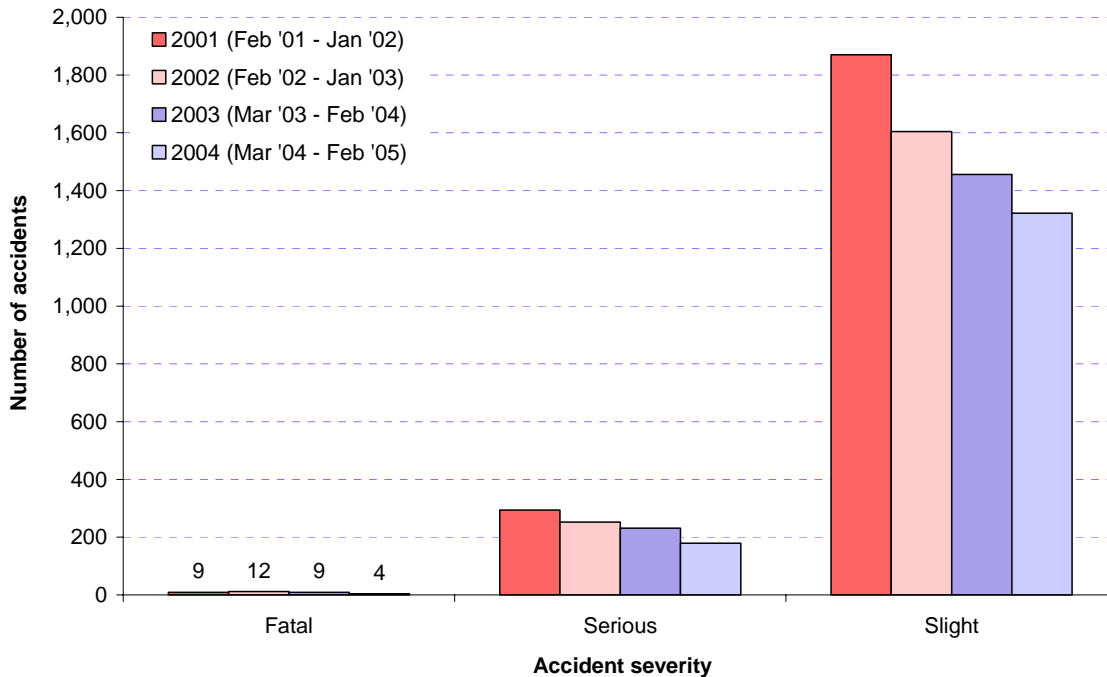
The data for 2004 and 2005 suggest that there has been a very slight increase in the proportion of accidents that are affecting pedestrians in the charging zone compared to vehicle occupants or riders. This change is not apparent in the other parts of London and, at 2 percentage points, cannot be considered to be statistically-significant at this stage. However, it could be indicative of increased pedestrian activity, or alternatively reduced vehicle activity within the zone.

6.4 Severity of accidents

Road traffic casualties are categorised into three severity classes, reflecting the degree of personal injury sustained.

Figure 6.1 shows the severity of the injuries resulting from accidents in the charging zone and on the Inner Ring Road during charging hours. As can be seen there is a reduction in the number of injuries across all severity categories, reflecting the general trend of accident reduction. In the second year after charging compared to the first, the number of fatalities reduced from nine to four, serious injuries have reduced by over 20 percent and injuries classified as slight, which make up the majority of injuries, have reduced by nearly 10 percent.

Figure 6.1 Reported personal injury road traffic accidents within the congestion charging zone and on the Inner Ring Road combined, 07.00 to 19.00, March to November, 2001 to 2004.

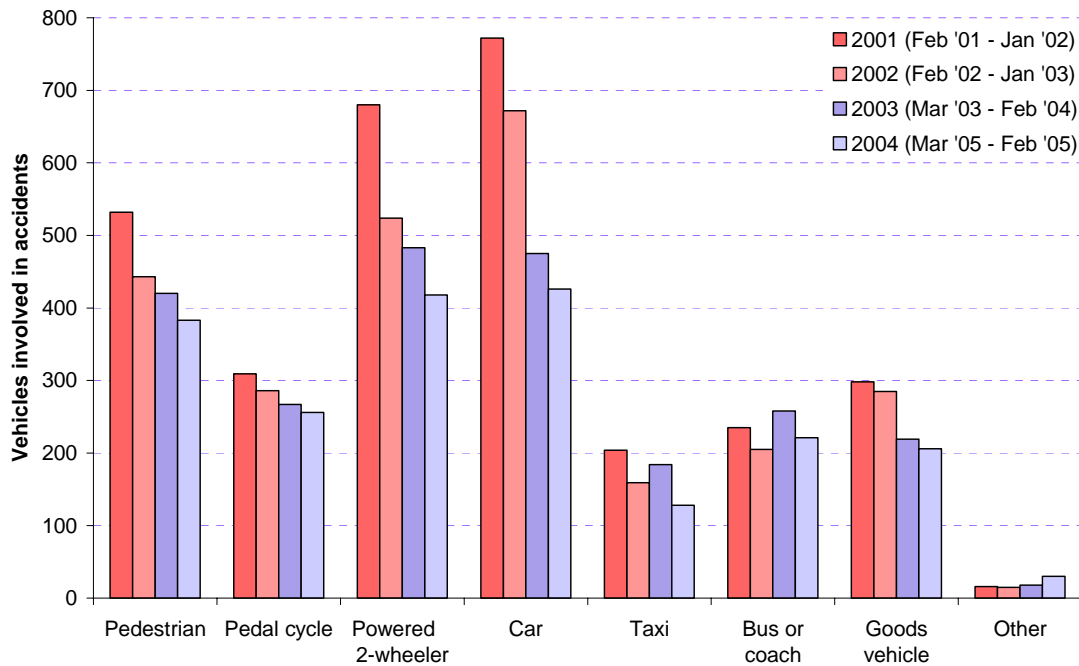


6.5 Vehicle involvement in accidents

Figure 6.2 illustrates trends in the characteristics of vehicles involved in personal injury accidents within the charging zone. The prevailing downward trend is again evident for most types of vehicle, again reflecting the general trend of reduced accidents.

Comparing data for 2004 with the previous year, the largest percentage reduction was for the number of taxis involved in accidents, at 30 percent. However, it is notable that the data for the 2003, the first year following the introduction of charging, indicated an increase which may have been associated with increased taxi activity in the charging zone, and so this trend for 2004 is welcome. The number of buses and coaches involved in accidents has continued to reduce, by 14 percent in the second year after charging, alongside powered two-wheelers reducing by 13 percent, cars by 10 percent, goods vehicles by 6 percent and pedal cycles by 4 percent. There has also been an apparent increase, although small in magnitude, in the involvement of 'other' vehicles, which includes vehicles such as tricycles.

Figure 6.2 Accident involvement by vehicle type within the congestion charging zone, 07.00 to 19.00, March to November, 2001 to 2004.



Similar patterns are also seen across the rest of London, although on the Inner Ring Road cars, taxis and goods vehicles have experienced smaller proportionate of reductions, whilst all other modes have had a greater proportionate reduction in the number of vehicles involved in accidents.

It is notable that the reductions in the number of pedal cycles, powered two-wheelers and buses and coaches involved in accidents inside the charging zone are occurring despite an increase in the number of these vehicles entering the charging zone in 2004 compared to 2003, again suggesting that the various TfL and borough accident reduction measures are having a significant impact.

6.6 Independent statistical review of impact of congestion charging on accidents

An independent statistician has been appointed by TfL to review the available data, findings and conclusions previously published, and to comment on the role of congestion charging in delivering reductions in accidents in the charging zone over and above those that might have been expected were the charging zone to conform to trends seen more generally across London.

TfL previously concluded that there had been an ‘additional’ reduction in the number of accidents of between 40 and 70, within the charging zone and on the Inner Ring Road combined, for the first year after the introduction of charging. This was most likely to reflect the traffic reduction effect of charging, leading to less possibility of accidents as fewer vehicles were circulating within the charging zone. This finding was considered to be compatible with TfL’s expectation of between 150 and 250 fewer accidents per year across the

whole of London, since although the contribution of the charging zone and Inner Ring Road combined is only a proportion of the total, the accident reduction effect of charging would be spread more widely throughout Greater London and beyond, albeit at a less intense level.

The review made the point that no completely rigorous basis exists for precisely quantifying the number of accidents 'saved' by the introduction of congestion charging, in such a way that will permit a methodologically sound way of estimating an error band.

The key methodological difficulty is that any rigorous estimate of the reduction in accidents following the introduction of the scheme requires an estimate of what the level of accidents would have been if the charge had not been introduced.

Two methods of estimating this have been explored:

- a regression analysis of the trend during 2001 and 2002 and projecting this forward to 2003;
- an analysis of the ratio between accidents in the charging zone and on the Inner Ring Road compared with accidents in the rest of London.

The regression method was considered to be inapplicable owing to the relatively low number of observations, meaning that the resulting error bands would have been unworkably large. Therefore, this method of establishing an estimate was not endorsed.

This leaves the ratio comparison method. This is essentially the method that TfL has used. These data have been re-examined and extended by using data from 1999. The precise choice of periods for the construction of ratios can make a significant difference to the estimate obtained for the reduction.

If the ratio is based on the most recent year before the introduction of charging, January to December 2002, and if this ratio is applied to the year immediately after the introduction, March 2003 to February 2004, then the additional estimated reduction in the charging zone is 118 accidents. However if the ratio for the previous year is used the additional reduction is 169 accidents. If the two year period is used the result is 145 fewer accidents in the charging zone.

If instead of calendar year periods the ratios are moved forward by one month, eg to February 2002 to January 2003 etc, then the equivalent reduction of injuries in the charging zone and Inner Ring Road compared to the rest of London across the three different comparisons are 88,181 and 137 fewer accidents respectively.

However, an examination of the ratios for each year from 1999 shows an increasing trend in the ratio, ie accidents in the zone have reduced faster than on the rest of London. It could therefore be argued that further comparable declines would have happened in the absence of charging. If the

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average reduction in the ratios over the period 1999 to 2002 is carried forward to the period March 2003 to February 2004 then the estimated reduction falls to 62 accidents. However as the ratio between the number of accidents in the charging zone and rest of London may not have continued to fall this latter estimate is probably on the cautious side.

Based on this method it could be suggested that a central estimate of around 100 additional accidents 'saved' per year within the charging zone, with error bounds between 60 and 140 fewer accidents would be a reasonable conclusion. This is rather higher than the previously published range. It was the view of the statistician that the previous lower bound of 40 was over cautious as this compared the reduction in the rest of London for the peak period with the reduction in the charging zone and Inner Ring Road in all periods including weekends.

Overall, while the review considers that the previous published estimate is on the cautious side it was not suggested that a revised accident reduction estimate is put forward by TfL, reflecting the caveats and uncertainties that are considered to apply. The overall conclusion was that TfL can remain confident that congestion charging led to a real reduction in accidents in central London, and that the previously published estimate of the scheme resulting in between an additional 40 and 70 fewer accidents 'saved' in the charging zone and on the Inner Ring Road combined in the first year after the scheme is on the cautious side.

6.7 Air quality – emissions

Previous reports have described the impacts of congestion charging on air quality, and have explained the complex and indirect nature of the processes involved.

TfL had previously and provisionally estimated 'attributable' savings of 12 percent in emissions of both NO_x and PM₁₀ within the charging zone (reflecting the observed traffic volume, composition and speed changes). In addition, improvements to the vehicle technology profile between 2002 and 2003 were assessed to have contributed a further 4 percentage points to these savings in each case, such that the total reduction in road traffic emissions between 2002 and 2003 within the charging zone was estimated at 16 percent, for both NO_x and PM₁₀.

In addition, TfL estimated that the traffic volume and speed changes then observed had not significantly affected emissions on the Inner Ring Road, which had reduced overall primarily owing to the effect of vehicle technology changes. TfL also estimated that there had been savings of 20 percent in CO₂ emissions from road traffic within the charging zone.

These estimates had the following characteristics:

- They were based on data reflecting early post-charging conditions in 2003.
- They related to an annual average day, including both charging hours, non-charging hours and weekends, but did not include an apportionment for that part of 2003 before charging was in operation.
- They only considered traffic on a network of the more major roads within the charging zone.
- They did not include non-tailpipe PM₁₀ from road traffic, tyre and brake wear, which has now been included in the inventory update, and which is responsible for about one-third of total road traffic PM₁₀.
- They used an early assessment of the UK vehicle fleet technology profile for 2003, which has since been amended, in particular to take account of London-specific developments such as the emissions abatement programme (particularly affecting PM₁₀) for TfL buses.

Results are now available from a full re-working of the London Atmospheric Emissions Inventory for 2003, undertaken on behalf of the GLA for wider use for air quality assessments by local authorities in London. This new inventory includes several features and enhancements that are beneficial for wider air quality assessment purposes, but that will have affected the previous estimates. The overall effect has been to reduce the estimated proportionate reduction in emissions from the traffic volume and speed changes brought about by congestion charging, but to increase the estimated improvements due to changes in the vehicle fleet. Overall, the estimated emissions reductions between 2002 and 2003 are comparable to previous estimates.

These new features are:

- Inclusion of full road traffic flow and speed data for 2003, including data from non-TfL sources, together with flows and speeds on minor roads. Minor roads would tend to show marginally smaller traffic speed changes in relation to congestion charging, compared to the major roads used previously. The calculation of annual average emissions on a whole-2003 basis would also tend to slightly reduce the attributable congestion charging impact, in respect of the part of 2003 before charging was introduced.
- Inclusion of PM₁₀ from non-tailpipe road vehicle sources, principally tyre and brake wear. This was not included in the previous TfL estimates. With the rapid progress being made more generally with tailpipe PM₁₀ abatement in the vehicle fleet, this source becomes relatively more important. In the 2003 inventory, PM₁₀ from this source is estimated to contribute up to one third of total road traffic PM₁₀ emissions. Calculations based on this would therefore show a proportionately smaller impact from the same traffic input data. Similar changes have also been made to NO₂/NO_x ratios (the proportion of NO_x that is emitted directly as NO₂) to reflect updated emissions factors, although the impact of this on the revised emissions estimates is less significant.

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- Complete overhaul of the national vehicle stock model, reflecting increased penetration of diesel vehicles into the car fleet and many other enhancements. In addition, the 2003 inventory includes much improved representation of the TfL bus and London taxi fleet, reflecting TfL's emissions reduction programme. These changes will have relatively increased the proportion of the change for 2003 against 2002 that is attributable to vehicle technology changes, and correspondingly decreased the proportion of the changes that are attributable to traffic volume and speed changes.

Table 6.3 shows a full breakdown of the estimated changes to emissions of key pollutants in relation to congestion charging between 2002 and 2003. Key observations from the table are as follows:

- Of those effects directly attributable to congestion charging, traffic volume changes are now assessed to have had only a relatively small impact on total emissions. This mainly reflects the relatively small contribution of petrol cars to total emissions in central London and a substantially increased proportion of the car fleet that is now assessed to be diesel fuelled in the inventory. Furthermore, these reductions are partly offset by observed increases in taxis and buses (diesel vehicles). These profile changes apply both to the charging zone and the Inner Ring Road, in the latter case a small increase in overall traffic volumes having been observed.
- The overall impact due exclusively to changes in traffic volumes and relative vehicle populations is therefore assessed to be: savings of around 1 percent in both NO_x and PM_{10} within the charging zone; and increases of between 7 and 9 percent in NO_x and PM_{10} respectively on the Inner Ring Road, although much of this reflects methodological changes to the inventory calculations, rather than 'real' change (see further below), and in any case is only one component of overall change.
- This is only part of the picture however, as the changes in traffic speeds observed as a result of congestion charging are now assessed to have been more significant in reducing emissions than previously estimated. These result in savings of typically 6 percent in NO_x and PM_{10} within the charging zone, and typically between 7 and 8 percent on the Inner Ring Road.
- In combination, the traffic and speed changes together are estimated to have reduced emissions (all road traffic related sources, all roads, annual average day) of NO_x by about 8 percent within the charging zone, with emissions effectively unchanged on the Inner Ring Road. For PM_{10} , the equivalent changes are a reduction of around 6 percent within the charging zone, and a small increase of about 3 percent on the Inner Ring Road. In the case of PM_{10} , these estimates are particularly affected by the inclusion in this analysis of an apportionment for tyre and brake wear. This has the effect of reducing the magnitude of the estimated percentage, as opposed to absolute change, by about one-third.
- Change estimates are further affected by revised estimates for vehicle technology change. These are not directly attributable to congestion

charging, but reflect wider improvements to the emissions performance of the UK (and some specific elements of the London) vehicle fleet. The estimates given below are somewhat larger than previously reported. They indicate that technology changes were responsible for reductions of 6 and 7 percent in emissions of NO_x in the charging zone and on the Inner Ring Road respectively. Equivalent figures for PM₁₀ were reductions of 9 and 10 percent between 2002 and 2003 on an annual average basis.

- Taking all of the above changes together, total road traffic related emissions of NO_x were estimated to have reduced by around 13 percent inside the charging zone, and by 7 percent on the Inner Ring Road. Total road traffic related emissions of PM₁₀ were estimated to have reduced by 16 percent within the charging zone, and by 7 percent on the Inner Ring Road.

Table 6.3 Principal changes to emissions of NO_x and PM₁₀. Percentage change, 2003 compared with 2002.

Change	Charging zone			Inner Ring Road		
	NO _x	PM ₁₀	CO ₂	NO _x	PM ₁₀	CO ₂
Flow change - motorcycles	-	0.4	0.2	0.2	2.4	1.0
Flow change - taxis	2.3	3.8	2.4	2.0	3.6	2.1
Flow change - car	-4.5	-4.6	-11.2	-1.6	-1.8	-3.9
Flow change - bus and coach	2.9	1.0	1.2	3.2	1.1	1.4
Flow change - light goods	-0.1	-0.1	-0.1	1.7	3.2	2.3
Flow change - rigid goods	-1.6	-1.0	-0.7	1.6	1.0	0.7
Flow change - articulated heavy goods	-0.4	-0.2	-0.2	0.4	0.2	0.2
Traffic volume change	-1.4	-0.8	-8.4	7.4	9.7	3.8
Speed change	-6.5	-5.5	-7.3	-7.7	-6.9	-8.5
Traffic volume and speed change	-7.9	-6.3	-15.7	-0.2	2.8	-4.7
Vehicle stock change	-5.5	-9.2	-0.7	-6.7	-9.6	-0.7
Overall traffic emissions change 2003 versus 2002	-13.4	-15.5	-16.4	-6.9	-6.8	-5.4
Overall traffic emissions change 2004 versus 2003	-5.2	-6.9	-0.9	-5.6	-6.3	-0.8

- Table 6.3 also includes estimates for CO₂ emissions. These emissions are more directly related to vehicle-kilometres driven and fuel consumed. The traffic and speed changes observed in the charging zone are estimated to have led to savings of 15.7 percent, split roughly equally between those due to reduced traffic, and those reflecting less congestion (more fuel-efficient driving conditions). On the Inner Ring Road, the observed small increase to traffic flows resulted in a proportionate increase in CO₂ emissions, but this was more than countered by the favourable speed trends that were also observed, giving an overall reduction of 8.5 percent.
- The table also includes a provisional estimate for the changes between 2003 and 2004. This primarily reflects vehicle technology changes and does not include a full re-working of the traffic and speeds in the inventory. Further reductions of about 6 percent are indicated in both NO_x and PM₁₀, both within the charging zone and on the Inner Ring Road, continuing to

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reflect emissions improvements to the vehicle fleet. Given the generally neutral trends in traffic and speeds observed during 2004 and 2005 within the charging zone and on the Inner Ring Road, these changes are likely to be representative overall. Note that these further reductions are on top of the established reduction in 2003, which will have persisted.

Therefore, between 2002 and 2004, total emissions of NO_x from road traffic sources in the charging zone are estimated to have reduced by approximately 18 percent. On the Inner Ring Road, the equivalent reduction was approximately 12 percent. Equivalent reductions for PM₁₀ were approximately 22 percent in the charging zone, and approximately 13 percent on the Inner Ring Road.

6.8 Measured air quality

Previous reports have described the indirect nature of the relationship between changes in emissions from road traffic and measurements of ambient air quality at fixed air quality monitoring sites. It was explained that congestion charging would only be expected to affect tailpipe emissions from road traffic, through reducing the volume of traffic in the charging zone, and allowing it to circulate more efficiently. Other influences on road traffic emissions, emissions from non-road sources, 'imported' pollution from elsewhere and variations in the weather also determine measured pollution levels. This means that the substantial emissions reductions brought about by congestion charging within the charging zone would be very much diminished at air quality monitoring sites, and would therefore be difficult to detect in the medium-term.

Data for the majority of air quality monitoring sites in London are available through the London Air Quality Network. TfL's *First Annual Monitoring Report* set out those sites that would be used for congestion charging monitoring purposes, the sites being grouped into 'site classes' to reflect congestion charging geography. Most sites benefit from a lengthy time-series of data, and the inclusion of sites well outside the charging zone would also allow the effect of changes to background concentrations to be assessed.

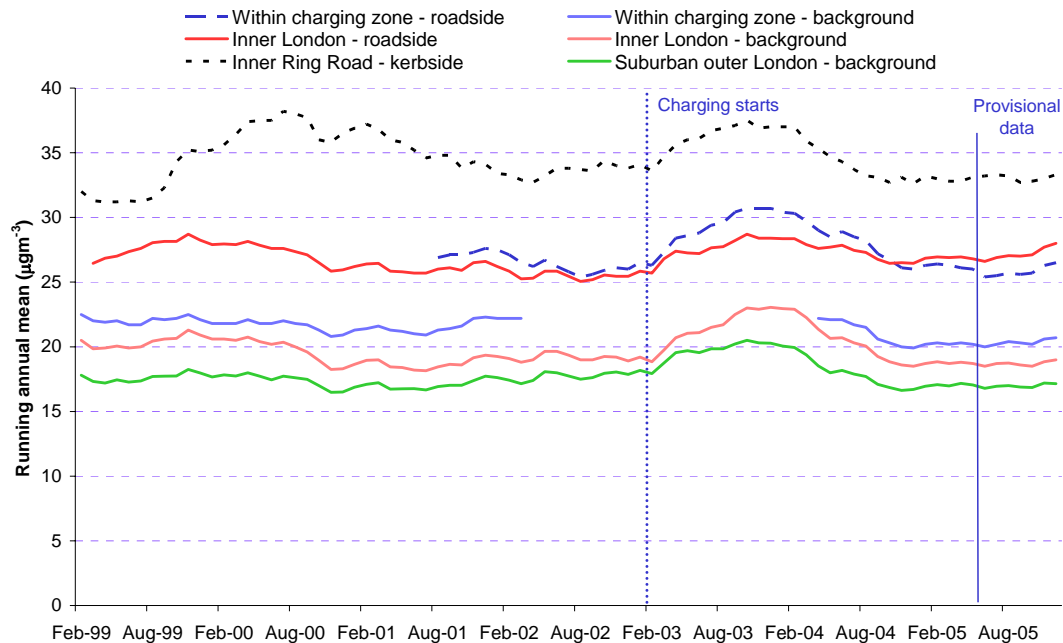
6.9 Trends in ambient PM₁₀

The *Second Annual Monitoring Report* described how unusual meteorological conditions had led to elevated PM₁₀ concentrations throughout much of 2003, obscuring any impacts of congestion charging. Weather conditions and PM₁₀ concentrations in 2004 had been much closer to the long-run average, although trends in PM₁₀ concentrations remained indistinct. Weather conditions during the first half of 2005 were also relatively benign, allowing a clearer assessment of recent trends.

Figure 6.3 shows running annual mean PM₁₀ concentrations at congestion charging indicator sites. Mean concentrations at the 'Within Charging Zone' Roadside site have fallen below those of the Inner London Roadside class (which is an average of eight monitoring sites) for the first time.

Concentrations at all sites have stabilised at a level similar to that prior to the start of the scheme, following the peak caused by unusual meteorology during 2003.

Figure 6.3 Running annual mean PM₁₀ concentrations at congestion charging indicator sites.



Weather conditions and the quantity of particulate pollution imported from the Continent have a very strong influence on PM₁₀ concentrations, so trends at all of the sites are very similar. A clearer picture of changes since introduction of congestion charging can be seen by looking at peak concentrations, which corresponds to a national air quality objective for PM₁₀.

Figure 6.4 shows the number of days on which mean concentrations of PM₁₀ were greater than 50 µgm⁻³, as a running annual total. The national objective for 2005 is for this concentration to be exceeded in fewer than 35 24-hour periods. At 'background' locations throughout London there are typically only a small number of 'exceedence days', the majority occurring during periods of high regional pollution. The number of exceedence days increases at locations closer to central London, major roads or industrial sources.

This figure demonstrates that the number of exceedences at background locations within the charging zone dropped during 2005 to a level equal to or lower than those of inner London, mirroring the concentration trend in Figure 6.3. However, whilst possibly encouraging, a full assessment is made difficult by interruptions to the monitoring due to long term building works and equipment failure at key monitoring sites.

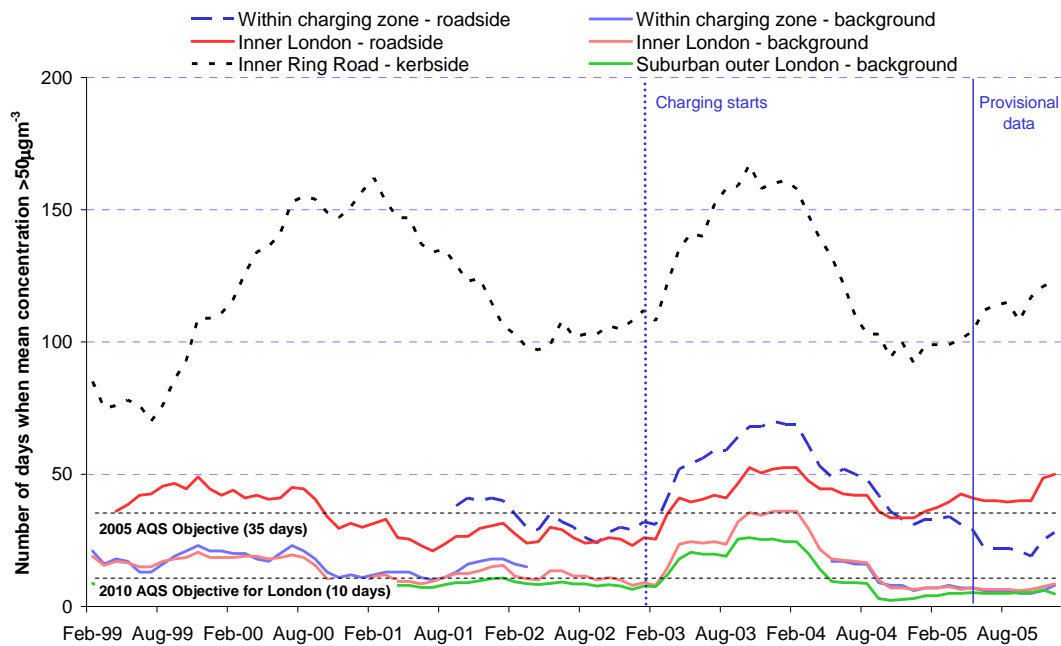
At roadside locations, the number of exceedences rose rapidly during 2003 due to exceptional meteorological conditions, and then quickly dropped again during 2004. Exceedences at Inner London Roadside sites and on the

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boundary of the charging zone then started to rise again during 2005. However, exceedences at the Within charging zone roadside site continue to fall, reaching the lowest level since monitoring began in the 12 months ending October 2005.

The site on the boundary of the charging zone – Marylebone Road – typically records high levels of PM₁₀, as it is located at the kerbside immediately adjacent to a heavily-trafficked road. However, the behaviour of PM₁₀ at this site closely mirrors the more general trend, and does not suggest any specific congestion charging related influences.

Figure 6.4 Running annual mean count of PM₁₀ exceedence days.



Congestion charging is not the only positive influence likely to have affected PM₁₀ concentrations. Long-term improvements to the vehicle fleet are also delivering substantial reductions in road traffic PM₁₀ emissions, these particularly affecting diesel-fuelled vehicles such as buses and taxis, which are more prevalent in central London.

TfL is developing proposals, subject to Consultation and a Mayoral decision, for a London-wide Low Emission Zone. The earliest date that this could be implemented is 2008. The Low Emission Zone would initially target further reductions in PM₁₀ by encouraging the use of cleaner heavy diesel vehicles on roads within Greater London.

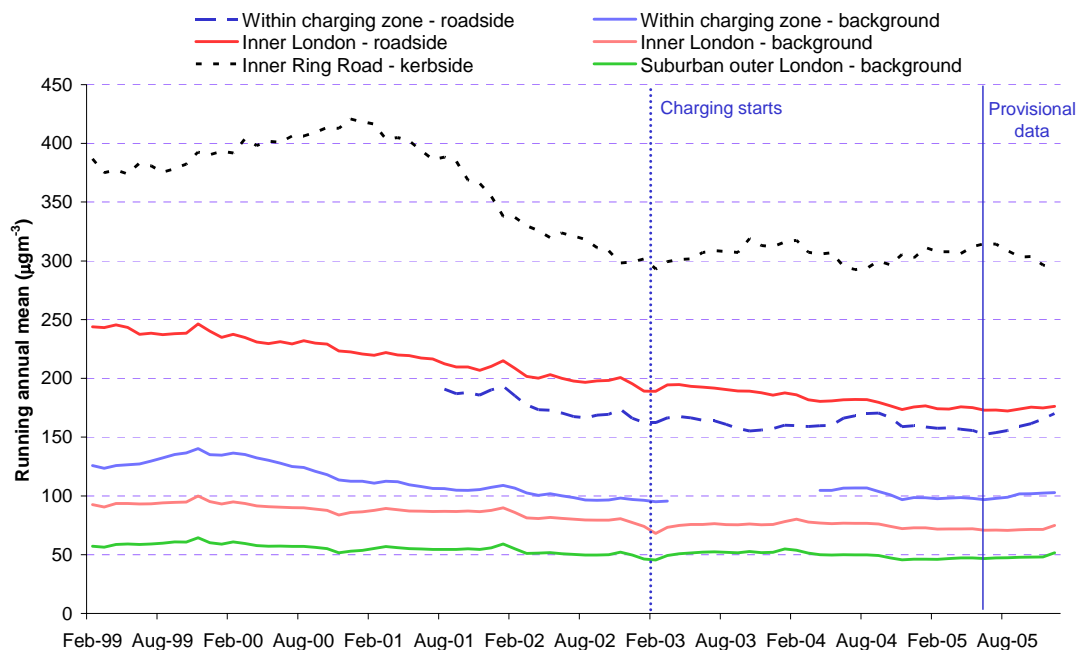
6.10 Trends in ambient NO_x/NO₂

Oxides of Nitrogen (NO_x) is a collective term for both Nitrogen Oxide (NO) and Nitrogen Dioxide (NO₂). The majority of NO_x consists of NO, which is then converted into NO₂ in the atmosphere, primarily through reaction with Ozone (O₃). NO₂ is the pollutant to which national air quality objectives apply.

The *Second Annual Monitoring Report* described how the positive effects of a general, London-wide decrease in emissions of NO_x from road traffic were being countered by other factors producing an increase in NO₂ concentrations. The *Third Annual Monitoring Report* described a mixed picture, with continuing general declines in NO_x concentrations across London, but stability or even small increases in NO₂ concentrations at the same sites. In this respect, conditions had apparently departed from long-term trends, where reduced NO₂ concentrations could be expected to follow from reduced NO_x emissions, but the causes of this were not immediately clear. It was thought that changes to the emissions characteristics of the vehicle fleet may have been responsible, although this required further investigation.

The picture for NO_x concentrations during 2005 has been of further small declines (Figure 6.5) continuing the established trend. This general downward trend has resulted in an overall decrease in NO_x concentrations of more than 20 percent over the last six years at Inner London Background sites. A slightly more rapid fall has been recorded by Inner London Roadside sites, around 25 percent over the same period. Reductions to NO_x in the charging zone have been slower and less distinct, the data suggesting the influence of factors particularly associated with central London.

Figure 6.5 Running annual mean NO_x concentrations.

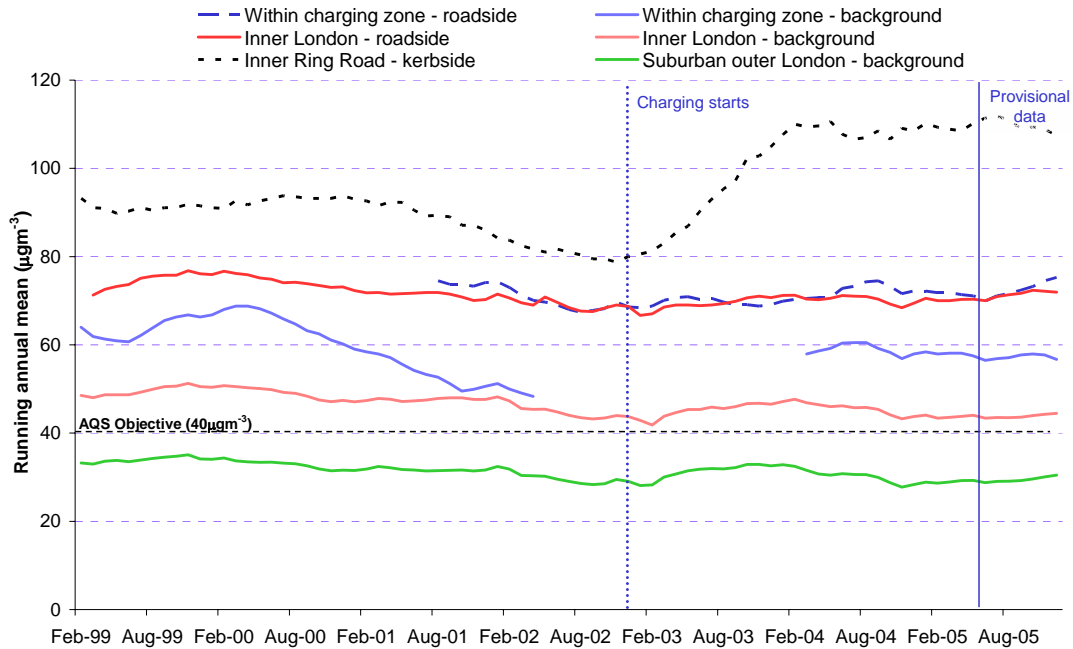


Trends in NO₂ concentrations are shown in Figure 6.6. It is seen that, despite a steady decrease in NO_x concentrations, running annual mean NO₂ concentrations at all site classes have changed very little since 2002. At the Marylebone Road site on the boundary of the charging zone, concentrations have actually increased. There is also some suggestion from the figure of a pattern of slight reductions at 'background' sites, away from busy roads, and small general increases at sites in locations close to busy roads. These trends

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do not reflect established relationships between concentrations of NO_x and NO_2 .

Figure 6.6 Running annual mean NO_2 concentrations.



It is now thought that these trends result from increased emissions of primary NO_2 from road traffic, and that this is a general phenomenon occurring elsewhere in the UK and more widely, reflecting changes in vehicle technology and fleet composition. Primary NO_2 is NO_x that is emitted directly as NO_2 . It has conventionally been considered to represent only a small fraction (up to 10 percent) of the total NO_x emitted from road transport. Increases in this proportion would lead to higher relative NO_2 concentrations, as the production of total NO_2 would not be limited to the same extent by available Ozone (a significant limitation in urban areas).

The most obvious manifestation of this phenomenon would be an increase in the ratio of NO_2 to NO_x in the air. Table 6.4 shows this ratio, calculated for each of the site groups used for congestion charging monitoring purposes for recent years. A clear upward trend dating back several years is apparent, which would be consistent with significant shifts in the emissions characteristics of the general vehicle fleet. Increases in this ratio are particularly apparent at sites close to busy roads, again suggesting a traffic-related cause. Ratios during 2005 appear to have stabilised, but at historically high NO_2 to NO_x ratios. Note that this table shows ratios in ambient air, as opposed to ratios directly emitted from vehicles.

Table 6.4 Trend in NO₂/NO_x ratios measured in ambient air (proportion of NO_x that is NO₂). 2002 to 2005.

Site Group	2002	2003	2004	2005
Suburban outer London	56%	63%	61%	63%
Inner London background	54%	63%	63%	62%
Within charging zone background	54%	60%	59%	56%
Inner London roadside	34%	38%	40%	41%
Within charging zone roadside	40%	44%	45%	45%
Inner Ring Road roadside	27%	33%	36%	37%

TfL is continuing to investigate these trends. It is clear from the data that they are not confined to the congestion charging zone and therefore are not directly associated with changes brought about by congestion charging itself. Other data suggest that changes to the fleet profile of diesel-fuelled vehicles may be primarily responsible, specifically abatement technologies (Euro Class progression and retrofit technologies) for reducing PM₁₀, these vehicles being particularly prevalent in central London. Whilst this has implications for the ability to meet the national air quality objectives at some sites for NO₂ in the short term, it is primarily a re-distributive rather than an additive effect, and continuing reductions to NO_x emissions would be expected to lead to further falls in NO₂ concentrations in the medium-term.

6.11 Ambient noise

This section updates TfL's sample surveys of noise measurements taken at a small number of selected sites in and around the charging zone. Data are now available for five relevant sites over the five years 2001/2 to 2005/6, all measurements being taken over the Winter period of each year.

Measured traffic changes of the extent described elsewhere in this document would be unlikely of themselves to give rise to significant changes in ambient noise. In addition, the sample measurements described would not be expected to give statistically-robust measurements of either the overall noise climate in the charging zone, or changes from year to year. Nevertheless, the results are useful in an indicative sense.

Table 6.5 updates a table presented in previous reports to include data for surveys in late 2005/6. Comparable L_{den} values for all four available years are shown and include differential weightings for evening and night-time noise to reflect greater noise sensitivity at these times.

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Table 6.5 Sample noise measurements dB(A). Congestion charging monitoring sites, Winter 2001/2, 2002/3, 2003/4, 2004/5 and 2005/6 compared.

Site	Index	2001/2	2002/3	2003/4	2004/5	2005/6	Difference 2005/6 vs average all previous surveys
Site 5	L _{Aeq} , 16 hour Day	73.0	74.4	73.8	74.6	75.9	+2.0
	L _{Aeq} , 8 hour Night	71.1	72.9	71.1	72.4	75.0	+3.1
	L _{den} , normalised	80.4	82	81.1	82.0	81.6	+0.2
	L _{den} , free-field	77.9	79.5	78.6	79.5	79.1	+0.2
Site 6	L _{Aeq} , 16 hour Day	70.2	69.6	69.1	73.5	72.0	+1.6
	L _{Aeq} , 8 hour Night	66.9	65.2	66.7	68.9	69.2	+2.3
	L _{den} , normalised	76.3	74.9	75.9	76.2	76.3	+0.5
	L _{den} , free-field	76.3	74.9	75.9	76.2	76.3	+0.5
Site 7	L _{Aeq} , 16 hour Day	57.4	61	58.7	63.3	59.2	-0.8
	L _{Aeq} , 8 hour Night	50.9	52.2	51.1	55.7	54.6	+2.9
	L _{den} , normalised	65.1	67.4	65.9	67.5	62.2	-3.6
	L _{den} , free-field	62.6	64.9	63.4	65.0	62.2	-1.0
Site 16	L _{Aeq} , 16 hour Day	71.7	72.5	72.5	74	74.2	+1.7
	L _{Aeq} , 8 hour Night	72.3	71.5	71.5	72.7	73.4	+1.5
	L _{den} , normalised	79.1	79.2	79.2	79.4	80.0	+0.9
	L _{den} , free-field	79.1	79.2	78.8	79.4	80.0	+1.0
Site 19	L _{Aeq} , 16 hour Day	62.6	63.4	62.2	-	63.6	-0.2
	L _{Aeq} , 8 hour Night	57.6	59.1	57.2	-	60.0	+1.3
	L _{den} , normalised	71.1	72.4	70.8	-	67.4	-3.5
	L _{den} , free-field	68.6	69.9	68.3	-	67.4	-1.0

Note: The L_{Aeq} values quoted in are free-field values normalised to a distance of 10 metres from the kerb.

Site 5: Marylebone Road (Inner Ring Road)

Site 6: Farringdon Street (within charging zone)

Site 7: Central Street (within charging zone – 'background' site)

Site 16: New Kent Road (radial road approaching Inner Ring Road)

Site 19: Berkley Square (within charging zone – data not available for 2004/5)

Looking at measurements previously reported, TfL concluded that there was no evidence of significant changes at the sample sites that might have been associated with the introduction of congestion charging. On the basis of the new results for 2005 and 2006, this conclusion remains valid.

6.12 Summary of key findings

Reported road traffic accidents resulting in personal injury in 2004 have continued to reduce across London. Trends in accidents within the charging zone during 2004 have been comparable to those elsewhere in London, reflecting broader trends and continuing road safety initiatives. Independent statistical treatment of accident trends confirms that TfL's assessment, that the traffic changes resulting from congestion charging has been responsible for between 40 and 70 fewer personal injury accidents within the charging

zone and on the Inner Ring Road per year is reasonable. There continues to be no evidence of disproportionate or detrimental impacts on the more vulnerable road users in or around the charging zone.

A full update of the London Atmospheric Emissions Inventory, for wider use in air quality assessment across London, now allows definitive comparisons between emissions from all road traffic sources on an annual average basis for the whole of 2002, 2003 and provisionally for 2004. This update includes several enhancements that put congestion charging impacts into a wider context. Whilst the absolute magnitude of the emissions reductions previously reported are broadly confirmed, the inclusion in the inventory for the first time of additional sources, such as PM₁₀ from tyre and brake wear, together with a substantially updated assessment of the technology profile of the vehicle fleet, reduce the proportionate emissions saving directly attributable to congestion charging traffic changes to 8 percent for NO_x and 7 percent for PM₁₀ (annual average for 2003). Vehicle technology improvements are now assessed to be responsible for a larger proportion of the change between 2002 and 2003, meaning that total NO_x emissions within the charging zone fell by 13 percent and total PM₁₀ emissions fell by 15 percent overall, closely comparable to the estimates previously reported.

This revised assessment confirms that the impact of charging on traffic emissions on the Inner Ring Road has been neutral, with overall savings (mostly reflecting vehicle technology changes) of approximately 7 percent in emissions of both NO_x and PM₁₀.

Measurements of concentrations of key air pollutants during 2005 reveals some interesting developments. There is some evidence of accelerated declines in concentrations of PM₁₀ within the charging zone, compared to the rest of London. However, as these data are taken from only one roadside site within the charging zone, there could be a range of reasons other than the congestion charge to explain this decline. New data also allow a better approach to the interpretation of trends in NO₂ concentrations, and suggest a strong relationship to changes in the technology and composition of the wider vehicle fleet.

Limited sample surveys of ambient noise in and around the charging zone continue to suggest an absence of a detectable congestion charging impact.

7 Boundary case study

7.1 Introduction

During the development of the central London congestion charging scheme, a number of issues were identified relating specifically to the boundary area – including the Inner Ring Road itself and the area immediately beyond. These ranged widely across possible traffic effects associated with diversion around the boundary of the charging zone, through economic and social effects associated with the geographical discontinuity represented by the charging zone boundary, to public transport and environmental consequences arising from the changed travel and activity patterns.

Clearly, any changes instigated by the scheme would take place against the backdrop of more general change for reasons unrelated to the scheme and, for most attributes, the area outside of the charging zone would not be expected to be affected to the same degree as the charging zone itself.

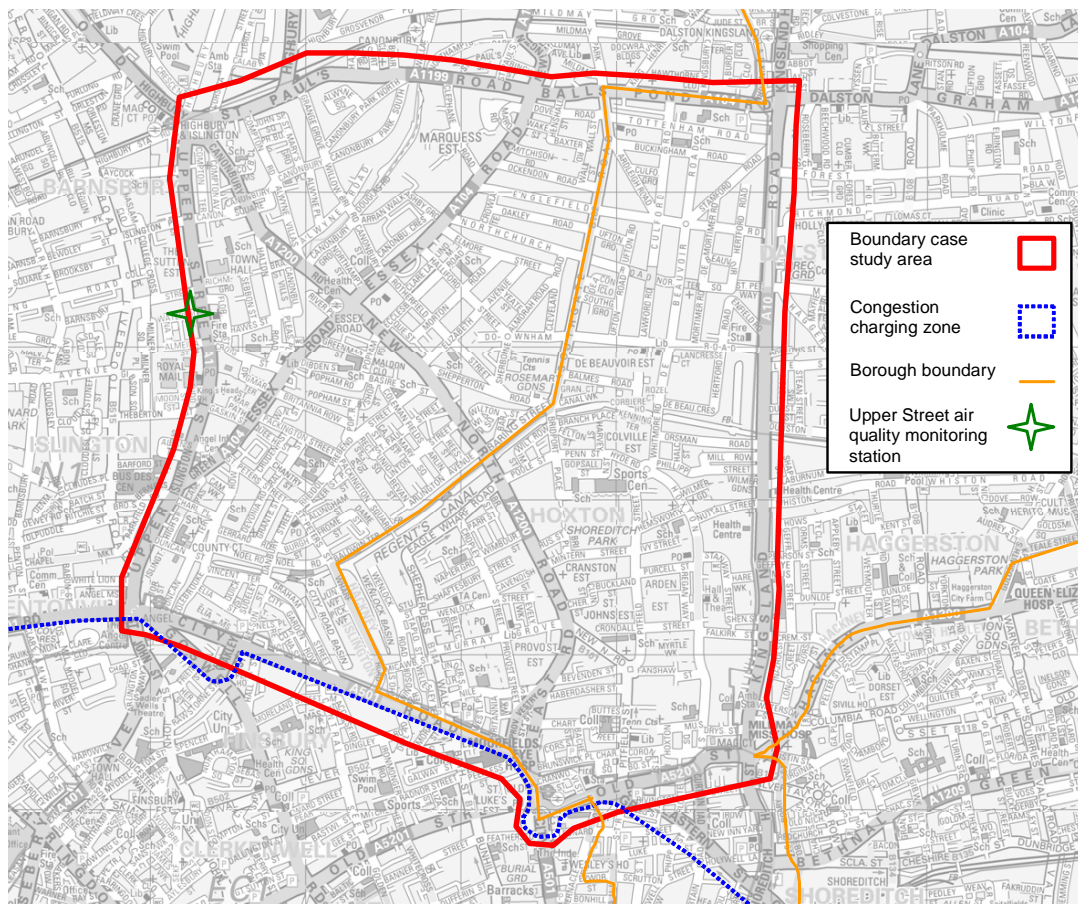
It was determined that these possible effects should be monitored through an intensive 'case study' of a relatively small area adjacent to the boundary. Because of the diversity of inner London, no one area could be wholly representative of the entire boundary. Focusing on a specific area would, however, allow effective use of resources and allow observed effects to be related to a specific set of geographical and socio-economic conditions. Information gathered here would be complemented by extension of many other aspects of the monitoring work to inner London more generally.

The boundary case study area

The area selected for this work lay to the north of the charging zone: broadly bounded in the south by the charging zone itself; in the west by Upper Street; in the east by Kingsland Road; and in the north by St Paul's Road and Balls Pond Road. Figure 7.1 provides a map of the case study area. The monitoring work consisted of extensions to the core programme deployed inside the charging zone itself, covering key traffic volume, congestion and public transport studies, alongside surveys of businesses and households, and studies of key environmental impacts. Findings after nearly two years of operation were reported in the *Third Annual Monitoring Report*.

This section updates the previous commentary and summarises the findings from this work after approximately three years of operation of the central London scheme. It concludes that the impacts of charging on the boundary area remain largely neutral, with some transport gains and a general absence of adverse traffic, congestion, economic and environmental effects attributable to charging.

Figure 7.1 Map of the boundary case study area.



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The findings of this work will inevitably reflect local and London-wide 'external' factors that will have affected travel patterns in the case study area during the period of study. Locally, the first of these is the 'Shoreditch Triangle' traffic management scheme, which involved substantial changes to the configuration and operation of the Inner Ring Road, together with a range of other improvements and renewals. The work for this scheme mostly took place during 2002, thus potentially affecting 'before' measurements in the monitoring data. This would have particularly affected traffic conditions on the Inner Ring Road itself, and perhaps also on approach roads to the charging zone in the eastern part of the case study area.

London-wide factors such as the suspension of the Central Line in the first half of 2003 and the July 2005 bombings are also likely to have affected traffic conditions and public transport patronage.

Also important will be the impacts of several local traffic management schemes implemented in and around the case study area by the London borough of Islington. These schemes were specified and funded as 'complementary measures' for congestion charging, and were implemented

7. Boundary case study

progressively between 2002 and 2004. Initial results from these schemes were described in TfL's *Third Annual Monitoring Report*.

Key findings to date

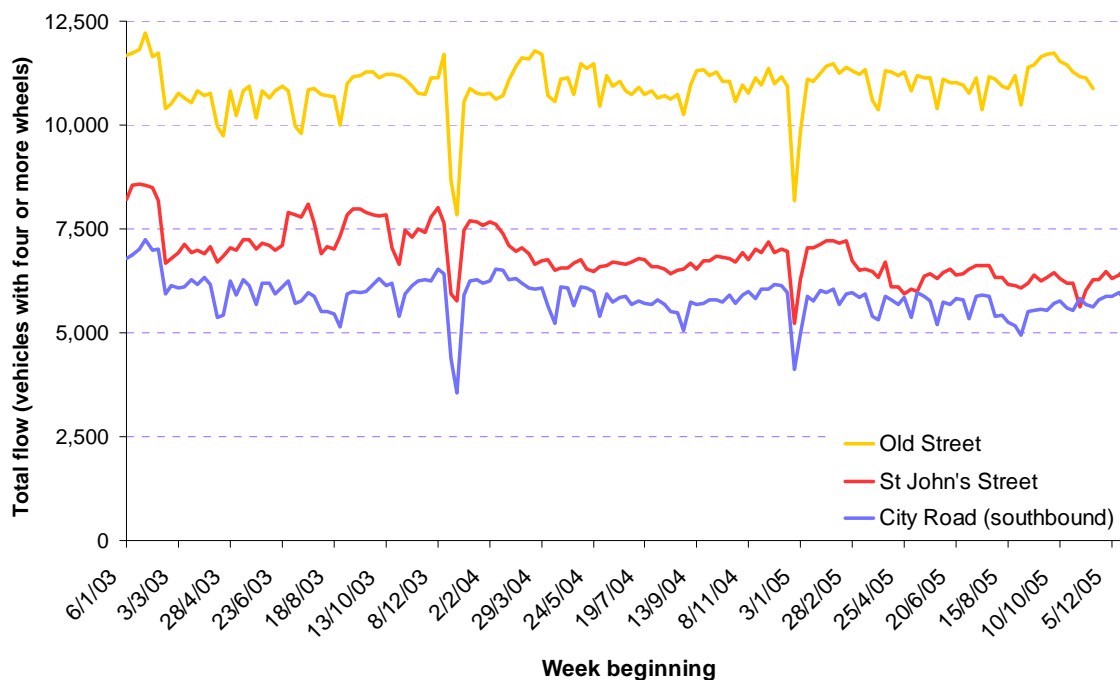
- Reductions in traffic entering and leaving the charging zone, approaching the zone on radial routes and circulating on the Inner Ring Road have been observed in the boundary case study area. Traffic flows show reductions during charging hours, and have generally remained stable at other times, indicating that travellers have generally not shifted their travel times in response to the congestion charge. These changes closely mirror those observed elsewhere around the boundary of the charging zone.
- Small increases in average speeds on the Inner Ring Road and in the boundary case study area have been observed. The implementation of the 'Shoreditch Triangle' traffic management scheme makes comparison of conditions before and after charging difficult, but congestion has remained broadly stable or seen some improvement in the boundary case study area.
- The increase in bus service capacity in the area has been matched by an increase in patronage. Underground patronage increased in both 2004 and 2005, mirroring network wide trends and indicating influences other than congestion charging.
- The economy in the boundary case study area is characterised by small businesses, many of which classify themselves as 'places which customers visit'. VAT registrations show that the number of businesses operating in the area both inside and outside the charging zone was unaffected by the introduction of charging, and Dun & Bradstreet data show that there has been steady growth in sales since the introduction of congestion charging.
- Businesses in the boundary case study area were broadly supportive of congestion charging and did not report any significant negative effects. Factors such as organisational change, the economy, and the threat of terrorism were seen to have had more of an influence on business performance. There were no significant differences between the attitudes and experiences of business operating just inside and just outside the boundary.
- Trends in air quality in the boundary case study area have followed the inner London average and, as with London-wide air quality trends, it has not been possible to definitively isolate any effects associated with the introduction of congestion charging at this stage.
- The number of personal injury road traffic accidents in the boundary case study area has continued to fall, in line with London-wide trends. No specific changes have been observed that can be associated with congestion charging.

7.2 Impacts on traffic patterns

Continuous trend data from automatic counters located at some of the busier entry and exit points to the charging zone in the boundary case study area show overall reductions in traffic entering the zone of comparable magnitudes to those reported in the *Third Annual Monitoring Report*. They also confirm that the observed reductions correspond with the introduction of charging on 17 February 2003.

Common to all of the sites is a comparative stability of traffic volumes on Saturdays and Sundays, and a degree of variation over the period since charging associated with seasonal and local traffic factors (Figure 7.2). In the first months of 2005, ie two years after the introduction of the congestion charging, overall levels of traffic entering and leaving the charging zone at City Road and St John's Street were very similar to or slightly lower than those observed during the first few weeks of charging, showing sustained overall reductions. Flows at the Old Street site were very similar to pre-charging levels, this site showing no apparent impact from the 'Shoreditch Triangle' traffic management scheme.

Figure 7.2 Weekday traffic flow into and out of the charging zone during charging hours. Permanent monitoring sites in boundary case study area (both directions combined unless indicated), January 2003 to December 2005.



Manual classified counts, taken during Spring and Autumn each year at all entry and exit points to or from the charging zone within the boundary case study area provide further information on flows entering and leaving the charging zone. For all traffic entering and leaving the charging zone through the case study area (vehicles with four or more wheels, weekday charging hours), a reduction of 22 percent has been observed. For potentially

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chargeable vehicles (cars, vans and lorries), a reduction of 30 percent has been observed. These findings are generally in line with those for the congestion charging zone boundary as a whole.

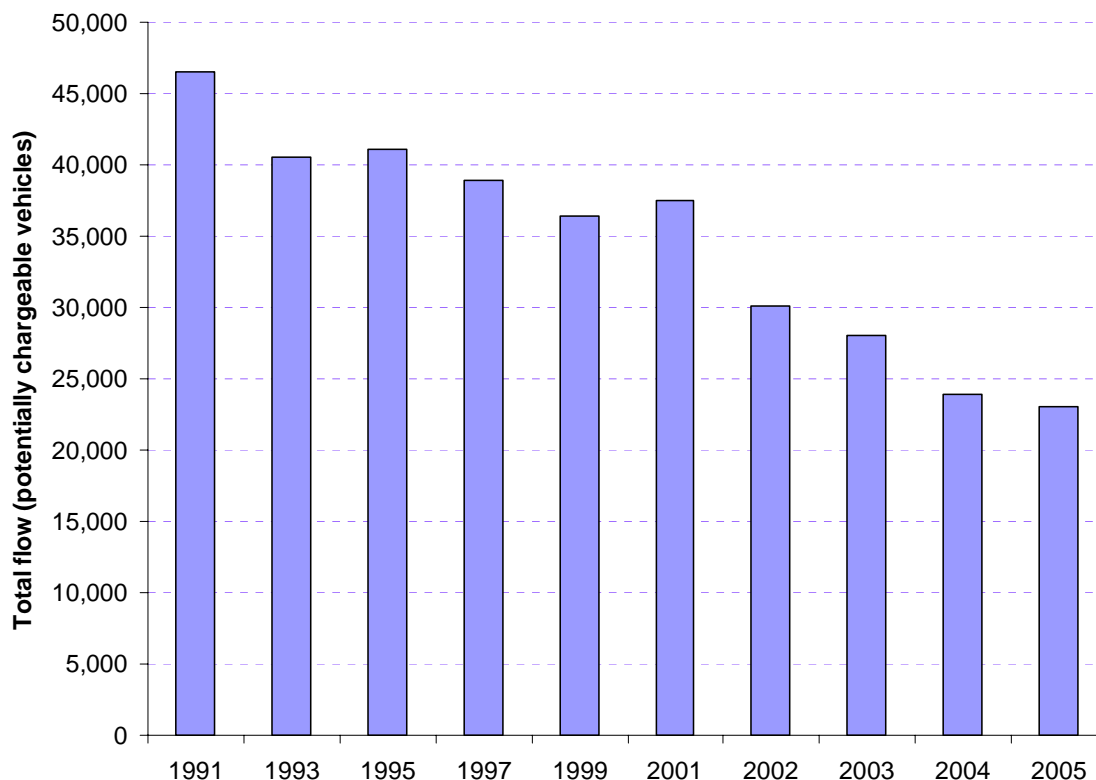
Table 7.1 Changes in traffic entering and leaving the charging zone, charging hours, all entry or exit points within the boundary case study area. 'Annualised' Spring and Autumn counts.

Vehicle type	2002 flow	2003 flow	2004 flow	2005 flow	% change 2005 vs 2002
Vehicles four or more wheels	62,500	48,500	47,200	48,800	-22%
Potentially chargeable vehicles	53,400	37,500	36,100	37,500	-30%
- Cars	37,500	23,600	22,700	24,200	-35%
- Vans	12,800	11,000	10,900	10,700	-16%
- Lorries	3,000	2,900	2,300	2,400	-20%
Non chargeable vehicles	19,200	21,700	21,800	21,500	+12%
- Licensed taxis	6,900	7,800	8,400	8,500	+23%
- Buses and coaches	2,200	2,600	2,800	3,000	+36%
- Pedal cycles	3,900	4,400	4,500	4,900	+24%
- Powered two-wheelers	6,200	6,200	6,200	5,400	-12%
All vehicles	72,500	59,200	57,900	59,000	-19%

Radial traffic approaching the charging zone

For radial traffic approaching the charging zone (as opposed to crossing into it), the portion of the TfL central cordon within the case study area records overall reductions of 21 percent (vehicles with four or more wheels, inbound, weekday charging hours) between 2002 and 2005. Here, however, the reduction in potentially chargeable vehicles (cars, vans and lorries) is 24 percent, (Figure 7.3). These results are consistent with the reductions in traffic entering the charging zone, as reported in Table 7.1, but show a greater reduction in traffic than around the TfL central London cordon as a whole. This is likely to reflect local traffic conditions and in particular the on-going works in the King's Cross area, as well as reduced traffic from congestion charging, as this cordon lies outside of the charging zone and Inner Ring Road in this area.

Figure 7.3 Potentially chargeable vehicles crossing the TfL central cordon inbound at 13 sites between Upper Street and Kingsland Road inclusive. Charging hours equivalent, 1991 to 2005.

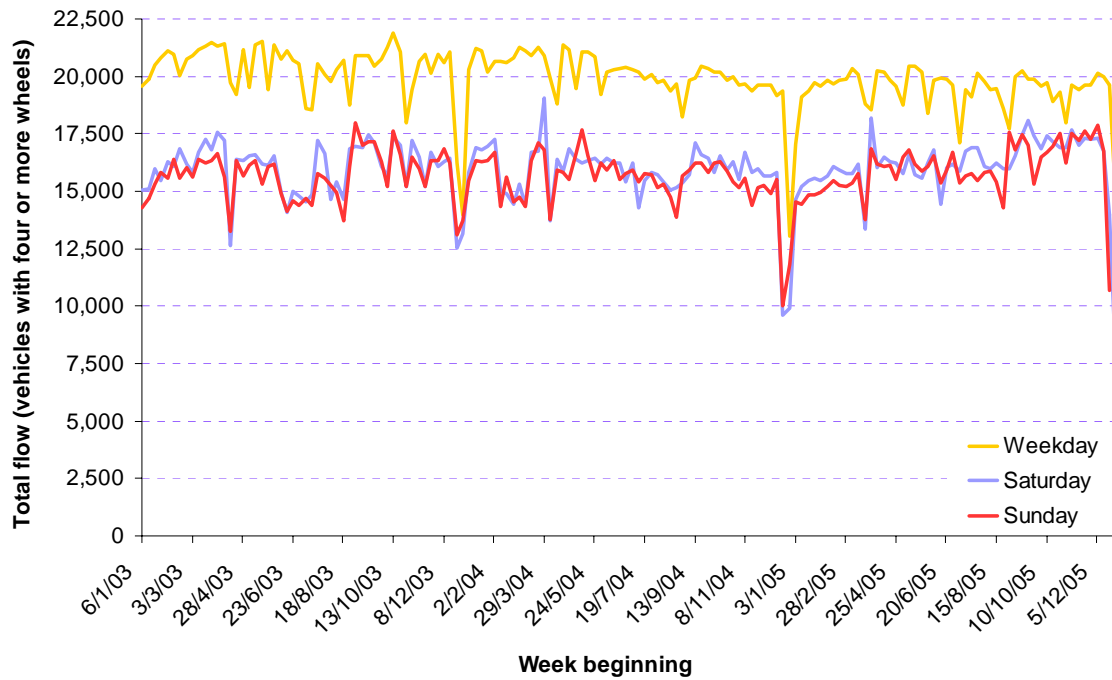


Traffic on the Inner Ring Road

Continuous traffic flow data from the automatic counter site on City Road show stable flows, spanning both the introduction of charging itself and more recently (Figure 7.4). Typical flows here have reduced and are now marginally below those recorded in the weeks before charging started. Interestingly, weekend traffic flows have risen at this site and are gradually converging with weekday flows.

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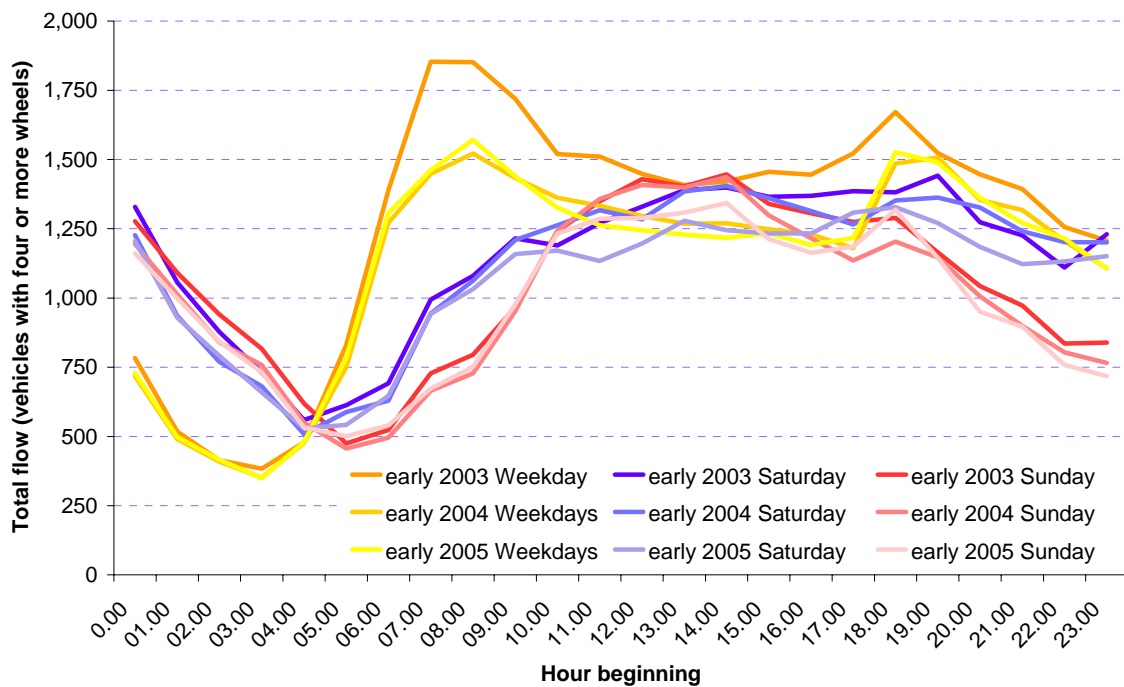
Figure 7.4 Traffic flow during charging hours equivalent, on City Road Inner Ring Road permanent monitoring site (both directions combined), January 2003 to December 2005.



Temporal displacement of trips

Figure 7.5 shows an indicative hourly flow profile for traffic entering the charging zone, from available continuous monitoring sites in the boundary case study area. The picture is very similar to that observed across the whole of the charging zone boundary, with overall reductions in traffic during charging hours, combined with a general absence of changes at other times.

Figure 7.5 Indicative hourly flow profile of traffic entering the charging zone within the boundary case study area (typical days, vehicles with four or more wheels only).



7.3 Impacts on congestion

Traffic changes outside the zone caused by the introduction of congestion charging were expected to lead to corresponding, although smaller changes in congestion – some positive (such as on radial routes approaching the zone) and some potentially negative (such as additional delays from traffic diverting around the boundary of the charging zone). Overall, net gains were expected, although it was recognised that the extent of preparatory traffic management (particularly the ‘Shoreditch Triangle’ scheme) and other works in the boundary case study area would make a full comparison of before and after measurements difficult.

As with the main programme, speed data for the case study area have been collected using moving car observer surveys. Figure 7.6 shows the network surveyed; note that the robustness of these data is limited by the coverage of the survey network.

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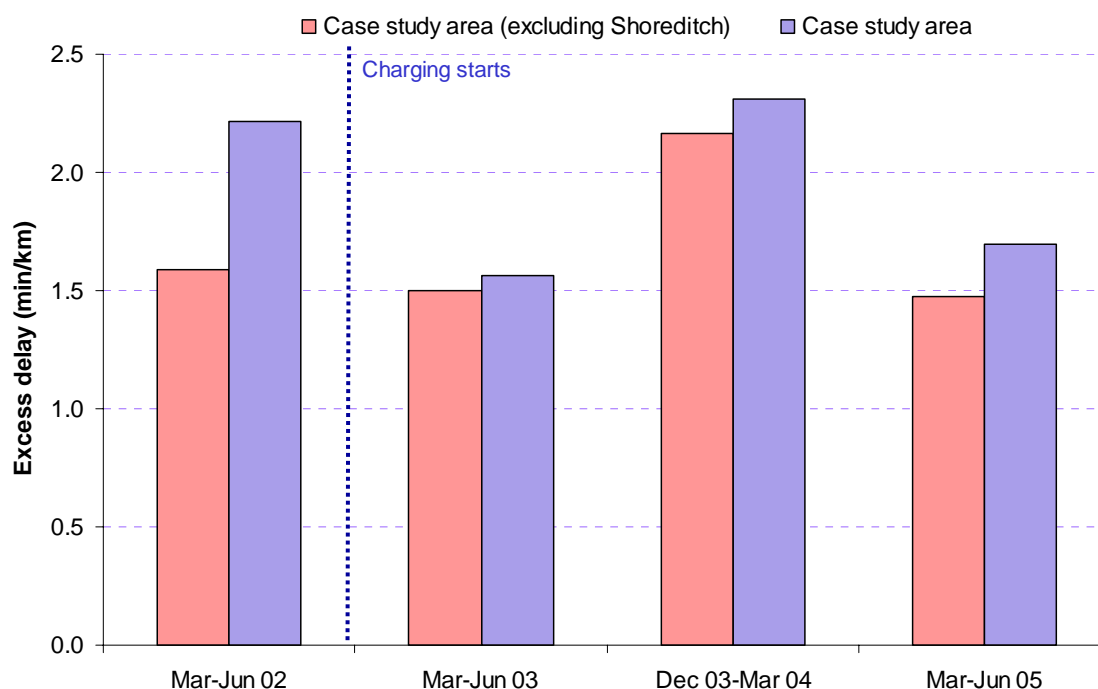
Figure 7.6 Map of speed survey network in boundary case study area.



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Comparison of measured levels of congestion in Spring 2002 and Spring 2005 on this network show overall reductions during weekday charging hours of around 24 percent (Figure 7.7). It is likely that this finding relates primarily to other factors, particularly the 'Shoreditch Triangle' traffic management scheme. If the immediate Shoreditch area is excluded, measured congestion levels show greater stability before and after charging, at consistently around 1.5 to 1.6 minutes per kilometre.

Figure 7.7 Excess delay (minutes per kilometre) in the boundary case study area during charging hours equivalent, before and after charging.



Average network speeds, including time spent in queues, in the boundary case study area (including Shoreditch) increased from around 14 to around 17 kilometres per hour during charging hours, whilst speeds on sections of the Inner Ring Road increased marginally from 13 to 14 kilometres per hour during charging hours between 2002 and 2005.

7.4 Impacts on public transport

Congestion charging was implemented against the backdrop of radical and ongoing improvements to buses in and around central London. The scheme was expected to result in increased travel by bus and, to a much lesser extent, by Underground to the charging zone.

Bus supply and patronage

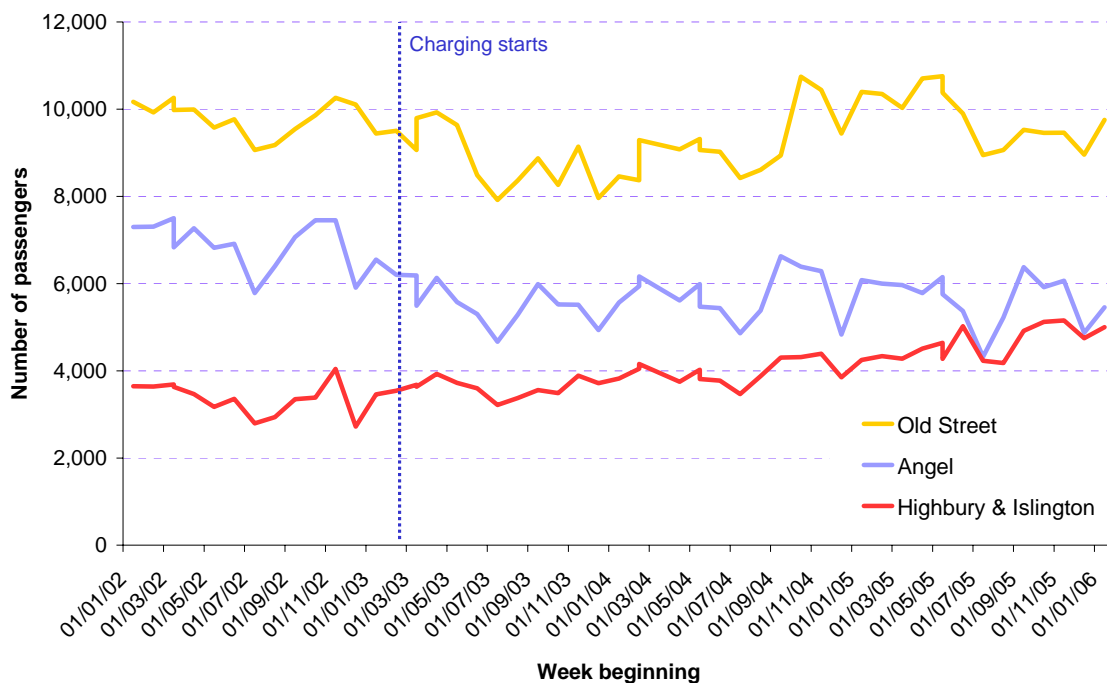
Bus routes that pass directly through the boundary case study area saw overall increases of 40 scheduled buses per hour during the morning weekday peak period in 2003. There has also been a parallel move towards the introduction of buses with higher passenger capacities on some of the routes in the area. Broadly speaking, there has been an increase in the supply of buses of between 10 and 20 percent, although the balance at individual sites is somewhat variable. The increased supply of buses has been matched by increased patronage. Note that the surveys of bus patronage used here operate on a five year cycle, so there are no updated data for 2005.

Underground patronage

Underground patronage has been affected by a variety of 'external' factors since the introduction of congestion charging, such as the prolonged closure of the Central Line from January to May 2003 and shorter-term closure of the Northern Line in the same year, as well as the July 2005 bombings in central London. These have made it very difficult to identify a specific 'congestion charging effect' on Underground patronage, which in any case was expected to be relatively small.

There are three Underground stations within the case study area. Ticket-gate-based patronage data are compared for periods either side of the introduction of congestion charging in Figure 7.8.

Figure 7.8 AM peak passenger exits at Underground stations within the boundary case study area.



In the first year after charging there was a slight increase in the number of passengers exiting the station during the morning peak period at Highbury and Islington. This was thought largely to comprise passengers displaced by the Central Line disruption, whereas at Angel and Old Street stations passenger exit trends reflected network wide reductions.

In 2004, the second year after charging, all stations in the boundary case study area showed increases in the number of passengers exiting the stations, on average by 8 percent, again similar to the network wide increase of 6 percent during that period.

In 2005, all stations have again seen an increase in the number of exiting passengers in the morning peak. Angel and Old Street stations saw increases

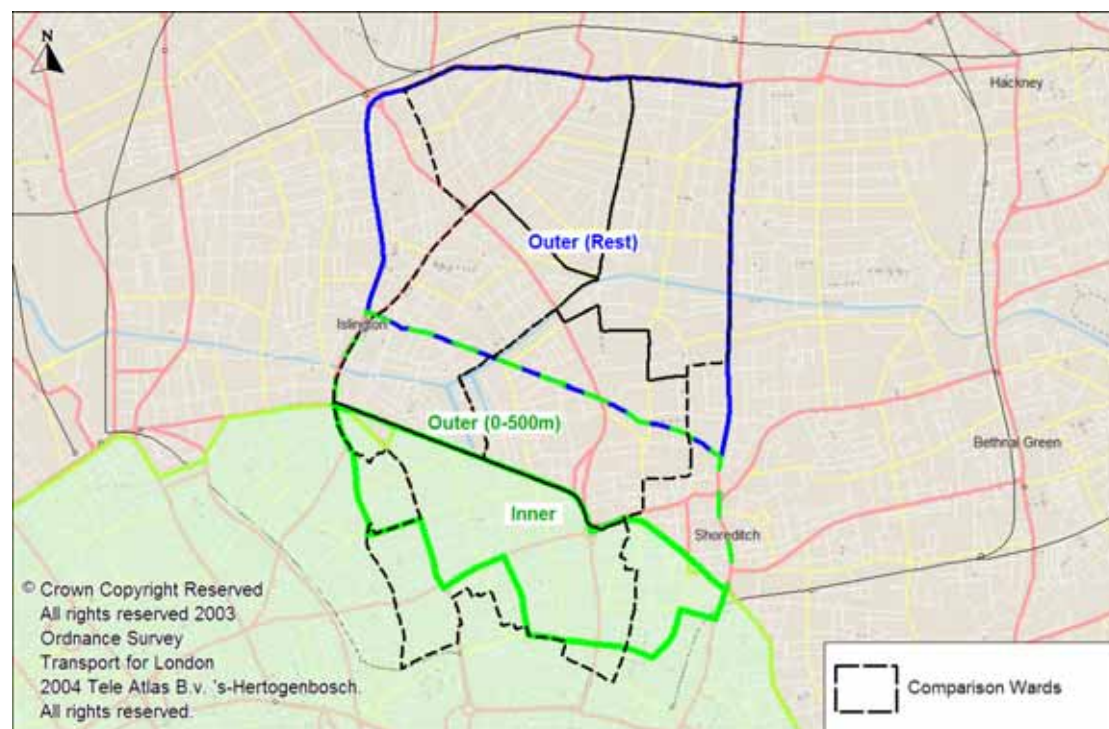
of 4 and 2 percent respectively, comparable to the network wide average of 3 percent, whilst Highbury and Islington saw an increase of 11 percent. This is somewhat greater than the network-wide trends, but is not thought to be specifically related to congestion charging.

7.5 Impacts on business and the economy

Prior to the introduction of congestion charging, concerns were raised that businesses located around the boundary of the charging zone would be subject to increased costs, due to their likely interaction with customers and suppliers in the charging zone, and perhaps to increased congestion in the local area. However, it was also felt that changed travel patterns might lead to increases in 'passing trade' for these businesses.

To investigate these issues, a survey was undertaken with businesses in the boundary case study area, and in an adjacent area just inside the charging zone. The primary aim of this survey was to monitor the views and perceptions of employers based within the case study area, and then to compare these with third party quantitative data on business performance to obtain an overall picture of how the area has been affected by congestion charging. Figure 7.9 shows the area included in the survey.

Figure 7.9 Map of the boundary case study business survey area.



A further boundary business survey was undertaken in Autumn 2005, following the July 2005 Variations, and consisted of a 20 minute telephone interview. The survey achieved a response rate of 17 percent, with 616 interviews carried out with local businesses.

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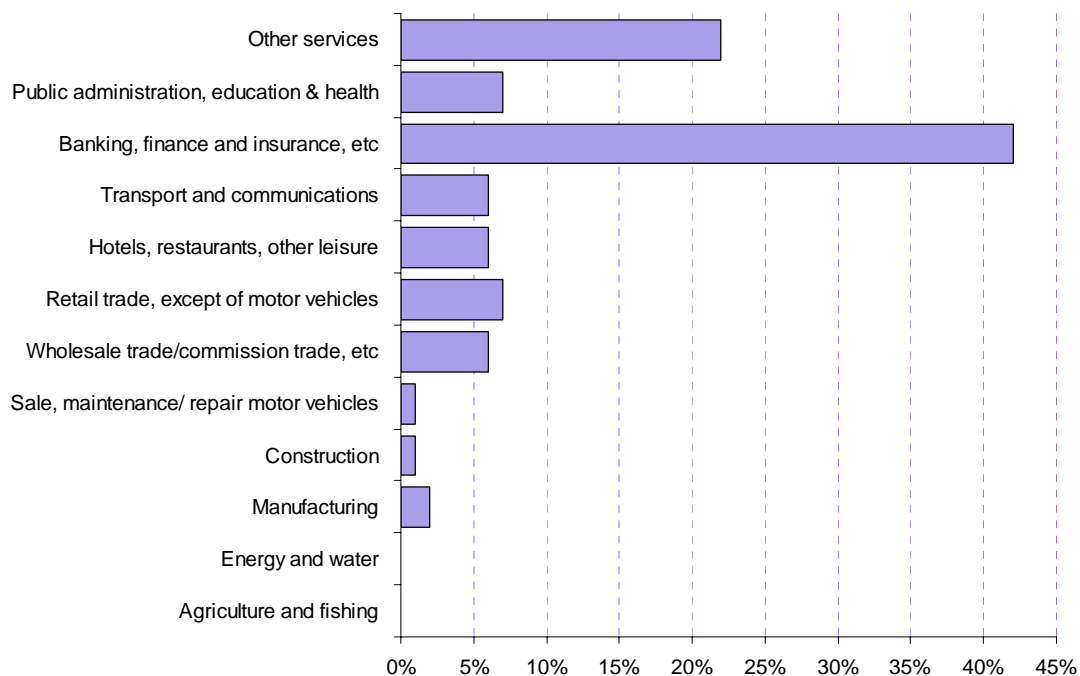
Analysis of secondary data sources included the Dun & Bradstreet businesses database, the Annual Business Inquiry and the VAT Registrations database. For further explanation of these sources, see the Business and Economic impacts section of this report (Section 5).

Secondary data analysis and survey findings are presented below.

Characteristics of the local economy

There are approximately 7,200 businesses and 100,000 employees based in the boundary case study area and inner boundary area. The majority of businesses were financial services or other service industries (Figure 7.10). There is very little industrial activity within the boundary case study area.

Figure 7.10 Business composition by sector.



Businesses in the boundary case study area were more likely to be small, single site enterprises (72 percent) than those just inside the charging zone boundary (57 percent). Two thirds had 10 employees or less, compared to under half of those just inside the boundary.

Sixteen percent of businesses in the boundary case study area were classed as 'places where customers visit', compared to ten percent of those just inside the boundary.

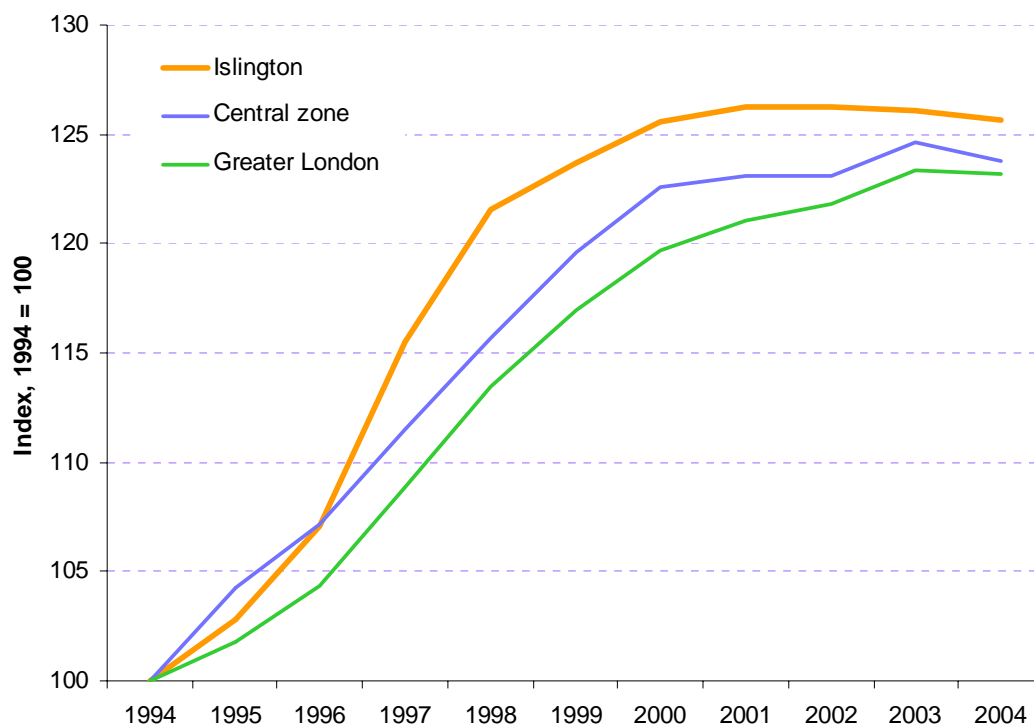
Business performance

Dun & Bradstreet data indicate an underlying increase in sales of 5 to 6 percent amongst businesses located in the boundary case study area

between 2003/4 and 2004/5, compared to a decrease of 2 percent amongst businesses just inside the charging zone. This excludes growth via takeovers or mergers, and also excludes any reductions in sales caused by businesses closing down or moving out of the area.

The smallest area for which VAT registrations data are available is the individual Local Authority. VAT registrations data show that the total number of businesses based in Islington, in which the majority of the boundary case study area is located, has remained static since 2002 (Figure 7.11). The 'churn', the rate at which businesses register or de-register, has increased slightly over this period. These findings are in line with London-wide trends.

Figure 7.11 Net change in the stock of businesses registered for VAT, 1994 to 2004.



For the 2005 TfL boundary business survey, some 89 percent of businesses surveyed agreed to comment on their performance in the last financial year. Of those that responded, 20 percent said that it was better than in the previous year; 11 percent said it was worse.

The factors that were most commonly mentioned as having an influence on business performance were 'internal factors' (38 percent), 'general economic conditions' (32 percent) and 'terrorism and the July 2005 bombings' (8 percent). Congestion charging was mentioned by 8 percent of respondents as having had an impact on business performance in 2004/5 (which could have been either positive or negative).

Recruitment and retention of staff

The vast majority of businesses surveyed in the boundary case study area said that less than 10 percent of staff left and were replaced in 2004/5, although around one in ten stated that more than half of their workforce was replaced in the past year. High staff turnover was most common in the leisure sector. Most organisations ascribed increases in staff turnover to the expansion of their business and the resulting need to recruit more staff. Only 15 percent of respondents indicated any difficulty in recruiting new members of staff. None of these respondents cited congestion charging or the lack of public transport as a factor.

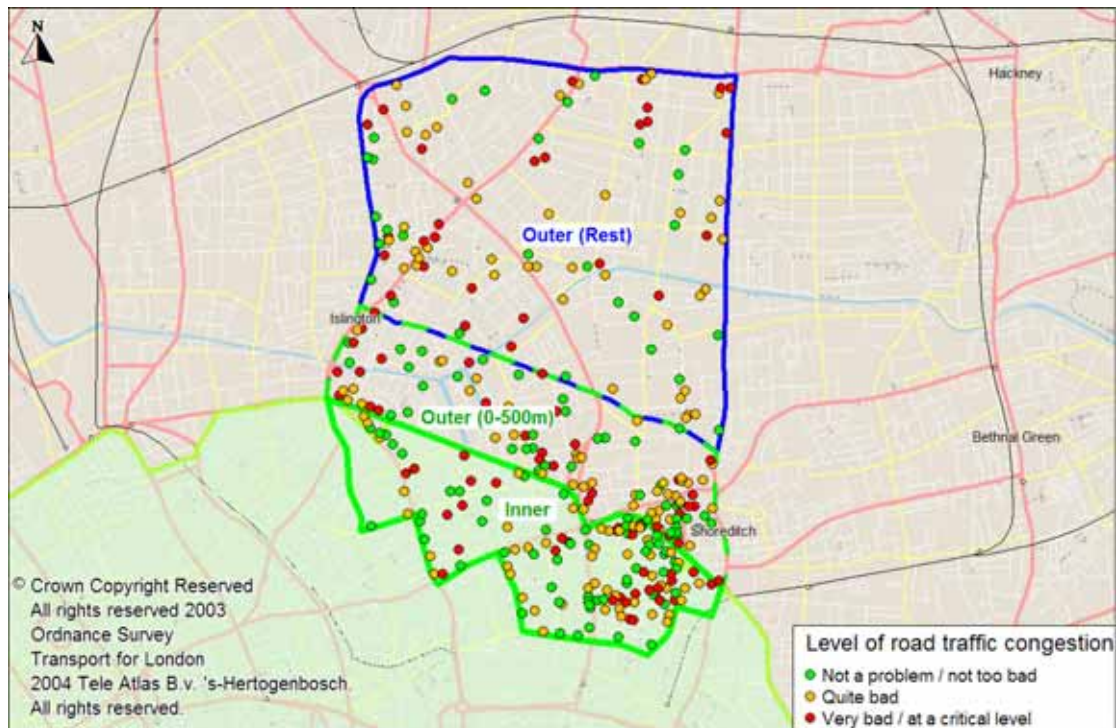
Attitudes towards congestion charging and transport

Transport costs were seen to represent around 7 percent of total business costs, rising to 12 percent for distribution and wholesaling businesses.

Just over six in ten businesses in the boundary case study area considered that transport difficulties affected them 'a great deal', or 'quite a lot'. They most frequently cited public transport delays and unreliability as 'a problem'. Congestion charging was mentioned as 'a problem' by 12 percent of respondents.

Businesses in the boundary case study area were as likely as those just inside the charging zone to say that peak period congestion was 'very bad' or 'at a critical' level. Figure 7.12 highlights locations containing high concentrations of businesses identifying congestion as 'very bad' or 'critical'.

Figure 7.12 Business opinion of the level of road traffic congestion, boundary business survey 2005.



Business support for the congestion charging scheme

In the 2005 survey, some 56 percent of businesses in the boundary case study area supported the congestion charge, as long as there was continued investment in public transport. Retailers were the least likely and finance businesses were the most likely to support the congestion charge. The perceived impacts of the congestion charge are detailed in Figure 7.13 and Figure 7.14.

In total, 68 percent of business respondents considered that the introduction of congestion charging had made the buses and the Underground more crowded. TfL considers that congestion charging has led to only a small increase in the number of Underground passengers. Whilst bus passenger numbers have risen substantially, there have been corresponding rises in bus service provision. Consequently, TfL does not consider that congestion charging has led to overcrowding on the public transport network, either in general or more specifically in the boundary case study area.

Similarly, whilst 62 percent of business respondents considered that the introduction of congestion charging had increased congestion just outside the charging zone, the data presented in Figure 7.7 show that congestion levels in the boundary case study area fell after the introduction of charging.

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Figure 7.13 Perceived positive impacts of the congestion charge, boundary business survey, 2005.

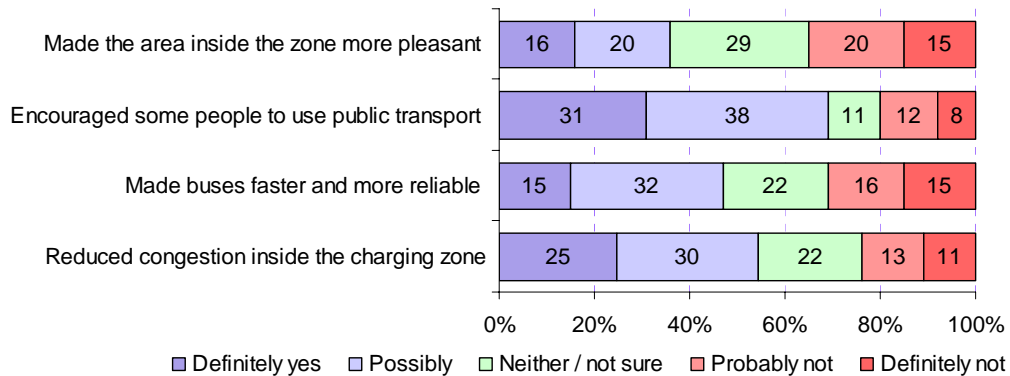
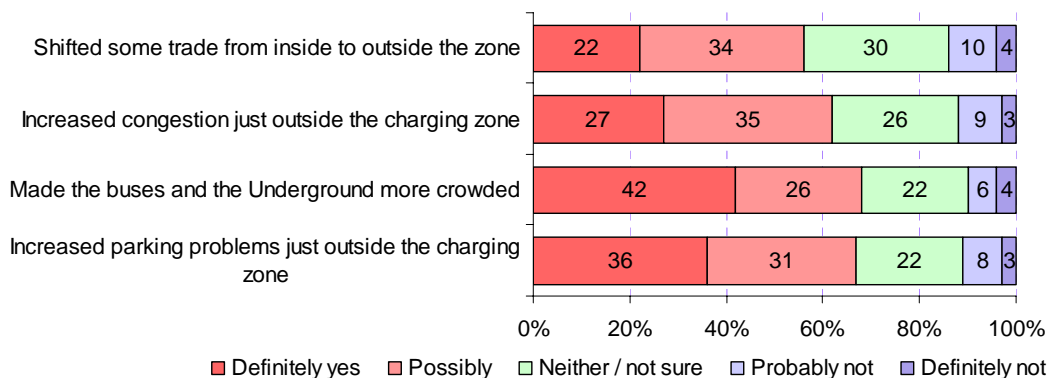


Figure 7.14 Perceived negative impacts of the congestion charge, boundary business survey, 2005.



7.6 Air quality and road safety impacts

Traffic changes brought about by the scheme might be expected to affect the environment, primarily in terms of air quality, and perhaps contribute to trends in personal injury road traffic accidents within the case study area.

In both cases however, the traffic changes observed in the boundary case study area (as opposed to the charging zone itself) have been relatively mixed, such that it would be unlikely that any observed changes in air quality or accidents would be directly as a result of charging.

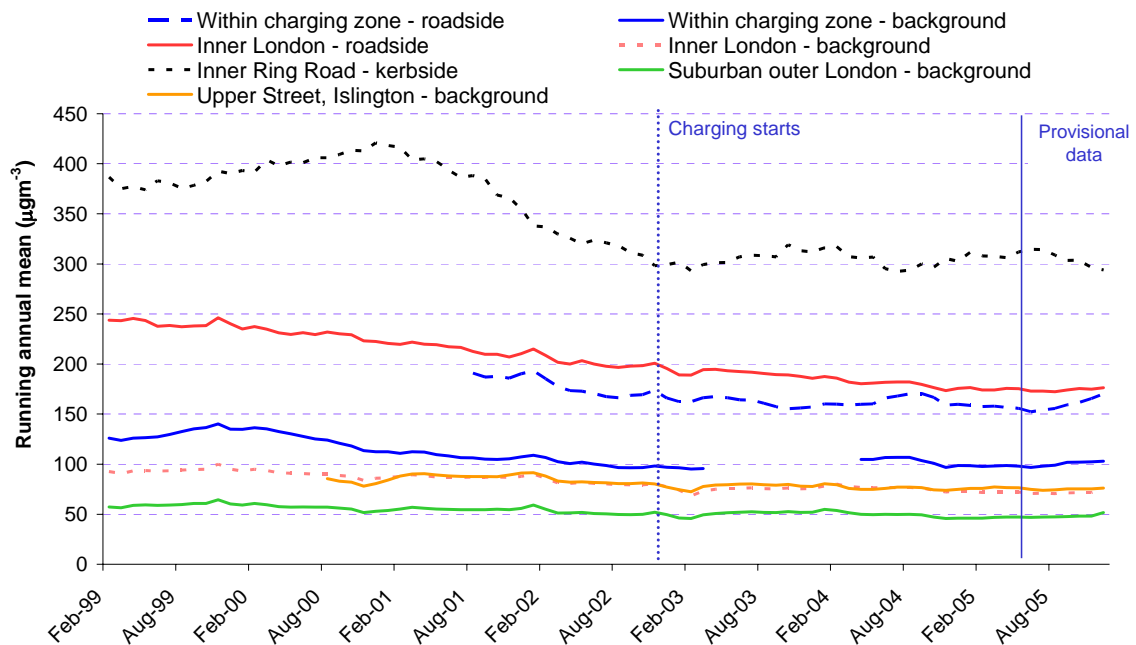
Air quality

Trends in ambient air quality in the boundary case study area can be inferred from the monitoring site on Upper Street, Islington, an inner London 'background' site away from major roads. This is one of approximately 80 sites across London that are affiliated to the London Air Quality Network. Continuous trend data for key pollutants at this site can be obtained and compared with similar data at other sites, to examine how air quality at this site behaves in relation to trends elsewhere.

Overall, air quality at the Islington site has behaved broadly as would be expected, given the absence of significant traffic effects, and the 'background' trends observed elsewhere in London.

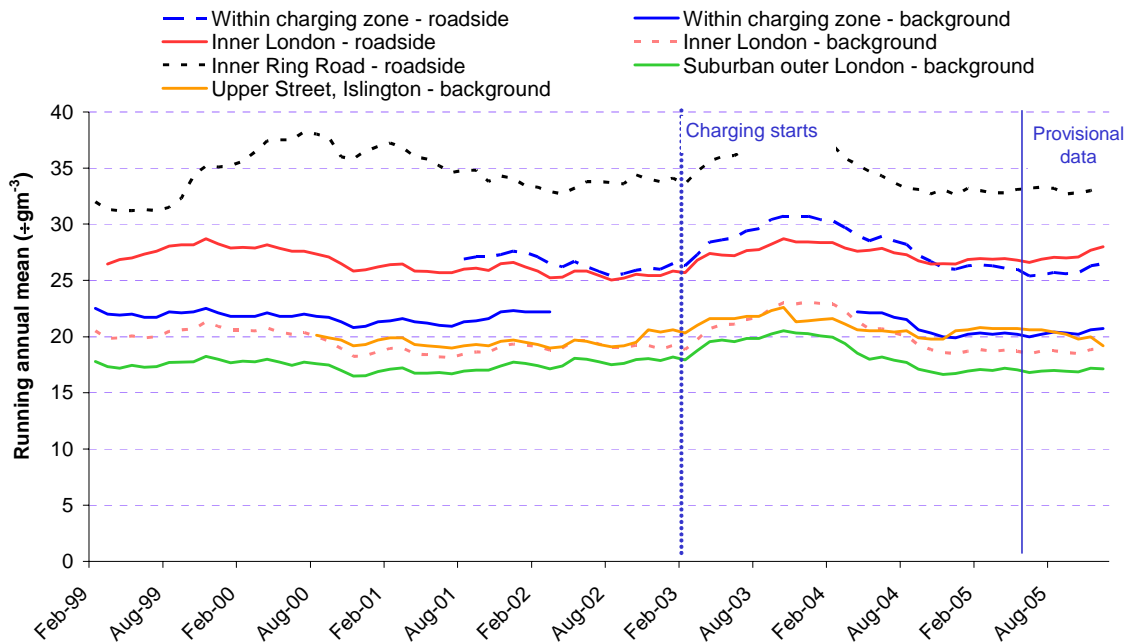
In the case of oxides of nitrogen (NO_x – a fairly 'direct' indicator of road traffic emissions), Figure 7.15 shows that running annual mean concentrations at the Islington site have been stable or declining slightly for several years at around $80 \mu\text{g}/\text{m}^3$. These concentrations are very close to the average for inner London 'background' sites and are lower than 'background' sites within the charging zone. There is no indication of changed NO_x levels coinciding with the introduction of charging.

Figure 7.15 Concentrations of oxides of nitrogen (NO_x), Upper Street Islington compared with other sites.



In the case of NO_2 (nitrogen dioxide – a 'secondary' pollutant from road traffic), again running annual mean concentrations since 2000 have been remarkably stable at this site. Concentrations are similar to the inner London 'background' average and below concentrations at equivalent sites within the charging zone. There is again no visible response to the introduction of charging and – unlike some other monitoring sites across London – no evidence of recent rises in NO_2 concentrations.

Figure 7.16 Concentrations of PM₁₀, Upper Street Islington compared with other sites.



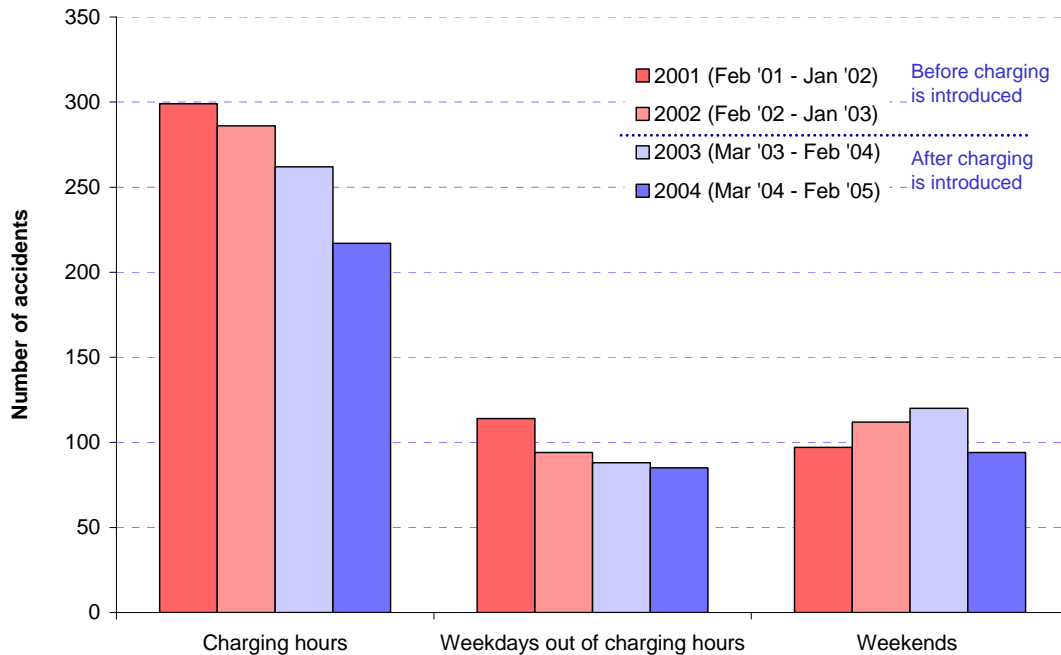
In the case of PM₁₀ (fine particulate matter – a proportion of which originates from road vehicle emissions), running annual mean concentrations have been broadly comparable with typical 'background' values for inner London sites.

In common with most sites across London, elevated levels of PM₁₀ were experienced throughout 2003, associated primarily with unusual weather patterns, although this did not lead to a breach of the 2005 air quality objective at this site. 2004 saw a return to 'normal' levels at this site, in common with the rest of inner London.

Accidents

Data for reported road traffic accidents involving personal injury shows that the total number of recorded accidents in the boundary case study area fell in all time periods in 2004 (Figure 7.17). Overall, by 2004 the number of accidents had fallen by around a quarter on weekdays and by around 3 percent on weekends compared with 2001 levels. This is in line with London-wide trends.

Moreover, there is no evidence of disproportionate changes to the severity of road accidents in the case study area, or of detrimental changes to the reported number of accidents involving two-wheeled vehicles, whose presence has been observed to increase since the introduction of charging.

Figure 7.17 Recent trends in road traffic accidents in the boundary case study area.

7.7 Summary of key findings

A case study area adjacent to the boundary of the congestion charging zone, covering parts of the boroughs of Islington and Hackney, was studied to explore the scope and intensity of possible 'boundary related' impacts arising from congestion charging.

Updated data for 2005 confirm the picture for 2003/4 reported previously. The traffic changes observed in the case study area were closely comparable to those observed across the whole of the charging zone boundary. There is no evidence of detrimental or disproportionate impacts reflecting congestion charging, and conditions in 2005 very closely reflect those observed in 2003/4.

Small reductions to congestion on the Inner Ring Road and more widely in the boundary case study area have been observed. The implementation of the 'Shoreditch Triangle' traffic management scheme makes comparison of before and after charging conditions difficult, but congestion has remained broadly stable or seen some improvement in the boundary case study area.

The increase in bus capacity in the boundary case study area has been matched by an increase in patronage. Underground patronage increased in both 2004 and 2005, generally in line with network wide trends and indicating influences other than congestion charging.

The economy in the boundary case study is characterised by small businesses, many of which classify themselves as 'places which customers visit'. VAT registrations show that the number of businesses operating in the

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area both inside and outside the charging zone was unaffected by the introduction of charging, and Dun & Bradstreet data show that there has been steady growth in sales since the introduction of charging.

Businesses in the boundary case study area were broadly supportive of congestion charging. Factors such as organisational change, the economy, and the threat of terrorism were seen to have more of an influence on business performance than congestion charging.

Trends in air quality in the boundary case study area have followed the inner London average and, reflecting data limitations, it has not yet been possible to identify any differential effects associated with the introduction of charging in the boundary case study area.

The number of road traffic accidents involving personal injury in the boundary case study area has continued to fall, in line with London-wide trends. No specific changes have been observed that can be associated with congestion charging.

8 July 2005 charge Variations

8.1 Introduction

This section looks at the impact of the changes to the central London congestion charging scheme that were introduced on 4 July 2005 – the ‘July 2005 Variations’. It considers available data from a range of sources, and draws some initial conclusions about the impacts of these changes on traffic conditions and chargepayer behaviour.

Background

On 4 July 2005 the standard daily congestion charge was increased from £5 to £8, with an equivalent increase for residents’ weekly charges, from £2.50 to £4. The existing range of discounts and exemptions remained. At the same time a new pricing discount was introduced for annual and monthly charge payments and the charge for vehicles using the fleet scheme was increased to £7.

TfL’s expectations

In TfL’s public consultation material it was expected that the July 2005 Variations would result in the following changes to traffic, congestion and scheme revenues, in relation to those quantities observed in 2004 and reported in TfL’s *Third Annual Monitoring Report*.

- A 3 to 7 percent reduction in traffic entering the zone (vehicles with 4 or more wheels).
- A 2 to 6 percent reduction in traffic circulating within the zone (vehicles with 4 or more wheels).
- A reduction of between 5 and 9 percent in the number of individual potentially chargeable vehicles (cars, vans and lorries) circulating within the charging zone.
- A reduction of between 4 and 8 percentage points in delays within the charging zone (ie congestion), additional to the nominal 30 percent already achieved, representing further reductions of between 0.1 and 0.2 minutes per kilometre in the observed excess delay measure.
- Additional net revenues, for reinvestment in transport, of between £35 million and £45 million per year.

In TfL’s Report to the Mayor following public consultation, TfL referred to the results of more detailed traffic projections, which indicated that the impacts of the changes could be more towards the lower end of these ranges, reflecting updated information on driver sensitivities and ‘background’ traffic changes.

Key findings

- The traffic trend and congestion data now available to TfL permit an interim assessment of the impacts of the July 2005 Variations, although seasonal effects mean that these results need to be interpreted with caution.
- Latest data indicate outcomes broadly within TfL's range of prior expectation, but trends for earlier months during the latter half of 2005 are less clear, potentially reflecting effects associated with the bombings in central London in July 2005, and a longer-term 'background' trend of slowly-declining traffic in central and inner London.
- In Spring 2006, volumes of traffic entering the charging zone have declined by up to 6 percent (vehicles with four or more wheels), comparing equivalent weeks in 2005 and 2006. Taking background trends into account, this suggests that the changes have been responsible for reductions in entering traffic of about 4 percent – towards the lower end of the range of TfL's range of prior expectation.
- Trends in traffic circulating within the charging zone are less distinct, data for early 2006 indicating overall reductions of between 3 and 4 percent in circulating traffic (vehicles with four or more wheels). Taking background trends into account, this again suggests an outcome towards the lower end of TfL's range of prior expectation.
- There is evidence from across the available data that reductions to potentially chargeable vehicles (cars, vans and lorries) have been partly offset by increases to non-chargeable vehicles (buses, taxis and two-wheeled vehicles).
- Trends in congestion charging payments received by TfL indicate a much clearer response to the July 2005 Variations. Autumn 2005 saw consistent reductions of 11 percent in the total number of congestion charges paid for on each charging day, intensifying to typically 12 percent in early 2006. Taking background trends into account, this corresponds to an overall reduction of about 7 percent in the use of the zone by chargeable vehicles, which is in the middle of TfL's range of prior expectation.
- Available measurements of congestion within the zone since Summer 2005 do not yet allow a robust assessment of the impact of the changes on levels of congestion within the charging zone.
- Surveys of travel behaviour change by chargepayers in response to the July 2005 Variations indicate that typically two-thirds of chargeable vehicle trips in the charging zone are work-related (either for commuting to and from work or employers' business). Approximately 60 percent of chargepayers paying the charge through non-retail and non fleet sales channels reported that they bore the cost of the congestion charge themselves.
- The behavioural surveys suggest reductions in chargeable travel to the zone in the range 8 to 17 percent, with a best estimate lying towards the lower end of this range – broadly corresponding to the observed changes in payments and levels of chargeable vehicles.

8.2 Available data sources

The following data sources are available to allow TfL to assess these impacts:

- Charge payments data, reflecting changes to the number and type of payments made, on a daily basis.
- Traffic counts of volumes of traffic in and around the charging zone. These include continuous volumetric data from automatic traffic counters located at a sample of the higher-flow entry points to the zone, as well as periodic full manual counts, which provide information on changes by individual vehicle type.
- Data from established moving car surveys of congestion and automatic number plate recognition cameras in and around the charging zone. Camera data can be used to measure the number of times unique vehicles enter the zone in a day, as well as providing an indicator of congestion trends by measuring average journey times between pairs of cameras.
- Data from a specially-commissioned telephone survey with a panel of 1,500 registered chargepayers, undertaken before and after the July 2005 Variations, to assess changes to their travel behaviour.

This section sets out key findings from these data sources to explore the range of impacts that the July 2005 Variations have had on travel to the charging zone. Each of the data sources has limitations and they therefore need to be interpreted in combination. Furthermore, whilst the impacts of the Variations on charges paid and, to a lesser extent, traffic volumes are now relatively clear, data describing impacts on congestion and revenues permit only an interim assessment at this stage.

It should be noted that the bombings of 7 July 2005 occurred on the fourth day after the implementation of the charge Variations. This complicated the assessment of the impact of the changes as they affected travel to central London during July and August 2005, and may have had longer term influences on travel behaviour.

8.3 Charge payments data

Charge payments data are the purest indicator of the use made of the zone by charge paying vehicles. They do not, however, allow consideration of the actual trips made by individual vehicles, for example to distinguish between those making only one trip on a given day, and those making several. Furthermore, they do not provide information on the use of the zone by non-paying vehicles or non-chargeable vehicles (eg taxis, buses and two-wheeled vehicles). Therefore, they do not provide a direct indicator of traffic levels within the zone.

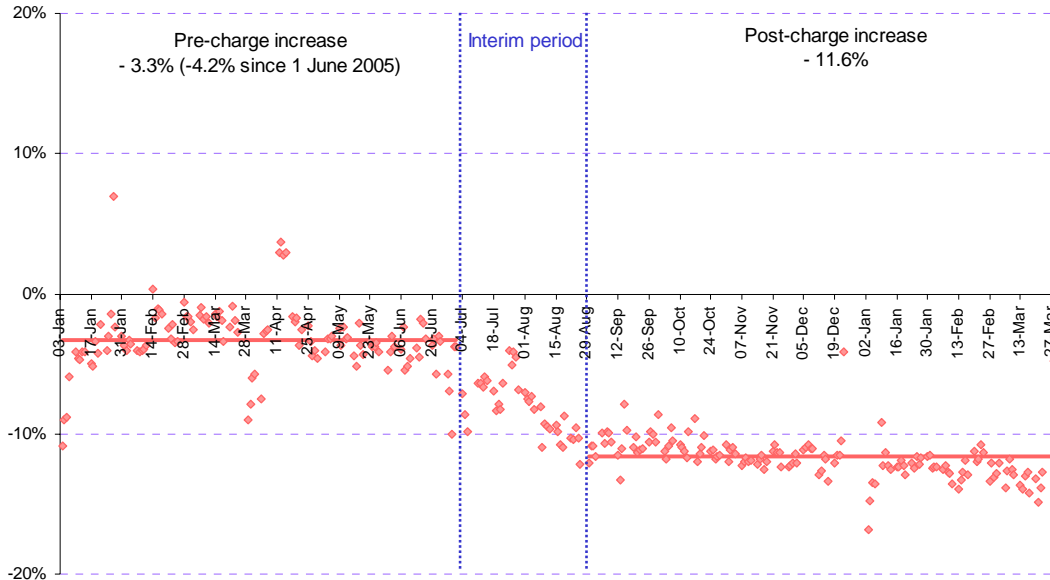
Total valid daily payments

The observed trend in total valid payments per day (all types of charges) is shown in Figure 8.1. This compares daily values for 2005 and into 2006

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against equivalent days during 2004 and into 2005, and reflects the total number of charges (of all types, including an apportionment for period payments) that are valid on any given day.

Figure 8.1 Year-on-year change in total daily valid charges, 2005 into early 2006.



It is seen that:

- Numbers of charges paid are relatively stable both before and after Summer 2005, with a 'transitional' period during July and August 2005.
- Charges paid during the early part of 2005 are consistently below equivalent numbers in 2004, by typically between 3 and 4 percent. This indicates a 'background' decline in the use of the zone by chargepayers, as has been noted elsewhere in the traffic data (see Section 2).
- Total daily valid charges for the latter half of 2005 are typically 11 percent lower than the equivalent period in 2004, and between 7 and 8 percent lower than the early part of 2005.
- This decline has intensified in the early part of 2006, total valid charges being typically some 12 percent lower than equivalent days in early 2005.
- Taking the 'background' trend into account, this 7 to 8 percent reduction would reflect the 'potentially attributable' medium-term impact of the Variations on charge payments, setting aside for the moment the possible impact of any continuing background reductions in traffic for other reasons during the latter half of 2005.

Changes by individual payment types

The trend in total valid payments per day conceals a range of responses, comparing conditions before and after Summer 2005, by each of the different groups of chargepayers.

- Residents of the charging zone, who have charges discounted by 90 percent, typically reduced payments by only about 1 percent, compared to

the early part of 2005. There has therefore been a minimal reaction among this group to the rise in the discounted weekly charge, from £2.50 to £4 (equivalent to 50 pence to 80 pence per charging day).

- Payments for vehicles registered on the fleet scheme have shown an increase of about 9 percent in charges paid through these arrangements, compared to the early part of 2005. This is likely to reflect new provisions for the operation of fleet scheme, making it more accessible and relatively more attractive, compared to before July 2005.
- Those paying their charge via monthly or annual payments have shown only comparatively small increases in numbers in spite of the new discounted pricing arrangements.
- The number of payments made by remaining 'standard' chargepayers (those who pay the charge on a daily basis through, for example, retail or internet sales channels) saw the biggest change, decreasing in number by about 16 percent overall compared to the first half of 2005. This includes a 'background' decline of about 4 percent.

8.4 Traffic survey data

Traffic survey data allows the impact of the changes on traffic levels to be assessed. Traffic measurements differ from charge payment data in three key respects:

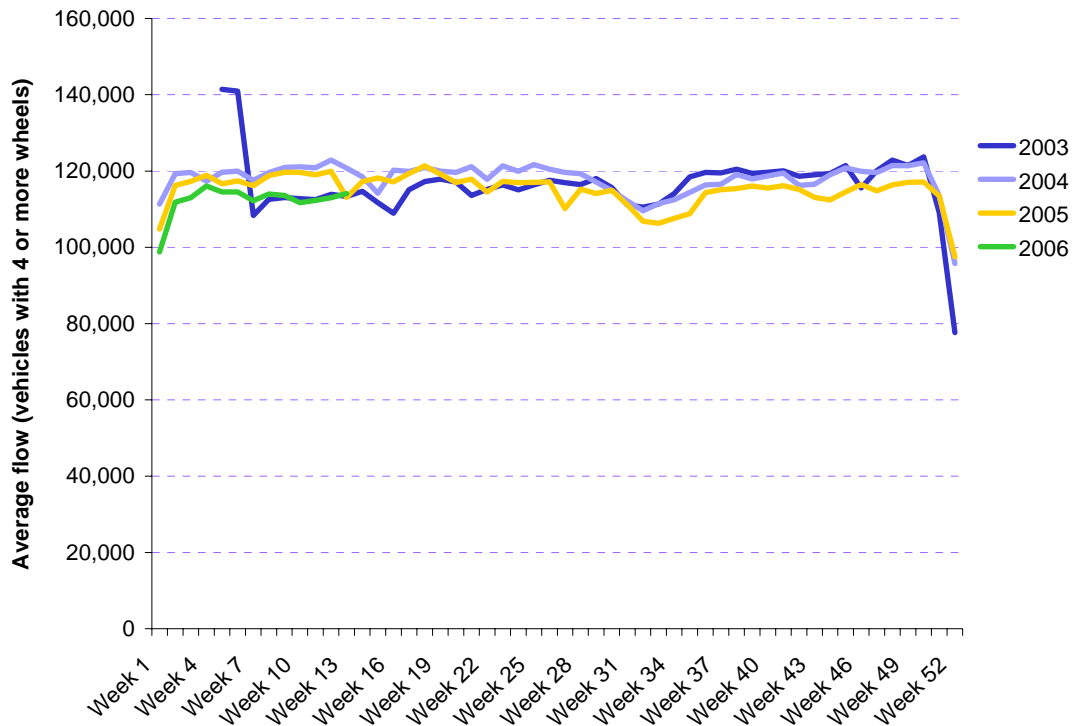
- *Indirect relationship to chargepayers.* Traffic counts include both potentially-chargeable vehicles (cars, vans and lorries) and non-chargeable vehicles (buses, taxis and two-wheeled vehicles). Although it is possible to distinguish the main vehicle types in classified traffic count data, this is not possible with continuous data from automatic traffic counters. Furthermore, vehicles classified as 'potentially chargeable' (cars, vans and lorries) include various types of exempted and discounted vehicles, such as London licensed private hire vehicles, whose response to the Variations would differ from those liable for the full charge.
- *Inability to determine frequency of entry by individual unique vehicles.* Vehicles passing count points will be counted on the same aggregated basis, whether they have made one or several movements during the day. This means that there is an important distinction to be made between total vehicle movements (the traffic count statistic) and unique vehicles contributing to those movements, the difference between the two reflecting a trip-frequency profile for individual unique vehicles.
- *Traffic counts are subject to various types of survey and sample error.* This needs to be recognised when considering small indicated changes.

Continuous automatic counts of traffic entering the charging zone

Figure 8.2 shows the long-term trend for all traffic with four or more wheels entering the charging zone during charging hours. These data are from automatic counters continuously measuring inbound traffic flow located at sixteen high-volume entry points to the zone.

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Figure 8.2 Traffic entering the congestion charging zone across 16 busier inbound roads. Average weekly flows, charging hours, vehicles with four or more wheels.



The following can be seen:

- Traffic entering the zone during 2005 (yellow line) is consistently lower than equivalent days in 2004 (pale blue line), typically by between 1 and 2 percent. In the first half of 2005, this reflects the small 'background' decline to traffic in the charging zone as noted in the charge payments data, and also in the wider body of traffic survey data discussed in Section 2.
- In the second half of 2005, this relative decline intensified, amounting to typically between 2 and 5 percent, reflecting a potentially-attributable response to the July 2005 Variations, but also probably including a component of ongoing background decline.
- In the early part of 2006 (green line), the decline intensified further, typically amounting to between 5 and 6 percent fewer vehicles with four or more wheels entering the charging zone compared with equivalent weeks in early 2005.
- Although the general pattern shown by traffic entering the zone is similar to that for congestion charge payments, it is notable that the magnitude of the indicated changes is considerably less. This primarily reflects the composition of traffic in central London, with fewer than half of the vehicles in the charging zone during charging hours being subject to the full daily charge.
- From these data therefore, the 'potentially attributable' impact of the Variations on total traffic (vehicles with four or more wheels) entering the charging zone lies between 1 and 3 percent for the latter half of 2005,

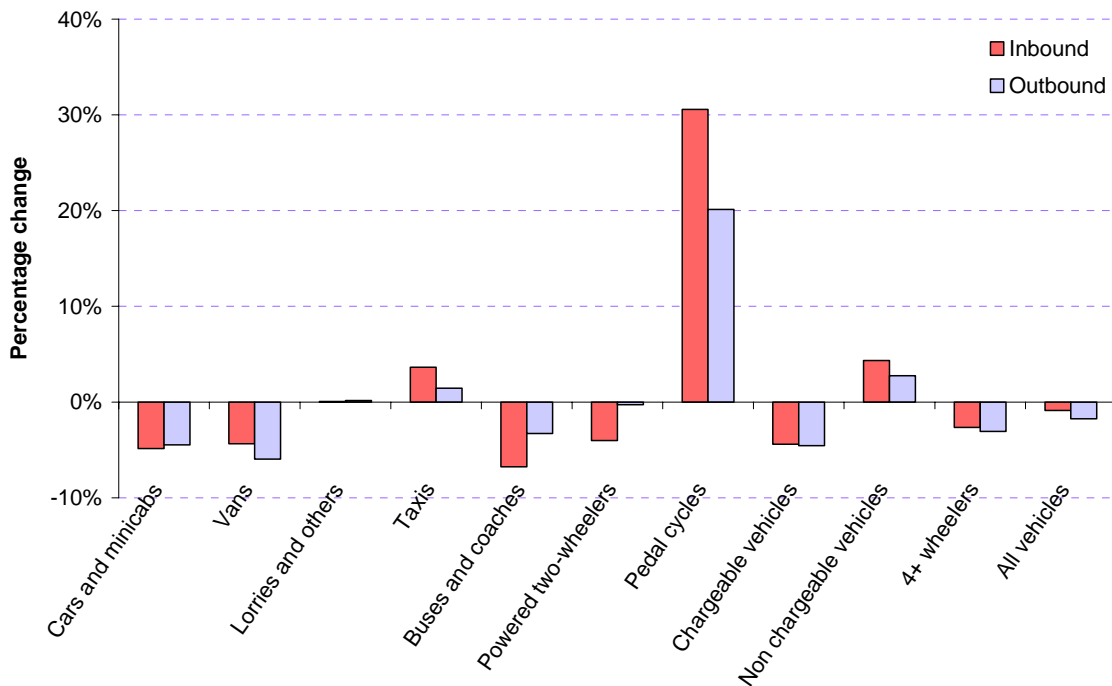
increasing to between 2 and 4 percent in early 2006. This corresponds to the lower end of TfL's range of expected impacts.

Periodic classified counts of traffic entering the charging zone

Classified traffic counts provide information on trends for the main vehicle types. They are only undertaken periodically, typically on two or four days per year, which means that they have a large statistical error, typically plus/minus 5 percent at the 95 percent confidence level for total traffic for a single count.

Figure 8.3 shows a sub-set of TfL's time-series of counts (see also Section 2), comparing traffic entering and leaving the charging zone during charging hours in the Autumn counts for both 2004 and 2005. Note that these are directly-comparable Autumn counts taken in each year and therefore differ from those considered in Table 2.1, which consider the average of both counts during each 'season' in 2005. The graphic shows percentage changes, the impact of each on total traffic levels varying according to their absolute contribution to total traffic.

Figure 8.3 Change in vehicles entering the congestion charging zone during charging hours. Autumn counts, 2004 and 2005.



Notes: Based on equivalent counts in September of each year only.

Various comparisons of these data have already been described in Section 2. Here, considering Autumn 2005 in relation to Autumn 2004, it is notable that:

- Potentially chargeable vehicles (cars, vans and lorries) show reductions of 4 percent inbound, and 5 percent outbound.
- Non chargeable vehicles show increases, of 4 percent inbound, and 3 percent outbound, over the same period.

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- Increases in non-chargeable vehicles therefore partly counteract the effect of reductions to chargeable vehicles, so that total traffic in Autumn 2005 is 1 percent lower than in Autumn 2004 in the inbound direction, and 2 percent lower in the outbound direction.
- The large percentage increases in pedal cycling have been noted elsewhere and may in part reflect a response to the July 2005 bombings and lower rainfall in the Autumn of 2005.

These data therefore show a mixed picture. There is some evidence of reductions to potentially-chargeable vehicles, as might be expected as a response to the July 2005 Variations, although the indicated changes are at the lower end of TfL's range of prior expectation. Furthermore, indicated increases in non-chargeable vehicles partly counteract the effect of reduced chargeable vehicles in terms of overall traffic flow.

Other traffic data

Automatic and manual counts of entering traffic give the most reliable picture of traffic trends in the charging zone. A range of supporting indicators are also available, as more fully described in Section 2. Key findings from these secondary indicators in relation to the July 2005 Variations are:

- Continuous automatic counts of traffic circulating within the charging zone show a less distinct trend than that for entering traffic. Traffic volumes for vehicles with four or more wheels have typically been 3 to 4 percent lower for comparable weeks (year-on-year) from the latter part of 2005.
- Manual counts of traffic circulating within the charging zone present a mixed picture. The prevailing indication is of small overall reductions in traffic, and again there is evidence of a degree of compensation between potentially-chargeable and non-chargeable vehicles.
- Both automatic and manual traffic counts taken on the Inner Ring Road do not show a distinct trend that might be attributable to the July 2005 Variations.
- The impacts of the July 2005 bombings on aggregate traffic flows were largely confined to the days immediately affected. Traffic levels apparently recovered rapidly, but it is important to realise that this is a net out-turn and possibly conceals a range of adaptations to travel behaviour of individuals, which could be important in explaining the longer-term trend.

8.5 Impacts on congestion

The July 2005 Variations were expected to lead to further incremental reductions to congestion within the charging zone, equating to savings of between 0.1 and 0.2 minutes per kilometre.

Available data and key findings

Measuring changes to congestion is more challenging than changes to traffic or payment levels. Standard moving car surveys of congestion are carried out

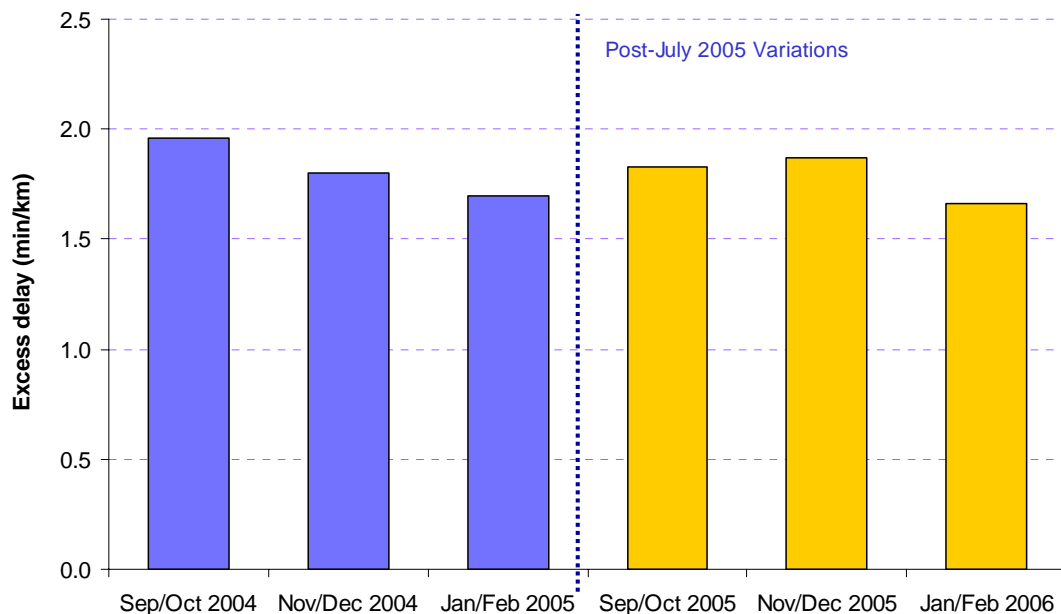
on a bi-monthly basis. Each survey is subject both to 'real' variability, partly reflecting changing road network conditions and traffic levels (eg seasonal variability), as well as statistical error, reflecting the properties of the survey method. The anticipated changes in congestion lie well within the band of uncertainty defined by these two quantities, such that a run of several surveys would be required to definitively establish any changes as significant. The impact of the July 2005 bombings would have been expected to further complicate the picture over the Summer and Autumn of 2005.

To date confirmed results from three moving car surveys of congestion are available, reflecting settled conditions over the Autumn and Winter of 2005/6. These can be compared against equivalent surveys undertaken before July 2005 to permit an interim assessment of congestion trends specifically in relation to the July 2005 Variations. Data from moving car surveys are supplemented by an analysis of camera data covering periods bracketing July 2005.

Data from moving car observer surveys

Figure 8.4 shows the trend in excess delay within the charging zone for comparable moving car surveys. Surveys relating to July/August in each year are excluded, as these were potentially affected in 2005 by the aftermath of the bombings in central London.

Figure 8.4 Excess delay within charging zone. Comparable moving car observer surveys before and after Summer 2005.



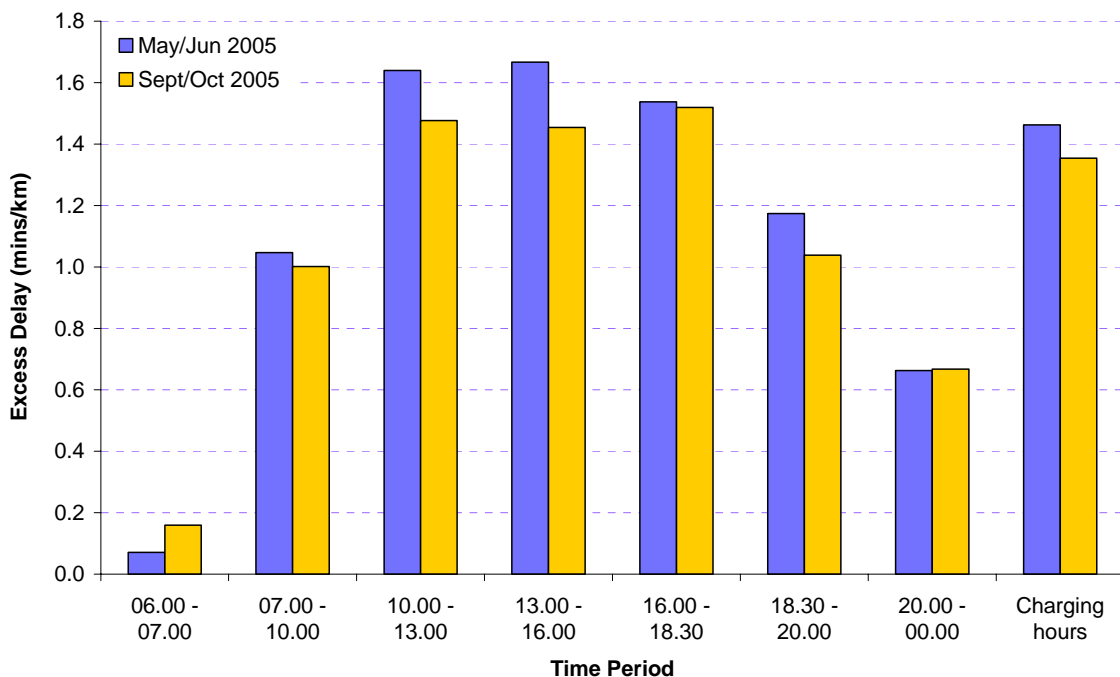
At this stage, the available data do not show a trend that could be considered to be statistically robust.

Data from automatic number plate recognition cameras

Congestion trends are also measured using data from cameras located in and around the charging zone. Figure 8.5 compares data from this source across two monitoring periods either side of July 2005. Note that these data were not collected on a continuous basis during 2005/6.

The comparison suggests that excess delays during September/October 2005 were consistently lower (during charging hours) than during May/June 2005. Again, however, TfL considers that more data are required to establish and quantify the impact of the Variations on congestion within the charging zone.

Figure 8.5 Excess delay within charging zone. Automatic number plate recognition camera pairs, May/June 2005 compared with September/October 2005.



8.6 TfL's Panel survey of chargepayers

The indicators described above illustrate the magnitude of aggregate change, but do not provide an understanding of how chargepayers as individuals have changed their travel behaviour in response to the July 2005 Variations.

To explore this further, TfL conducted a behavioural survey with a 'panel' of chargepayers, examining their travel choices and rationale both before (May 2005) and after (September 2005) the changes to the scheme.

The survey panel:

- Consisted of those who paid the charge at least once in the six months prior to May 2005 (ie 'active' users of the charging zone).

- Consisted of those who had registered their vehicle details with TfL, and therefore appeared on TfL databases, ie it excluded those who had not done so. Note that registration with TfL is not compulsory.
- Excluded those paying through the fleet scheme, those in receipt of resident and other discounts and exemptions and, owing to data limitations, those who paid through the retail sales channel.
- This latter group are also more likely to correspond to those chargepayers who are not registered with TfL and therefore ineligible to take part in the survey. However, it is also possible for an individual to pay through different sales channels on different days, and therefore there will possibly be a significant but unquantifiable overlap between 'retail' and 'non-retail' chargepayers in the survey sample.

Bearing these characteristics in mind, drivers taking part in the survey were selected to be representative in terms of frequency of travel to the charging zone on charging days across a year, reflecting the profile of this sub-group of chargepayers prior to the increase. The results from the survey have therefore been weighted by drivers' frequency of travel in order to gain a representative picture of these drivers (in terms of their aggregate behaviour) on a typical charging day prior to July 2005, so that subsequent changes can be assessed.

2,506 drivers were interviewed in an initial wave in May 2005. 1,506 drivers completed a follow-up interview in September 2005 and comprised the 'survey panel'.

Key topics for the survey were:

- general travel behaviour;
- travel in the previous week;
- sample trip made most recently to the charging zone;
- anticipated and stated changes to travel behaviour;
- journey costs;
- demographics.

This allowed direct comparison of reported changes to travel patterns, across a number of indicators and chargepayer groups. Note in particular that there are three bases on which to compare travel behaviour – general travel, travel in the past week, and most recent chargeable trip.

Analysis of the characteristics of the achieved survey panel suggests that it is directly representative of about two-thirds of the fully-chargeable vehicles circulating within the charging zone on a typical charging day, and that the exclusion from the survey of those paying via the retail channel is not a significant distortion to the applicability of the survey findings.

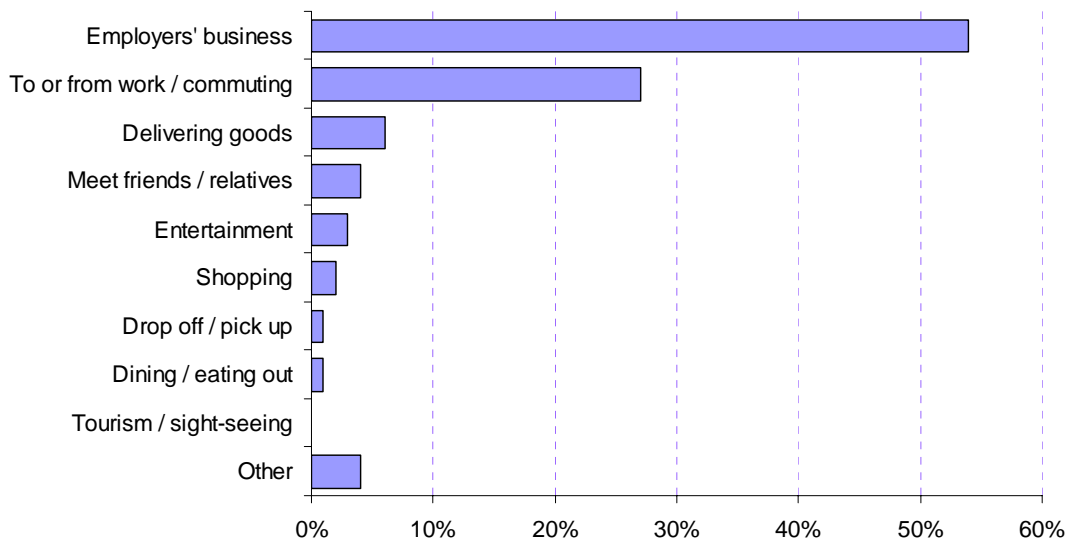
8.7 First wave of survey – May 2005

Key outcomes from this wave were the establishment of a detailed profile of the travel behaviour of £5 chargepayers, and also the exploration their anticipated responses to the Variations. A selection of findings is illustrated below.

Journey purpose for travel to the charging zone

Of those drivers that had driven into the zone during the week prior to their interview, 60 percent had done so on employers' business, a third had done so for commuting and only 8 percent for personal business (ie discretionary or leisure purposes). A very similar profile is obtained for the journey made 'most recently' to the charging zone, as illustrated in Figure 8.6. Here, 54 percent of trips were for employers' business, 27 percent were commuting to work, 16 percent said they were for personal business and the remaining 5 percent did not fit these categories.

Figure 8.6 Reason for most recent chargeable journey, May 2005.

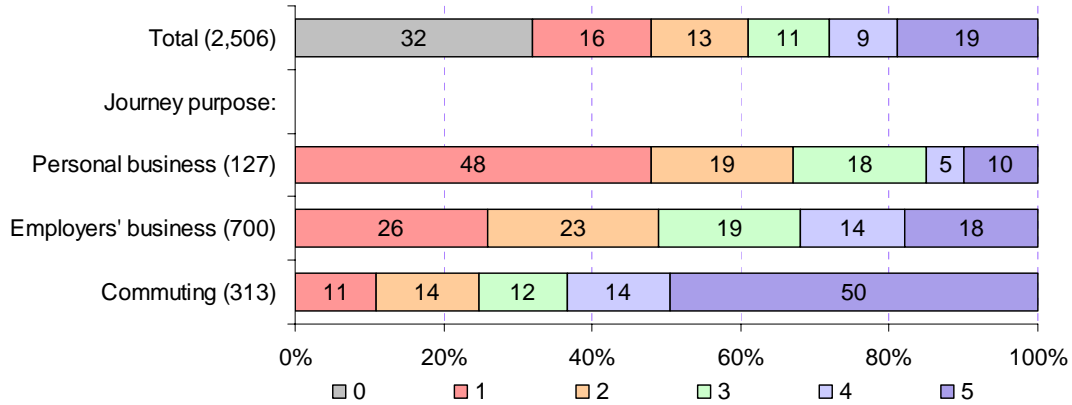


Where surveyed drivers had used other modes of transport to or in the charging zone in the previous week the pattern is distinctly different. 14 percent of drivers had also made journeys to the zone on public transport. Of these, only 12 percent said that those journeys were for personal business, whereas travel to work and employers' business trips accounted for around 45 percent of these trips each. Where travel had been made on foot or by other modes, an even greater proportion were for personal business, 22 percent. 43 percent of these trips had been related to employers' business and 36 percent had been for travel to or from work.

Figure 8.7 shows a frequency profile for a range of main journey purposes, relating to chargeable journeys made in the week prior to the interview. This shows that, typically, chargeable journeys to and from work were made on a

more frequent basis by individual chargepayers, with 'discretionary' leisure-related trips made less frequently.

Figure 8.7 Frequency and purpose of chargeable journeys during the week prior to the survey, May 2005.

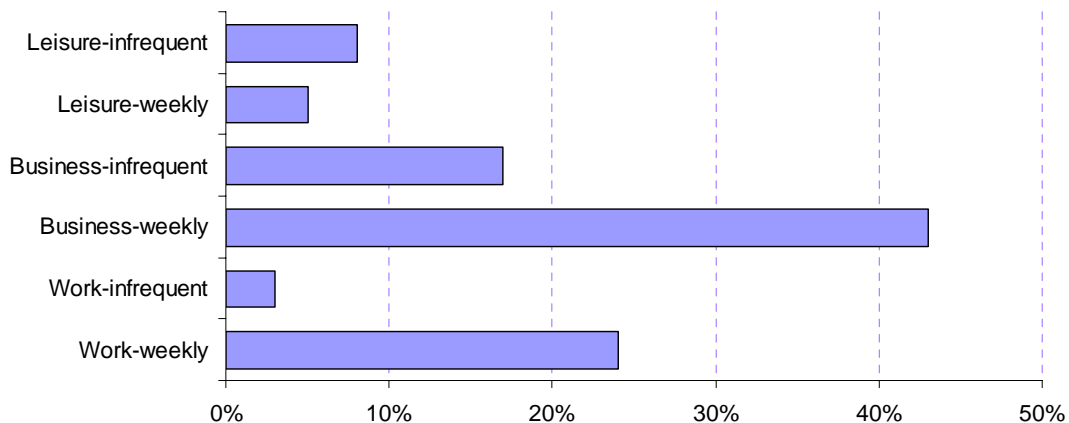


Frequency of travel to the charging zone

Frequency of driving to the zone varies by journey purpose. Figure 8.8 illustrates the mix of travel that was made by drivers on their most recent sample trip, weighted to correspond to a typical charging day.

The most likely trip to have been made by respondents was a frequent (once a week or more) business trip, at 43 percent of trips. There was quite a significant difference between that and the next most likely trip to have been made, which was frequent travel to and from work, this accounting for 24 percent of trips by respondents in the week before the survey. Infrequent (less than once a week) business travel is the next most frequent trip, accounting for 17 percent of trips, followed by infrequent and frequent personal business or leisure trips, accounting for 13 percent in total, and finally infrequent work trips, which account only 3 percent of trips by survey respondents on a typical week.

Figure 8.8 Proportion of chargeable journeys made most recently in terms of purpose and frequency, May 2005.



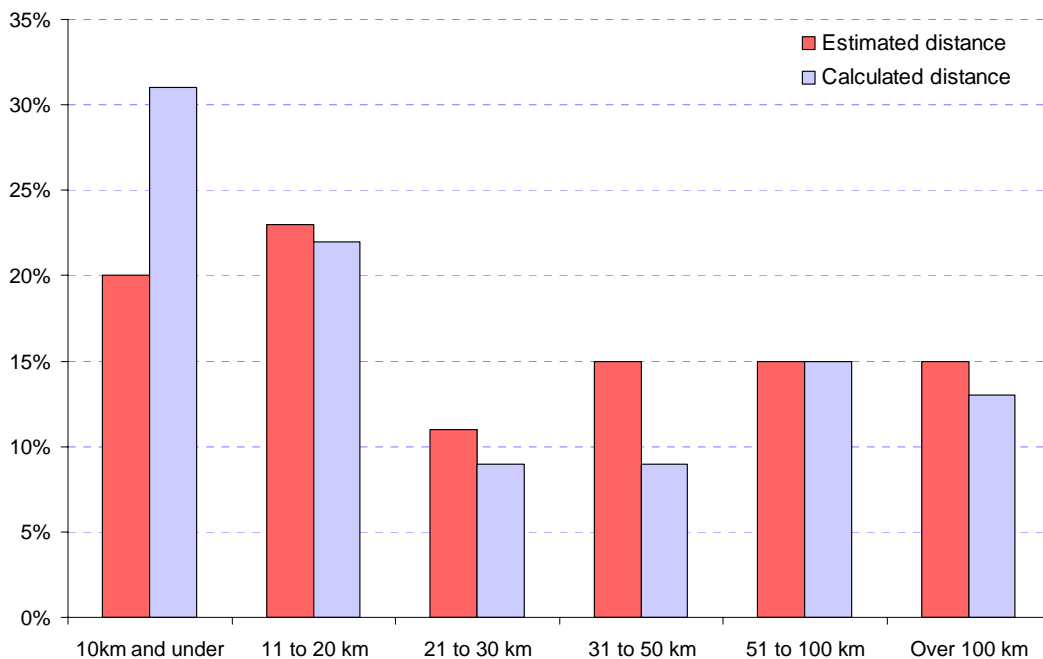
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When asked what vehicle they had driven for their most recent chargeable trip 80 percent had used a car, 10 percent a small van and 9 percent a larger van. Generally, less frequent travellers were more likely to be driving a car and those on business travel were more likely to be driving a van.

Trip length

Respondents were asked to estimate the length of their most recent chargeable trip to the charging zone. The 'true' distance was subsequently calculated by TfL, on the basis of stated origins and destinations. Figure 8.9 compares the trip length distributions obtained through both methods.

Figure 8.9 Estimated and calculated journey lengths for most recently made chargeable journeys, May 2005.



This figure shows a tendency by respondents to over-estimate the lengths of shorter trips, and under-estimate the length of longer trips. The indicated average trip length (all chargeable trips, typical charging day) is approximately 40 kilometres. This is somewhat higher than previous estimates available to TfL, and probably influenced by the exclusion from the survey of residents, those paying through the fleet scheme (e.g. delivery trips) and those paying the charge through the retail sales channel.

Journeys to work and for personal business average around 25 kilometres in length in this dataset, whilst trips for employers' business average around 46 kilometres.

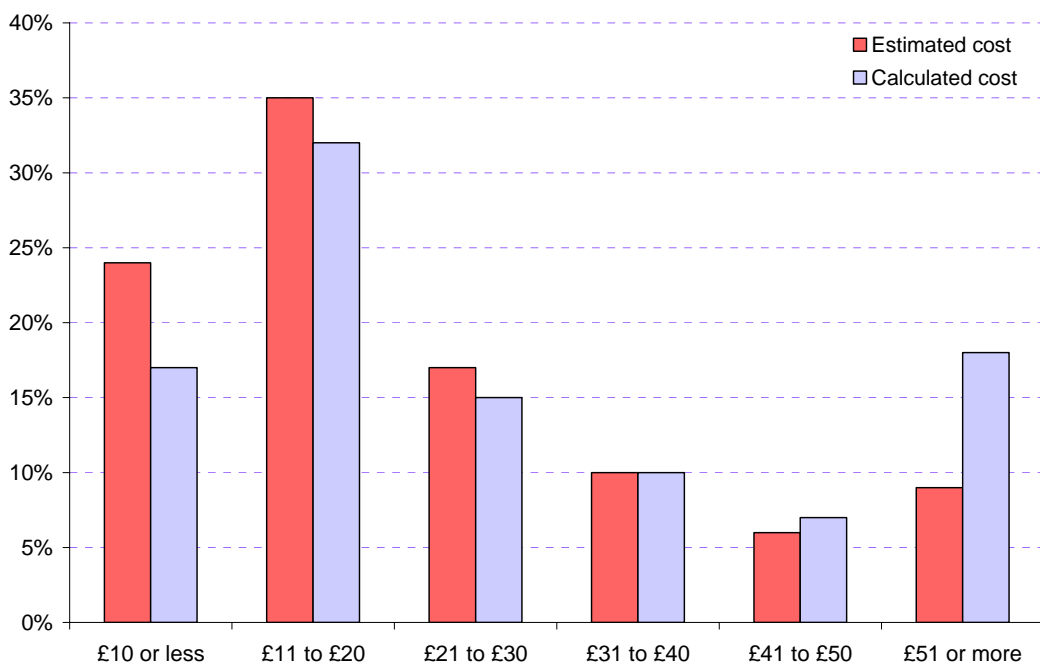
Cost of chargeable journeys to the zone

Respondents were asked how much they estimated they spent on different elements of their most recent chargeable journey, and to estimate an overall cost for this journey. This was then compared to a calculated cost. Calculated costs were based on parking costs provided by the respondent, the £5 cost of the congestion charge (at the time of the first wave of the survey), a notional vehicle operating cost based on a measured distance between their origin and destination, and the 'average cost' of running a car as calculated by the Automobile Association at 24 pence per kilometre, which includes an allowance for vehicle depreciation.

Across this dataset of all chargeable journeys the average total driver-estimated cost was around £27, and the average total calculated cost was around £34, including vehicle operational costs and vehicle depreciation. Excluding vehicle operational and depreciation costs the more immediate costs of the congestion charge and parking were on average only £11, although it was noted from the survey that many respondents making employers' business trips had parking provided at no cost.

As can be seen in Figure 8.10, calculated overall costs and driver-estimated costs were different. Generally journeys that cost under £20 are estimated by the driver to cost more, and journeys over £30 are estimated by the driver to cost less. The best match between driver-estimated and calculated cost are for journeys costing between £20 and £30.

Figure 8.10 Estimated compared to calculated total cost (including vehicle depreciation) of most recent journey to the charging zone, May 2005.



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For an 'average' driver, therefore, the cost of the congestion charge, then at £5 per day, comprised around one-seventh of the total cost of the journey, including vehicle depreciation. For individual drivers making multiple trips during the same charging day, this proportion would be correspondingly smaller.

However, these calculations are somewhat artificial, as the 'up front' cost associated with paying the charge would tend to figure more highly in most chargepayers' thinking when making decisions about their travel behaviour than the 'background' costs associated with vehicle ownership.

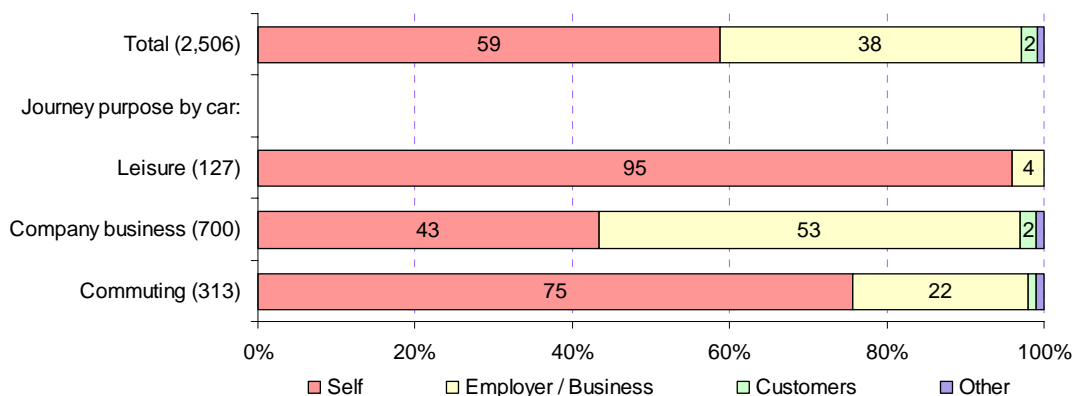
Who bears the cost of chargeable journeys?

To more fully understand motivations for travel behaviour change it is important to know who actually bears the costs for chargeable journeys. It would be expected that those who personally bear costs are more likely to respond to cost changes.

Overall, 38 percent of respondents stated that they had the charge paid for them by their business (Figure 8.11). A further 2 percent stated that they pass it on to their customers. Similar proportions of drivers have the costs of their petrol paid for them, although significantly more, at 59 percent, reported that they did not personally bear any costs for parking. These proportions are reflective of the journey purpose profile from the survey described above.

Respondents making chargeable journeys for personal business were least likely to have congestion charge and petrol paid for them, at around 6 percent, compared to 26 percent of those driving to work.

Figure 8.11 Bearer of congestion charge for most recent chargeable journey, May 2005.



It might also be expected that drivers' views on the proportion of their trip cost accounted for by the congestion charge would be reflected in whether or not they pay the costs themselves. Around 60 percent of those who bear all or some of costs themselves consider the charge to form a 'major part' or 'the majority' of their total journey cost, compared to only 40 percent of those who have all the costs paid for them.

In interpreting these findings, it is important to bear in mind the characteristics of the survey sample which excluded, for example, those paying the charge through the fleet scheme.

Pattern of chargeable journeys

Of all reported trips into the zone in a typical week, around half were 'simple' trips, involving driving in, parking and later driving out. One third involved multiple trips either within the zone or in and out of the zone and 9 percent involved driving through the zone without stopping. In addition to this, 6 percent of journeys involved a brief stop off or pick up inside the zone. Generally those that drove in more frequently were more likely to do multiple trips on a single day, and less frequent drivers are more likely to make a 'simple' trip: in, park and out.

Those on business trips were much more likely to be making multiple trips in the zone on any one day, at 48 percent, compared to 16 percent of those making leisure trips and journeys to work.

Chargepayer turnover

Over half of respondents to the survey reported that they had been making chargeable trips similar to the one they had made most recently (ie their most recent chargeable trip) for over two and a half years (ie since before charging began). The other half of respondents had only been making trips similar to their most recent chargeable trip since charging began. Of the most recent chargeable journey made by respondents, 22 percent had been making similar journeys for less than one year, and 24 percent for between one year and two and a half years.

Bearing in mind that the introduction of charging itself will have significantly altered the characteristics of the population of drivers making trips to the charging zone, this analysis suggests a potential 'turnover' in individual chargepayers of up to 20 percent per year – an important consideration when interpreting the aggregate traffic trends described elsewhere in this report.

8.8 Second wave of survey – September 2005

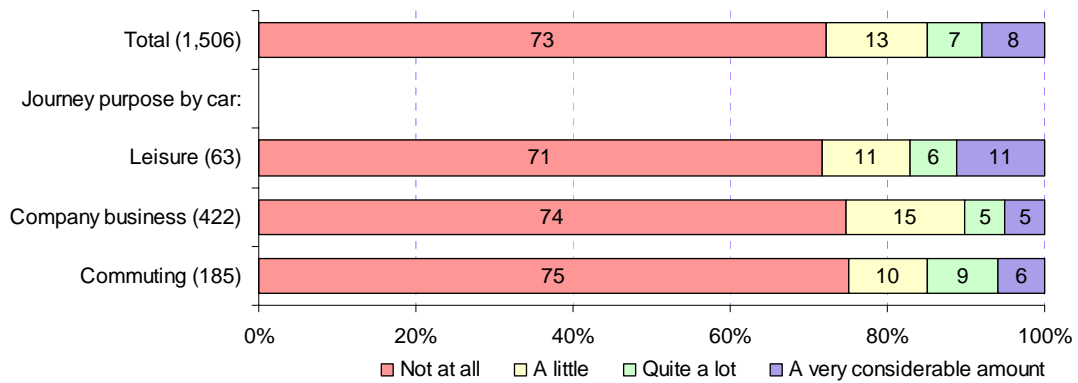
Key outcomes from this wave of the survey were the establishment of comparison profiles of travel behaviour by respondents who had participated in the first wave of the survey, potentially reflecting responses and adaptations to the July 2005 Variations.

Did drivers report having made changes to travel?

Figure 8.12 shows that a majority of respondents to the follow-up survey, 73 percent, did not report having made any change to their general travel to the zone (by all modes at all times) between the first and second waves of the survey.

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Figure 8.12 Reported change in general travel behaviour to the charging zone (all modes, all times, all purposes).



When asked about chargeable travel to the charging zone in the week directly before the September 2005 wave of the survey, the proportion of drivers who said they had not driven into the zone at all in that week rose by 15 percentage points, from 32 percent in the first wave to 47 percent in the second wave.

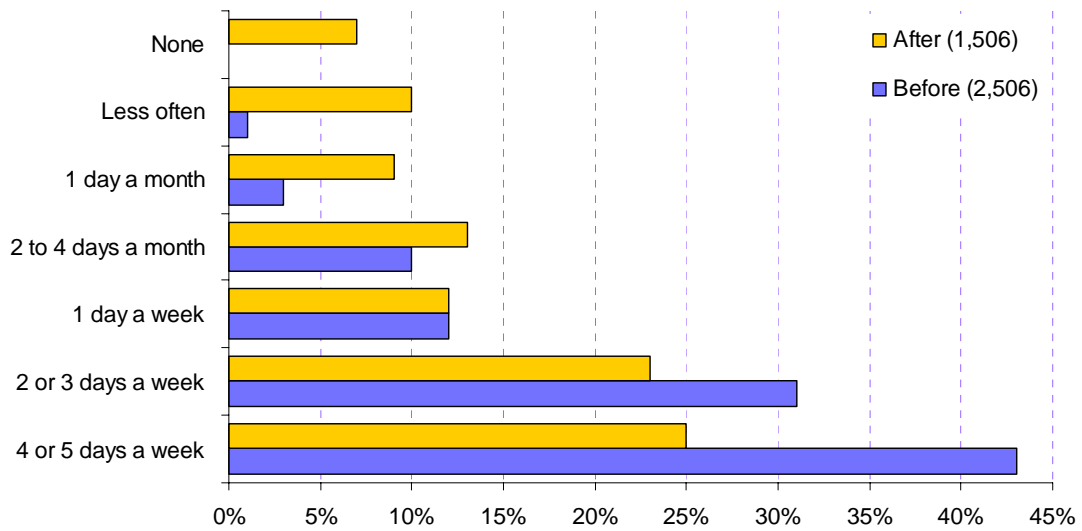
Did drivers change their frequency of travel to the charging zone?

Figure 8.13 shows how often respondents said that they drove into the charging zone, comparing both waves of the survey.

It is seen that, generally and as might be expected, respondents as a whole reported reduced frequencies of chargeable trips in the second wave of the survey compared to the first. It is important to note that this graphic considers frequency of paying the charge (ie making at least one chargeable journey) on a typical day, rather than the actual number of trips made on that day.

Seven percent of respondents reported not having made a chargeable trip at all since the charge increase in July (a period of about three months), but this needs to be seen in the context of eligibility for the survey (at least one trip in a six month period), the summer holiday period in July and August 2005, and the degree of natural 'turnover' in the population of chargepayers, as discussed above.

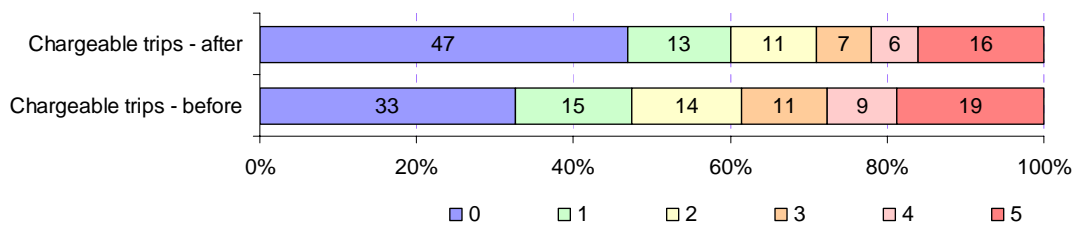
Figure 8.13 General frequency of chargeable journeys made by respondents before and after the charge increase.



There was also a considerable difference between survey waves in the number of chargeable journeys reported as having been made in the week prior to the September 2005 survey (Figure 8.14).

This analysis suggests that respondents reported making approximately 20 percent fewer chargeable trip-days (days with at least one chargeable trip being made per week) compared to before the charge increase. This will not directly reflect any change to the overall volume of travel to the charging zone however, as the (panel) survey did not include 'new' drivers, who had commenced driving to the zone between survey waves.

Figure 8.14 Number of days respondents reported making chargeable journeys in the week before the survey.



This, coupled with the exclusion from this survey of chargepayers paying through the retail channel, means that it is not possible to compare this finding directly with the changes in charge payments received by TfL described above.

Reasons given by respondents for changing travel patterns

Considering all respondents who completed both waves of the survey, 27 percent reported having changed some aspect of their general travel to the charging zone. The majority of these respondents said it was because of the

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charge increase (55 percent of respondents reporting change, equivalent to 15 percent of the survey population).

A further 18 percent of respondents reporting change, 3 percent of the survey population, said that it was because of a change in their personal circumstances, such as changing jobs or moving house. One quarter of respondents reporting change, equivalent to 4 percent of the survey population, had other reasons for changing their general travel behaviour and only 2 percent, less than one percent of the survey population, said it because of the July 2005 bombings in central London.

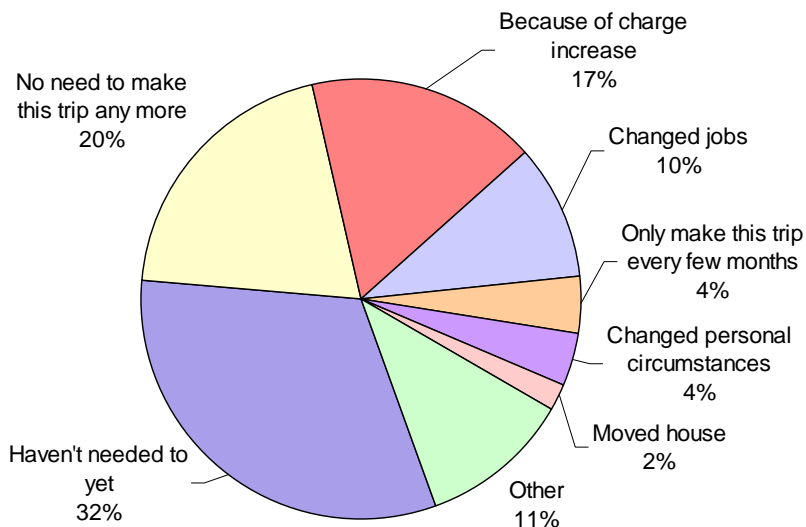
Those drivers who said they had made some change to their general travel to the zone because of the charge increase tended to be infrequent drivers, and were more likely to have changed travel mode than frequency of travel.

Looking more specifically at frequency of making trips similar to that described by respondents in the first wave of the survey (the 'most recent trip'), 20 percent of respondents reported not having made a comparable trip in the second wave, despite the survey taking place 3 months after the charge increase.

The proportion of these respondents saying that this was because of the charge increase is however considerably less than claimed this reason in relation to changes to general travel to the zone. In this case the charge increase was given as a reason for not making a similar trip by 17 percent of respondents, equivalent to 3 percent of the total survey population.

The majority of respondents, 56 percent, reported that the absence of a comparable trip was related to their wider activity patterns or that the most recent sample trip described in the first wave of the survey had been an irregular or one-off trip (Figure 8.15).

Figure 8.15 Reasons why drivers had not made a similar 'most recent' chargeable journey to that described in May 2005.

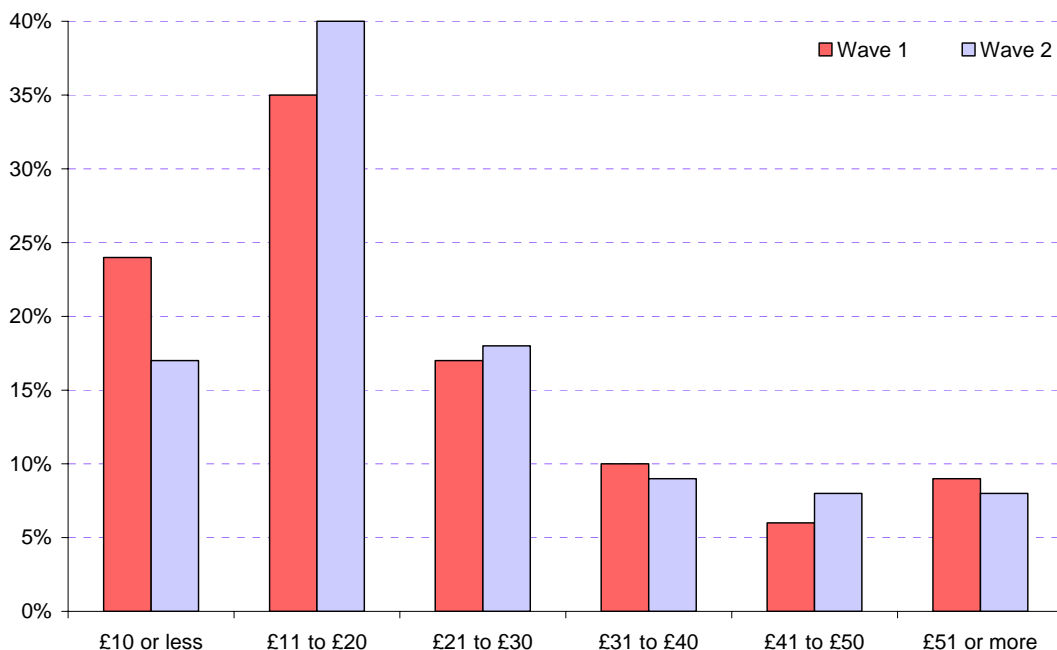


How have costs of journeys changed?

All things remaining equal the only change to the findings reported above for the first wave of the survey should be the additional £3 of the congestion charge. Therefore the average calculated cost of a comparable set of trips to the charging zone will have risen from £34 to £37, if vehicle operating and depreciation costs are included. The proportion of this average cost that is represented by the congestion charge itself will have risen from 15 percent to 22 percent.

Interestingly, the September 2005 survey found that there has been very little change in driver's estimates of their total journey cost of their travel compared to May 2005. In fact instead of increasing by the £3 that might have been expected, panellists still making similar chargeable journeys on average estimated their journey costs to have increased from £27 to just £28 (Figure 8.16).

Figure 8.16 Estimated costs of drivers' journeys to the zone before and after the July 2005 charge increase.



What types of trips have been most affected?

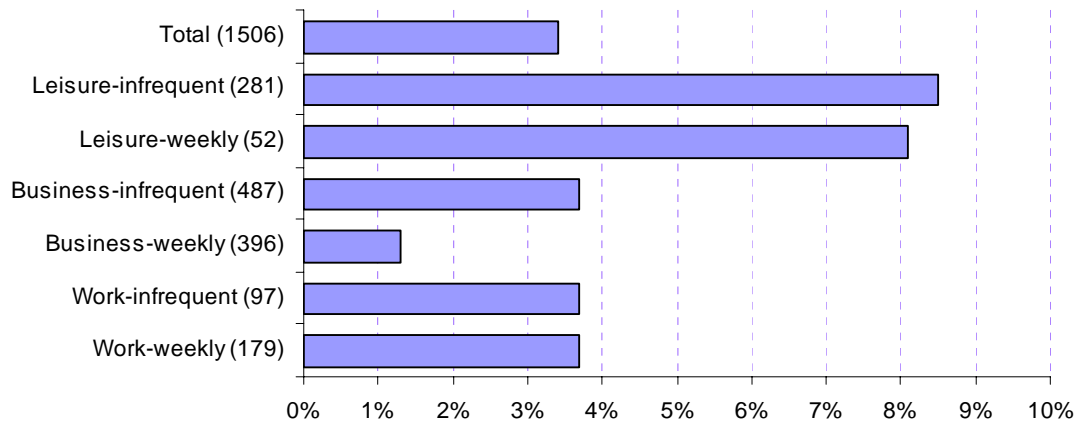
Figure 8.17 shows the proportion of different types of chargeable trip reported by respondents as no longer being made primarily as a result of the charge increase.

Personal business (discretionary and leisure) trips were the most likely to be claimed to having been curtailed as a result of the charge increase, with 8 percent of both frequent and infrequent drivers citing it as a reason. Nearly 4 percent each of frequent and infrequent work trips and infrequent employers' business trips were reported to have been curtailed, but only 1 percent of

8. July 2005 charge Variations

frequent business trips were reported to have been curtailed because of the increase in the charge.

Figure 8.17 Proportion of all journeys that are no longer made because of the charge increase by purpose and frequency (September 2005).



In terms of changes to trip making according to the cost of individual chargeable journeys, journeys costing the least (less than £20 in total) were reported to have been discontinued in the greatest numbers.

Table 8.1 summarises the types of chargeable journeys that have been found most or least likely to be reported by respondents as no longer being made between the two waves of the survey. In general, these findings are intuitive.

Table 8.1 Journeys that are least, or most, likely to have changed as a result of the charge increase.

Most likely to have ceased

Personal business
Made for less than a year
Driver bears whole cost
Irregular travel to the zone

Least likely to have ceased

Frequent employers' business trips
Made since before the introduction of charging at £5
Driver bears none of cost
Regular travel to the zone

Most likely to have changed mode

Work trips

Least likely to have changed mode

Employers' business

8.9 Summary of key findings

Total daily valid charges and automatic counts of traffic entering the charging zone provide similar, disaggregate indicators of use of the charging zone. Units of measurement are different, however, and the traffic data in particular are subject to statistical error.

Looking across the available data, TfL's interim assessment of the *potentially attributable* impacts of the July 2005 Variations on traffic within the charging zone can be summarised as follows:

- Charge payments, in terms of the total number of charges valid on a typical charging day, have reduced by between 6 and 7 percent, broadly corresponding to TfL's range of prior expectation.
- Total traffic entering the charging zone (vehicles with four or more wheels) has reduced by between 2 and 4 percent, towards the lower end of TfL's range of prior expectation.
- Whilst overall reductions in circulating traffic have been observed, it is not yet possible to precisely quantify these. TfL's current assessment would be that volumes of circulating traffic (vehicles with four or more wheels) have reduced by between 1 and 3 percent in response to the Variations. This is again towards the lower end of TfL's range of prior expectation.
- Available data do not yet permit an assessment of any changes to congestion in the charging zone that could be attributed to the July 2005 Variations.

The data also suggest that:

- Whilst the July 2005 bombings complicate the analysis over the Summer 2005 period, any effects on aggregate travel patterns were short term.
- Both payment and traffic data indicate that the scale of the observed impacts intensified in the early part of 2006. This may reflect a degree of 'delayed' adaptation by chargepayers, or perhaps some longer-term effects of the July 2005 bombings on the travel choices of individuals, or the continuance of the longer-term 'background' decline in traffic levels in and around central London, described elsewhere in this report.
- Traffic data are indicative of a degree of compensation between chargeable and non-chargeable vehicles, with the impact of reductions to chargeable vehicles (cars, vans and lorries) partly counterbalanced by increases to non-chargeable vehicles (buses, taxis and two-wheeled vehicles).
- There is some evidence from camera data of a degree of 'optimisation' behaviour by both chargeable and non-chargeable vehicles, in terms of small increases to the average frequency of entry per day for unique vehicles.
- The difference in the degree of change indicated by charge payments and traffic trend data are largely attributable to the relatively small proportion of vehicles in the charging zone that are 'fully chargeable'. In part this reflects the unique composition of traffic in central London, and in part the established impacts of the original charge of £5.
- Although the TfL survey of travel behaviour change survey does not accurately quantify the change in total chargeable travel to the charging zone, various calculations can be made that provide indicative values to set against those described elsewhere in this section.
- These suggest that, between the first and second waves of the survey, an indicative range of between 8 and 17 percent fewer chargeable journeys (equivalent to days on which charges are paid) were made to the charging zone on a typical charging day. Taking 'turnover' of chargepayers into

8. July 2005 charge Variations

account would narrow this range towards the lower values, which corresponds well with the other indicators of change based on traffic flow and charge payments data described in this section.

9 Scheme costs, benefits and revenues

The *Second Annual Monitoring Report* provided provisional estimates of the costs and benefits of operating the congestion charging scheme. The monitoring programme and the experience of the scheme have allowed Transport for London to reconsider those estimates for the scheme with its original £5 charge. However, it is not yet possible to give comparable estimates for the scheme following the July 2005 Variations, when the charge was increased to £8.

The scheme's principal costs, benefits and revenues are presented in 2005 prices and values for a typical year's operation. A provisional estimate is also provided for the scheme's net revenues in 2005/2006 and their allocation to transport programmes to support the Mayor's Transport Strategy as required by law.

9.1 Scheme operating costs and benefits

The costs of operating the scheme cover the payments to TfL's contractors, principally the key service providers involved in operating and enforcing the scheme. Further details of the service providers are given in Section 10. Operating costs also include the relevant staff and other costs of TfL supervising, administering and monitoring the scheme. The overall costs of sustaining the scheme need to take account of the provision of extra bus capacity to cater for car occupants who switch to public transport. These extra buses, in turn, create benefits in terms of improved service frequencies.

Scheme benefits principally cover the time savings and improved journey time reliability for those using the road network in and around the charging zone as a result of reduced congestion. Those using cars, vans taxis, buses and lorries experience these benefits mainly as less time spent in traffic queues. Bus passengers also experience lower waiting times as a consequence of improved service reliability. The scale and distribution of these benefits, and the extent to which they can be attributed to the congestion charging scheme, are assessed using the results from traffic surveys and traffic models of the changed traffic conditions resulting from the scheme.

Time savings and other benefits can be valued using established conventions; for example, time savings are assessed to be more highly valued by those making business-related journeys, than by those making journeys at their own expense to and from work. The proportion of these benefits that can be broadly allocated to business activities is taken to be that accrued by the occupants of commercial vehicles and to those in cars, taxis, goods vehicles and buses on employers' business trips (including the self employed).

There are other impacts. Fuel savings accrue from reduced car travel and from improved overall traffic conditions, which in turn means reduced emissions of CO₂ and other pollutants. There are also fewer accidents, as explained in Section 6.

9. Scheme costs, benefits and revenues

Charge payments are considered to be a transfer from chargepayers to TfL and are not part of the conventional assessment of costs and benefits; though they are a significant element of a separate financial analysis.

Those who are ‘deterred’ by the charge and change their behaviour as a direct result of the scheme, for example car drivers who switch to public transport, are assessed as incurring a negative benefit. However, the additional fare revenue they pay is an indication of a benefit they gain from their public transport trip and helps to offset the resource costs of the extra buses.

Those who pay the charge, while experiencing the benefits of the scheme, also incur what are known as ‘compliance costs’. These are separate from the financial costs of the charge and represent the time and effort involved in complying with the scheme. This can range from simple text messages to pay the charge to a business employing additional staff to handle the charge payments for a fleet of vehicles. These costs are currently being researched by TfL and as yet no firm estimate is available. At this stage the assumed compliance costs are £1 per charge payment for business travel, where employee time is likely to be involved, and 50 pence for other trips.

These various costs and benefits are brought together in Table 9.1.

Table 9.1 Summary of principal annual operating costs and road user benefits. (£ millions, 2005 prices and values, charge at £5)

	Scheme operating costs	Travel benefits	Compliance costs	Net benefits
Scheme operating and other costs				
TfL administration	-5			
TfL contractors	-85			
TfL extra buses	-20			
Sub-total – scheme costs	-110			
Scheme benefits				
Car users – business		65	-10	55
– journey to work, other		45	-10	35
Vans, lorries – business		35	-10	25
Taxis – business		30	0	30
– journey to work, other		10	0	10
Buses – business		2	0	2
– journey to work, other		40	0	40
Deterred – business		-5		-5
– journey to work, other		-20		-20
Reduced accidents		15		15
Reduced CO ₂ emissions		3		3
Other resource savings		10		10
Sub-total – road user and other benefits		230	-30	200
Total net annual benefits				90

9.2 Financial impacts

Total charge and penalty charge payments, based on the £5 charge, typically amounted to £190 million per year. TfL's costs of operating the scheme were typically £90 million per year.

There are also additional public transport fares generated by those transferring to bus, Underground and rail services. TfL estimate that these are of the order of £15 million per year largely offsetting the additional costs of £20 million per year of providing the additional buses.

Table 9.2 summarises the principal financial impacts of the scheme.

**Table 9.2 Summary of principal financial impacts.
(£ millions, 2005 prices and values, charge at £5)**

Scheme operating costs	
TfL administration	-5
TfL contractors	-85
Charge and penalty payments	
Charge payments	120
Penalty charge payments	70
Total net charge revenues	100
Other costs and fare income	
TfL extra buses	-20
Extra public transport fares	15

Table 9.1 and Table 9.2 show that the £5 scheme produced an overall benefit for London of roundly £90 million per year and resulted in net additional charge revenues to be spent on transport in London of roundly £100 million per year.

9.3 Allocation of net revenues

By law the net revenues from the scheme must be spent on measures to further the Mayor's Transport Strategy in accordance with an appendix to the Scheme Order approved by the Secretary of State for Transport. TfL is required to report every four years to the Secretary of State on the expenditure of scheme revenues.

Originally, the revenues from the scheme were only available to TfL for the first ten years of the scheme's operation. However, TfL have now been advised by Government that a longer period of hypothecation would apply if the scheme were enlarged in accordance with the revision to the Mayors' Transport Strategy, published in August 2004. The western extension is due to commence in February 2007 and, if so, the hypothecation period extends to 2017.

9. Scheme costs, benefits and revenues

Table 9.3 provides provisional out-turn figures for financial year 2005/2006, comparing scheme revenues with scheme operation costs. This covers the period of the July 2005 Variations, when the charge was increased to £8.

Table 9.3 Scheme revenues and costs, financial year 2005/2006. (£ million provisional)

Revenues	
Standard daily vehicle charges (£5 pre-July 2005, £8 post-July 2005)	121
Fleet vehicle daily charges (£5.50 pre-July 2005, £7 post-July 2005)	19
Resident vehicles (£2.50 per week pre-July 2005, £4 per week post July 2005)	2
Other income (eg registration charges)	2
Enforcement income	65
Total revenues	210
Total operation costs	88
Net revenues	122

Table 9.4 provides a provisional summary of the areas of expenditure of the net revenues in financial year 2005/2006.

Table 9.4 Application of congestion charging scheme revenues, financial year 2005/2006. (£ million provisional)

Bus network operations:	
Contributions towards bus network and service enhancements; to all buses now being low-floor accessible; to the introduction of 1,000 illuminated bus stops; to the development and introduction of an improved bus radio and location system; and to the increased capacity and modernisation of bus garages and bus stations.	100
Roads and bridges:	
Support to programmes for improving the quality of roads and bridges, including safety works on the Blackwall, Rotherhithe and Fore Street Tunnels and the strengthening of Westminster Bridge.	14
Road safety:	
Contributions to programmes to reduce child accidents across London, including contributions to Borough schemes.	4
Walking and cycling:	
Contributions to new pedestrian and cyclist measures, including the replacement of subways with surface facilities and contributions to Borough schemes.	4
Total	122

10 Scheme operation, enforcement and compliance

10.1 Introduction

The operation of the central London congestion charging scheme continued to improve throughout 2005, with the introduction of further service improvements that have resulted in an enhanced chargepayer experience and increased chargepayer satisfaction with the operation of the scheme.

Key findings for 2005

- Chargepayer satisfaction with the quality of service reached a new high of 78 percent in 2005.
- Total valid charge payments including resident and fleet users reduced after the increase to the daily charge in July 2005, and stabilised in the last quarter of 2005 at 96,000 per day, 11 percent down on the same period in 2004.
- Motorists paying for monthly or annual charges have received a 16 percent discount since July 2005.
- The internet (web) is now the most used channel for charge payments and accounts for some 30 percent of transactions.
- Capita performance has further improved with the vast majority of performance indicators being met each month.
- Enhancements have been made to the charge payment channels, including the addition of more outlets in petrol stations and implementation of an express payment option into the interactive voice response payment channel for payments by phone.
- The automated fleet scheme is now open to all vehicle types at a reduced threshold of 10 vehicles.
- Residents' discount processes were greatly improved, through streamlining the renewal process and aligning the discount and annual charge payment periods.
- Public Information developments in the past year include a downloadable computer desktop reminder to pay the charge, and an award winning radio campaign reminding motorists of the hours of operation of the scheme.
- Compliance with the scheme continues to improve with the level of penalty charges issued in 2005 21 percent down on 2004.
- Representations and appeals continue to reduce, with 17 percent of the Penalty Charge Notices now being subject to a representation and 1.2 percent subject to an appeal.
- Penalty charge payment rates are consistent, with 76 percent paid, the vast majority at the discounted penalty amount.
- An electronic interface between Capita and the Parking and Traffic Appeals Service, delivered in late 2005, ensures timely and efficient response to appeals.

10. Scheme operation, enforcement and compliance

- Improvements have been achieved to the enforcement of persistent evaders through the adoption of devolved clamping and removal powers against vehicles with expired tax discs, joint working with the police and more efficient identification of vehicles.

Scheme operation

10.2 Service developments and contractor performance

Developments to the operation of the scheme during 2005 have built upon the improvements to the quality of operation and the revisions to the contract with the main service provider, Capita, made in the period between September 2003 and April 2004. These were described in the *Third Annual Monitoring Report*.

These more recent developments have resulted in further increases in chargepayer satisfaction, with overall satisfaction with the operation of the scheme now at 78 percent, up from 72 percent at the start of 2005.

Key developments to the scheme can be summarised as follows:

Residents

- New, additional residents' 90 percent discount zones were introduced in several small localised 'buffer areas' around the charging zone.
- An improved process for residents' discount applications was introduced. This included an affirmation process so that residents need not re-apply with the level of evidence required at initial registration. Instead, an affirmation only that details have not changed is requested. This change has resulted in a greatly simplified process for those wishing to renew their discount.
- The timing of the renewal of the eligibility of residents' discounts was aligned with the timing of the renewal of the annual charge payments.

Payments

- Discounts of 16 percent were introduced for those paying for monthly or annual charges, better reflecting actual travel patterns of regular chargepayers.
- A new dedicated 'Frequently Asked Questions' tool was incorporated into the www.cclondon.com website.
- An 'express payment' option was incorporated into the interactive voice response (IVR) payment channel allowing the 90 percent of IVR users who want to pay only for the one day, to pay more quickly.
- Error messages were clarified for the Short Message Service (SMS) mobile telephone text payment channel to highlight when there has been any kind of error with a payment attempt.
- A revised user guide was provided for the use of the SMS text and interactive voice response payment channels.
- Additional 'PayPoint' outlets were introduced at selected petrol filling stations nationwide.

10. Scheme operation, enforcement and compliance

- Receipts from the PayPoint system were modified to state if an attempt has been made to pay the charge on a non-charging day.
- The requirement was introduced to enter a card security code when making payments through the call centre and internet.

Fleet Users

- All vehicle types are now eligible for the automated fleet scheme, with a minimum threshold of 10 vehicles.
- The ability was introduced for fleet operators to make unlimited ad-hoc additions to their accounts.
- Changes were made to fleet statements to clarify the date for which an ad-hoc charge is made, rather than the date on which the ad-hoc charge is paid.
- A 'forgotten password' link was introduced on the fleet extranet homepage to save fleet administrators from having to contact the fleet helpdesk.
- A syntax checker was incorporated into the fleet extranet to ensure that chargepayers enter valid vehicle registration numbers onto their accounts.

Persistent Evaders

- TfL obtained devolved powers from the Driver Vehicle and Licensing Agency (DVLA) to clamp and remove vehicles found 'on street' with out of date or expired tax discs. Enforcement of decriminalised traffic and parking infringements relies in part on the accuracy of the DVLA data to issue Penalty Charge Notices to the correct keeper. Vehicles that are displaying out of date or no vehicle excise duty ('tax discs') are also more likely to be registered incorrectly. Following a successful three-month trial, TfL was granted these devolved powers on a permanent basis in September 2005. By 31 December 2005, the congestion charging enforcement team identified and enforced against 819 vehicles without a valid tax disc.

Appeals

- Working in partnership with the Parking and Traffic Appeals Service, TfL successfully introduced an electronic data interface with the appeals service in November 2005. This interface allows the electronic transfer of all evidence relating to appeals between Capita and the appeals service. The system removes the need for paper exchange of documents thus reducing the likelihood of evidence going missing and saves a considerable volume of paper.

Foreign Vehicles

- June 2005 saw the appointment of a new service provider – Euro Parking Collection – responsible for the identification of the registered keepers and the recovery of penalty charges issued to foreign registered vehicles.

Performance has been effective with around 30 percent of cases passed to Euro Parking Collection leading to recovery of outstanding debts.

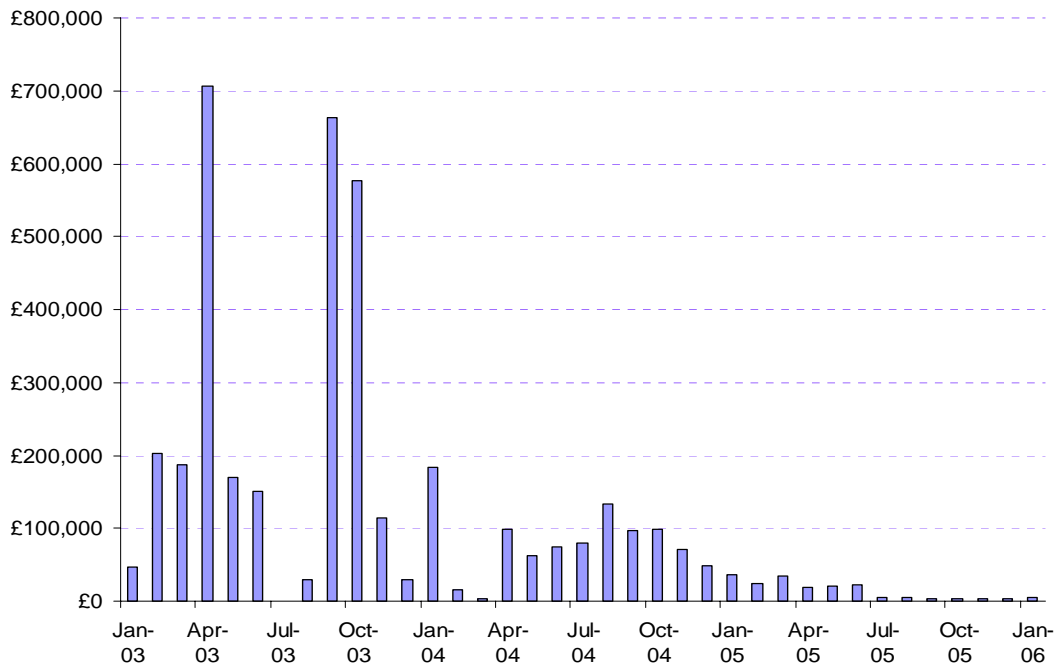
10.3 Capita performance

Capita is the main service provider that provides day to day operation of the congestion charging scheme on behalf of TfL. Capita have premises in London and Coventry where they manage key functions of the scheme operation including camera maintenance, image capture, the call centre, discount registration services and most enforcement services such as the processing of all Penalty Charge Notices, Penalty Charge Notice progression, representations and appeals.

TfL have 52 performance indicators within the Capita contract and its Supplemental Agreement. There are 7 'super' key performance indicators (SKPIs), 32 key performance indicators (KPIs) and 13 quality performance indicators (QPIs). Capita are required to make service credit payments against any indicators that do not meet the required level. As can be seen in Figure 10.1, performance against these indicators has further improved in 2005 with the vast majority of indicators being met.

This strict performance regime, monitored by a team of Policy and Monitoring Advisors based on site in Capita's main contact centre has contributed to an overall improvement in the quality of service of key performance areas such as Penalty Charge Notices incorrectly issued as a result of an error by Capita or the incorrect processing of representations and appeals, both of which are now at minimal levels.

Figure 10.1 Capita performance – service credit payments from Capita to TfL.



10.4 NCP performance

National Car Parks (NCP) is TfL's service provider for on-street enforcement operations. The company has provided an improved performance in 2005.

Some of these improvements have been achieved through the introduction of the 'Locust Van'. This vehicle has the capability to read number plates of parked vehicles whilst travelling at the speed of general traffic (Figure 10.2). This has led to a more effective method of identifying and enforcing persistent evaders of the scheme.

Figure 10.2 Locust Van.



Improvements planned for 2006

There are a number of additional developments that are planned to come into effect during the course of 2006. These changes are designed to improve further the quality of service and maintain high levels of chargepayer satisfaction. These include:

- From June 2006, payment of the charge for the previous charging day at a rate of £10 will be permitted up to midnight on the following charging day. This is in direct response to feedback from chargepayers and it is anticipated that this measure will help to reduce the number of Penalty Charge Notices issued due to those simply forgetting to pay.
- Further improvements to the www.cclondon.com website are planned to be implemented throughout 2006.
- All calls made to and from the call centre will be recorded. This will assist with the resolution of queries and disputes. This is planned to commence in the summer of 2006.

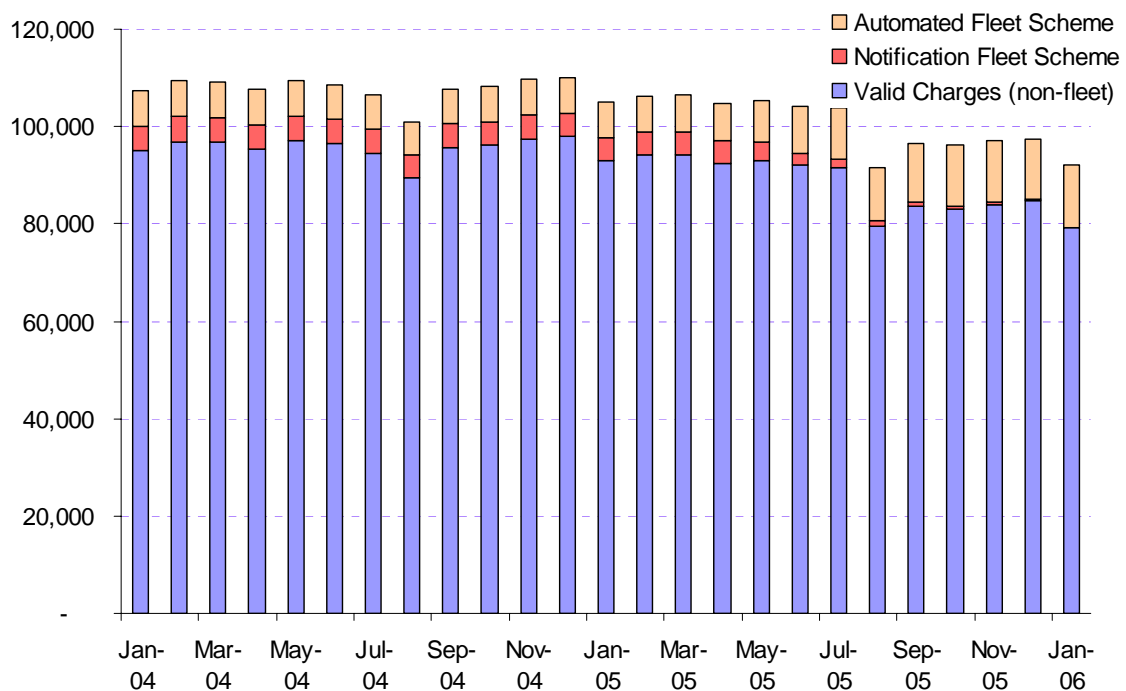
- The Blue Badge discount scheme for people with disabilities will be reviewed to improve the quality and service offered. This will involve London Boroughs and those organisations representing badge holders.
- Improved guidance in relation to the enforcement process will be available on the website www.cclondon.com.
- Further improvements to the residents' scheme, for example making it possible for residents to change vehicles without the need to pay the full charge and then claim a refund.

10.5 Congestion charging payments

Average daily charge payments remained relatively stable until 4 July 2005, when the daily charge increased to £8 and £7 for fleet chargepayers, though there is some evidence of year-on-year 'background' declines in the use of the charging zone, as described elsewhere in this report. Following the introduction of the charge increase, total valid daily charge payments reduced in number but stabilised at new levels relatively quickly. This adjustment was expected by TfL as a response to the July 2005 Variations, and is considered in more detail in Section 8.

Allowing more vehicles onto the automated fleet scheme from April 2005 along with the closure of the notification fleet scheme accounts over the period to October 2005 led to a corresponding increase in the number of charge payments made through the automated fleet scheme.

Figure 10.3 Number of valid charges on each charging day, January 2004 to January 2006.



10. Scheme operation, enforcement and compliance

Of the payments made for the 12 months ending January 2006, 16 percent were made in respect of vehicles registered for the 90 percent residents' discount, 12 percent were made for fleet vehicles and 72 percent were made in respect of vehicles paying the standard (£8) daily charge.

The introduction of discounts for 20-day and 252-day charge payments as part of the July 2005 Variations has led to slight increases in the number of these payments. Table 10.1 illustrates the percentages for each type of payment since the start of the scheme in 2003.

Table 10.1 Charges by payment type.

	Standard charges				Resident charges		
	Daily	Weekly	Monthly	Annual	Weekly	Monthly	Annual
First year of scheme							
(17/02/2003 to 31/12/2003)	82%	9%	6%	2%	20%	24%	56%
Second year of scheme							
(01/01/2004 to 31/04/2004)	82%	9%	6%	2%	18%	22%	60%
Pre July 2005 Variations							
(01/01/2005 to 03/07/2005)	82%	9%	7%	3%	17%	20%	63%
Post July 2005 Variations							
(04/07/2005 to 31/12/2005)	80%	8%	8%*	4%*	17%	17%	66%

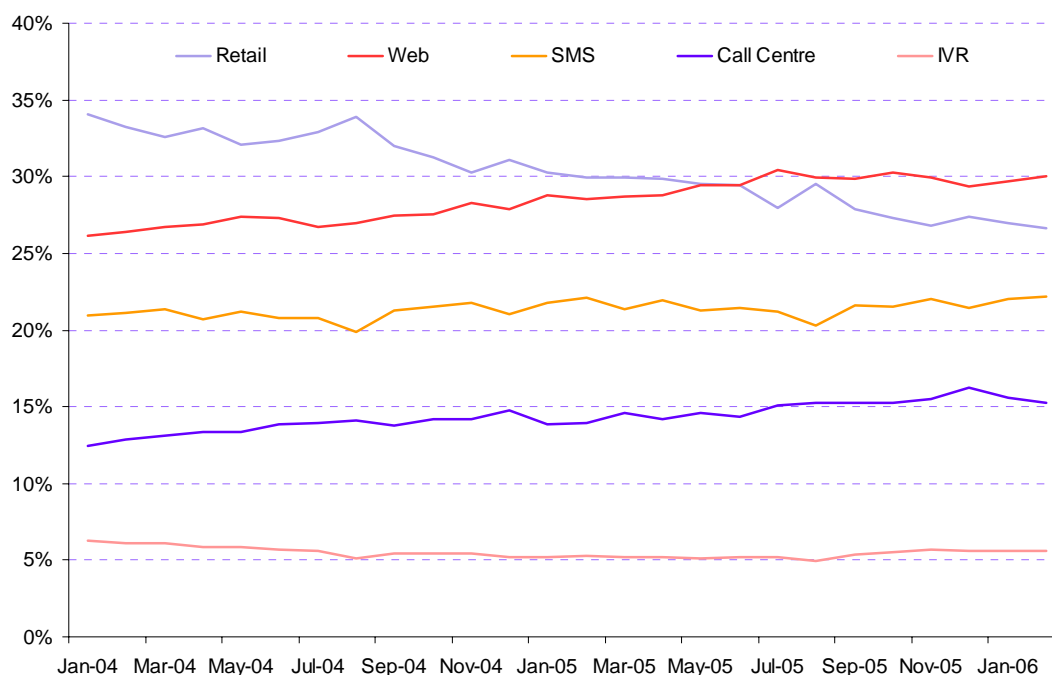
* After introduction of discounts for 20-day and 252-day purchases for standard charges, which were implemented ahead of July 2005.

10.6 Payment channel split

Chargepayers have access to a number of channels for paying the charge. Previous *Annual Monitoring Reports* have described established patterns, and also identified a trend towards growing use of automated payment channels.

This continued during 2005, with a continued migration away from the retail payment channel towards the web based channel. The retail channel, which at the beginning of 2005 was used by 30 percent of chargepayers, was used by only 27 percent of chargepayers by the end of the year. The introduction of additional PayPoints at selected petrol filling stations nationwide has been successful and these outlets, together with those PayPoint outlets located in the congestion charging zone, remain very popular locations to pay the charge. The web channel overtook the retail channel as the most popular payment channel in July 2005.

The introduction of the 'express payment' option on the interactive voice response channel in July 2005 has resulted in a significant reduction in the time taken to pay a charge using this method and a consequent slight increase in the number of charge sales being made through this channel (Figure 10.4).

Figure 10.4 Charge transactions by payment channel.

10.7 Quality of service

The quality of service has continued to improve during 2005, with overall 'chargepayer satisfaction' in 2005 the highest since the start of the scheme, at 78 percent, and up from 71 percent at the start of the year. There were no significant failures of contractual 'chargepayer' service targets throughout 2005.

Call centre performance has improved further in 2005, with average queuing times below 11 seconds for the entire year. The volume of calls has dropped slightly from 2004 figures, averaging at about 250,000 calls per month. This reduction in overall call volumes is in part due to the impact of the July 2005 Variations but also due to the reduction in levels of enquiries, indicating greater familiarity with the scheme, in part a result of improved public information. The levels of callers abandoning or unable to get through to the call centre have improved on the 2004 figure of 1 percent, remaining below 0.5 percent for the whole of 2005.

10.8 Public Information

A series of public information campaigns have been run during 2005, aimed at both frequent and infrequent drivers through a variety of media, including posters, press and radio. A radio campaign, which ran on eight London radio stations from November 2005 to March 2006 to remind chargepayers of the hours of operation of the scheme, won an 'Aerial Award' in January 2006 for its 'barbershop' advert. Chargepayers who had registered to pay by SMS text message but had never used the service and those who had not used the service for some time were also targeted via a direct mail campaign to encourage use of this payment channel. This campaign was awarded the

10. Scheme operation, enforcement and compliance

Silver prize at the 'Marketing Direct Intelligence Awards' in October 2005 and received a commendation for intelligent use of data.

A campaign to help chargepayers remember to pay the charge included a free downloadable computer 'desktop reminder'. This can be downloaded from www.cclondon.com and, as of 20 April 2006, over 7,000 people had downloaded the reminder. A car tax disc holder, with details of payment options and hours of operation, was also produced and has been requested by over 4,300 chargepayers.

Posters, bus and press adverts also reminded Londoners that there was no charge between Christmas Day and New Year's Day.

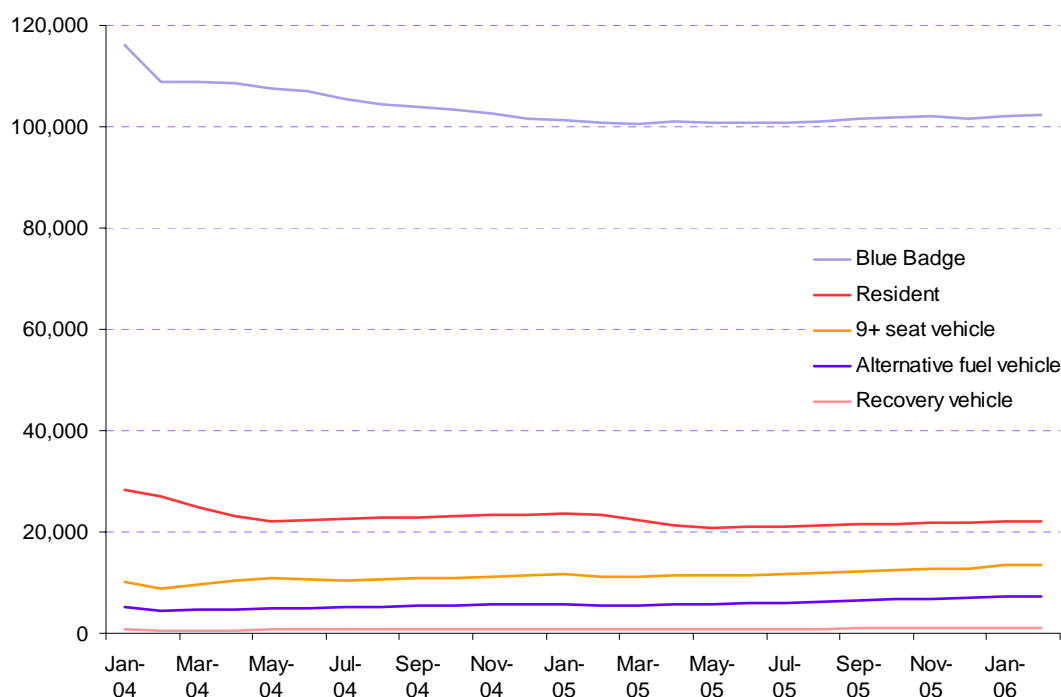
New leaflets have been developed specifically targeting newly registered residents and Blue Badge holders who had registered with Congestion Charging to help them understand how their discount works and providing handy tips to help them avoid receiving any unnecessary Penalty Charge Notices.

10.9 Registrations and discounts

Registration for the residents' 90 percent discount and the Blue Badge 100 percent discount have remained stable throughout 2005 while registration for 9+ seat vehicle and other, mainly alternative fuel, discounts have seen a slight increase.

The improved affirmation process for residents and 9+ seat vehicle discounts has resulted in a much simplified renewal procedure for these chargepayers.

Additional resident discount zones for the central London charging zone were introduced in December 2005. TfL notified the relatively small number of residents in these new areas of their ability to apply for the resident discount by first completing a door drop of leaflets and letters to all residential addresses in the areas. This was followed up by a named door drop to residents in the new discount zones.

Figure 10.5 Active discount accounts by type, January 2004 to January 2006.

In December 2004, the threshold for the minimum number of commercial vehicles in a fleet to be registered with TfL to be eligible for the fleet schemes was reduced from 25 to 10 vehicles. In April 2005 all vehicle types were allowed onto the automated scheme. The notification scheme, which was primarily aimed at fleets of cars, was closed down in October 2005 with all accounts transferred to the automated scheme.

The number of active fleet accounts increased by 50 percent during 2005, though the increase in usage (ie charges paid through this channel) was much less, at only 5 percent.

10.10 Frequency of chargepayer use of the scheme

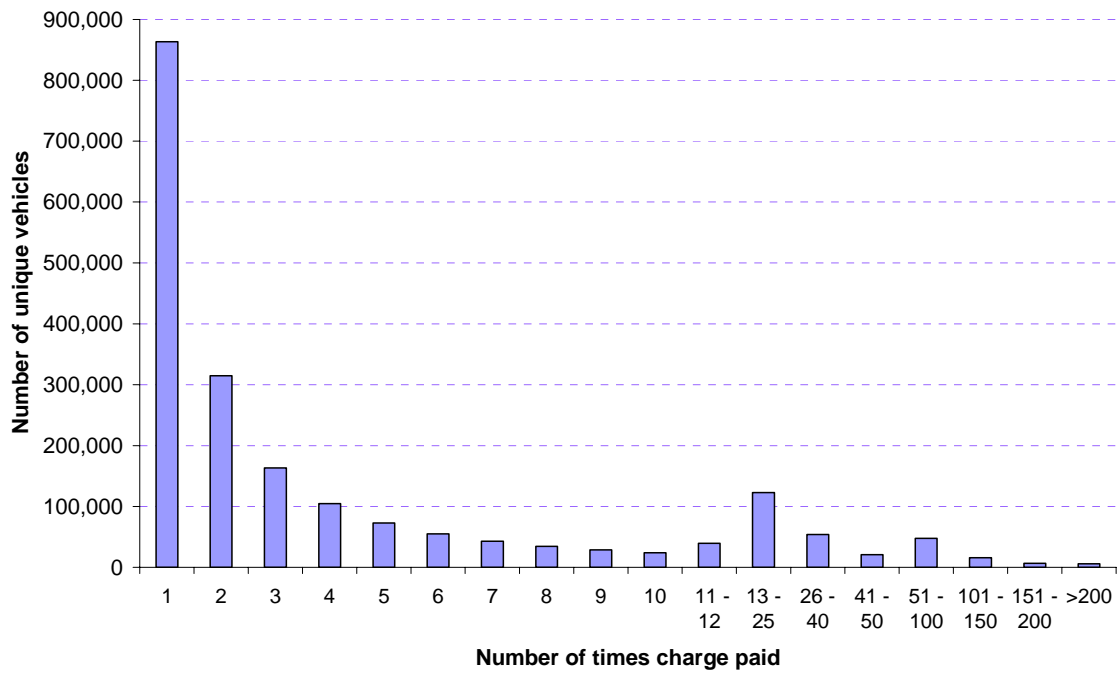
Research was carried out over the period June 2004 to July 2005 to establish the frequency of chargepayer activity in relation to the congestion charging scheme. This research was based on identifying the frequency with which payments were made for individual vehicles.

Figure 10.6 shows that the majority of chargepayers (who travelled to the charging zone at least once during the year) pay to travel into the charging zone on less than one occasion per month. 87 percent of unique vehicles for which a charge is paid average one payment per month or less. 43 percent only pay once during the year. Only 1.4 percent of charged vehicles are in the zone on an average of three or more days per week.

This distribution is not equivalent to the traffic data considered elsewhere in this report, since the relatively small number of unique vehicles in the more frequent payment categories will feature disproportionately in daily traffic.

10. Scheme operation, enforcement and compliance

Figure 10.6 Number of charge payments made by unique vehicles per year, July 2004 to June 2005.



Enforcement and Compliance

10.11 Background

There are no tollbooths or barriers around the congestion charging zone and no paper tickets or licences. Instead, drivers or vehicle operators pay to register their vehicle registration number on a database for journeys within the charging zone during charging hours for single or multiple charging days. Receipts (or receipt numbers) are available and on occasion are vital for proving payment of the charge for the correct vehicle on the date of travel.

Cameras at every entry and exit point, and at various points within the zone, capture images of vehicles within the charging zone during the hours of scheme operation (07.00 to 18.30) every charging day. The images are continually fed through to a central processing centre where automated number plate recognition systems interpret the characters on the number plate of every vehicle 'seen' by the cameras.

Once a registration number has been interpreted a complex process of confidence measurement of the images takes place. At the end of the charging day, only the best, highest quality interpretation of each individual detected vehicle is used for checking against the database of paid, exempt, 100 percent discounted or fleet vehicle registrations. Once a match against the database is made, the vehicle details and the images are automatically removed from the database. Images of all vehicles where there is no matching payment record on the database are then sent through to the next stage of the process. These are potential evaders.

By 02.00 on the next working day after the charging day, all the vehicle registration numbers for those vehicles where no payment match was made are sent to the Driver and Vehicle Licensing Agency using a web enabled interface developed in partnership by TfL and the Agency. By 07.00 on the same day the Agency supply TfL with the name and address of the registered keeper and vehicle details including the make, model and colour of the vehicle.

The final stage of the process, before the issue of any Penalty Charge Notice, involves a visual check of all the images of vehicles identified as potential evaders of the charge. Trained staff check that the camera systems have correctly interpreted the number plate. If there is any doubt, the image is rejected for re-interpretation or deletion.

Failure to pay the congestion charge or to register correctly for a discount results in a Penalty Charge Notice of £100 being issued to the registered keeper of the vehicle as supplied by the Driver Vehicle and Licensing Agency. This amount is reduced to £50 for prompt payment within 14 days. Failure to pay the Penalty Charge Notice within 28 days results in the issue of a Charge Certificate, and the amount due being increased to £150.

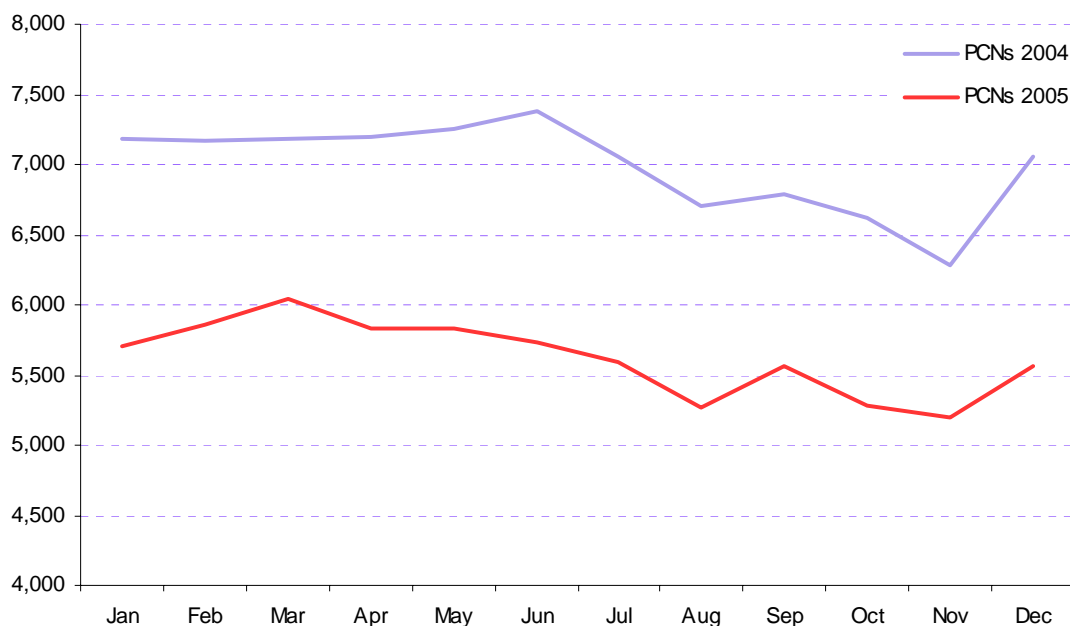
10. Scheme operation, enforcement and compliance

Should a chargepayer wish to challenge a Penalty Charge Notice, they are legally required to make a written representation to TfL. From the moment that a written representation is received by TfL, enforcement action is suspended until the matter is investigated. Should TfL reject the representation, the chargepayer is able to make an appeal against TfL to the independent Parking and Traffic Appeals Authority.

10.12 Penalty Charge Notices issued

The number of Penalty Charge Notices issued has continued to reduce throughout 2005. This continuing reduction can be attributed to greater chargepayer understanding of the operation of the scheme and the implications of not paying; reduced service provider and customer errors; fewer chargeable vehicles driving in the zone; and improved quality of service by Capita. Overall, 21 percent fewer Penalty Charge Notices were issued in 2005 compared to 2004.

Figure 10.7 Penalty Charge Notices (PCNs) issued, 2004 and 2005.



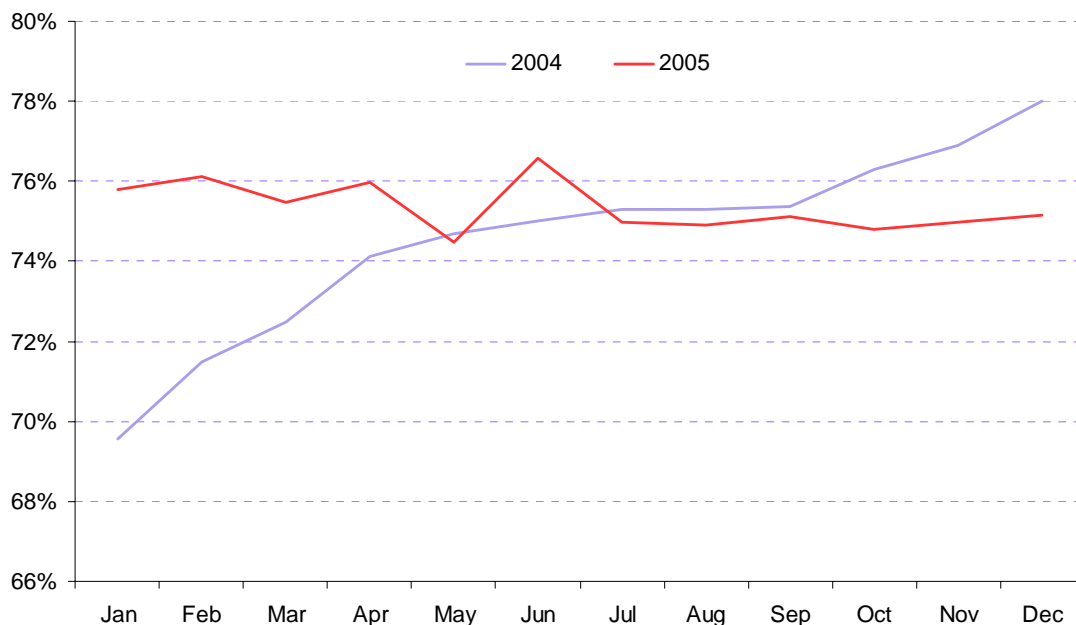
10.13 Penalty Charge Notices paid

Throughout 2005 the proportion of Penalty Charge Notices paid has remained consistently between 74 and 77 percent of all Penalty Charge Notices issued. Figure 10.8 is based on contravention date, and therefore Penalty Charge Notices recovered in the last few months of 2005 will increase over time to an anticipated average over the year of some 76 percent, compared to 75 percent in 2004.

This recovery rate for congestion charging Penalty Charge Notices compares favourably with that achieved by Local Authorities for similar civil debts such as parking offences. The remaining 24 percent of Penalty Charge Notices are cancelled as a result of an accepted representation or in the event that the

debt cannot be recovered as the keeper of the vehicle cannot be traced or is bankrupt or deceased.

Figure 10.8 Proportion of Penalty Charge Notices that were paid, 2004 and 2005.



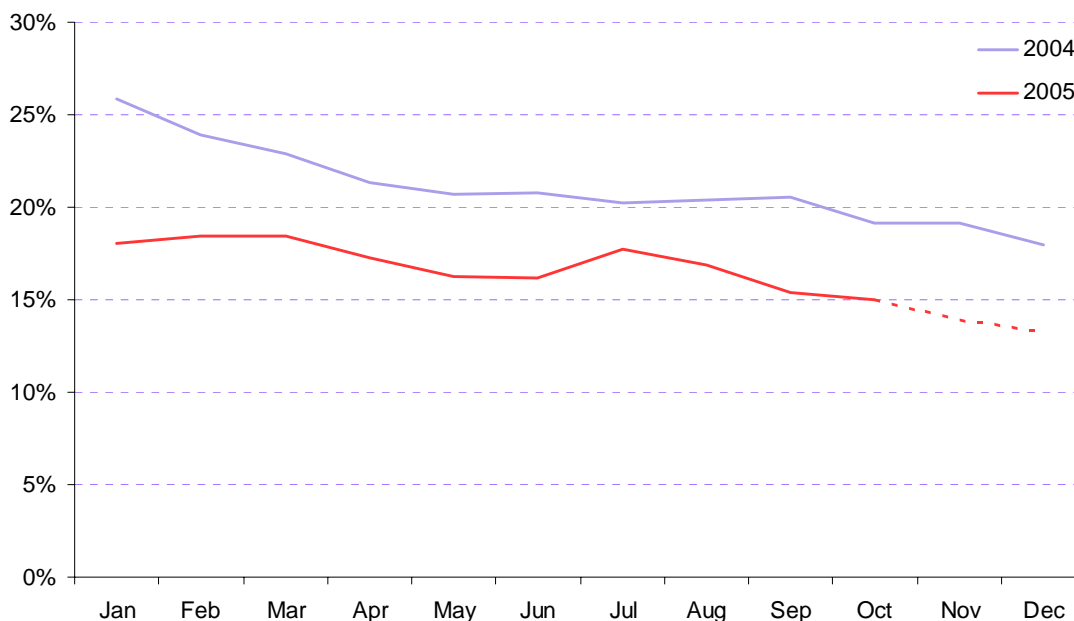
10.14 Representations made against Penalty Charge Notices

Every recipient of a Penalty Charge Notice has the right to challenge its issue through a written representation to TfL. A representation must be made within 28 days of the date of receipt of the Penalty Charge Notice by, or with the written permission of, the registered keeper of the vehicle.

The percentage of representations made against Penalty Charge Notices with a contravention date in 2005 is consistently below 18 percent.

Figure 10.9 is based on contravention date with almost all representations received within 5 – 7 months of the date of contravention. Data up to September 2005 are considered unlikely to change with minor increases expected for October through to December. An overall figure of 17 percent is expected for 2005. This percentage has fallen from a high of 64 percent in 2003 (21 percent in 2004) and reflects the improvements to, and increased understanding of, the scheme.

Figure 10.9 Representations received as a percentage of Penalty Charge Notices issued, 2004 and 2005.



The main reasons for representations being accepted or rejected in 2005 are listed below.

Representations accepted

- Vehicle sold before the date of offence – TfL accesses live data for the registered keeper as held by the DVLA and, as a result, Penalty Charge Notices can potentially be issued to the old keeper whilst the DVLA record is updated.
- Vehicle registration number payment error by chargepayer – TfL applies its discretion and normally accepts representations where chargepayers can prove that they made an innocent mistake in providing their vehicle registration mark when paying for the charge.
- Hire company transfer of liability – TfL will transfer liability for the penalty if a hire company provides evidence to support claims that the penalty was incurred by a chargepayer whilst the vehicle was on hire.

Representations rejected

- No charge/insufficient evidence – TfL will only normally accept a representation if sufficient evidence is provided and will not normally accept a representation from chargepayers who simply forget to pay.
- Representations are often rejected when a hire company is unable to provide sufficient evidence in the form required by Government Regulations that govern the transfer of liability from hire company to hirer. This protects TfL from re-issuing Penalty Charge Notices and then receiving complaints and representations from innocent motorists who did

not in fact hire the vehicle on the date of offence as indicated by the hire car company.

- Unplanned entry into zone – TfL will not normally accept representations from those who claimed they did not intend to travel into the zone, did not see the numerous signs, road markings etc. However, diversions introduced by the police or Local Authority are recognised.

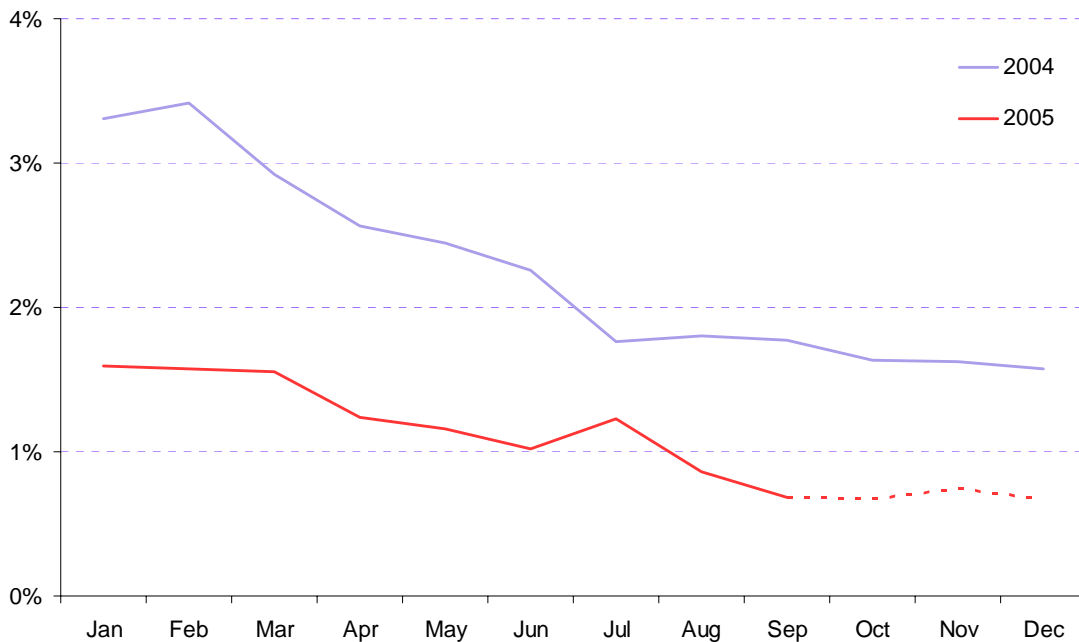
10.15 Appeals

The keeper of any vehicle that is the subject of a representation that TfL has considered but rejected may appeal against this decision to the Parking and Traffic Appeals Service (PATAS). All appeals are considered by independent adjudicators.

The volume of appeals received consistently reduced throughout 2003 and 2004 with further reduction throughout 2005. In 2005, some 1.2 percent of Penalty Charge Notices issued resulted in an appeal and on average 78 percent of appeals were determined in favour of TfL.

Figure 10.10 is based on contravention date with almost all appeals received within 5 – 8 months of the date of contravention. Figures up to August 2005 are not expected to change. Minor increases are expected for the period September to December as a result of some additional late appeals. The annual average appeal rate for 2005 is expected to be 1.2 percent.

Figure 10.10 Appeals received as a percent of Penalty Charge Notices issued, 2004 and 2005.



10.16 Debt collection and persistent evasion

Where a Penalty Charge Notice remains unpaid and there is no outstanding representation or appeal then the debt is registered at County Court and a warrant is passed to bailiffs for recovery of the debt. The registration process does not result in a County Court Judgement or contribute to credit history or credit ratings. The use of these measures to recover unpaid penalties is a last resort which TfL would rather not have to use but which is necessary to ensure that those who fail to pay the initial charge or penalties arising from non-compliance are pursued where possible.

As at December 2005 some 571,000 warrants had been issued to bailiffs since the start of the scheme. The number issued in 2005 was 245,000. TfL have four contracted bailiff companies who, through the warrant, have the power to seize goods to the value of the debt outstanding plus a defined set of additional fees incurred in the recovery of the debt. Since the start of congestion charging in February 2003 an average of 15 percent of warrants issued have resulted in payment, which is comparable with the recovery rate by bailiffs collecting unpaid parking and bus lane penalties.

In addition to bailiff recovery, TfL also carries out on-street enforcement using its powers to clamp and remove vehicles that are persistent evaders of the charge. A persistent Penalty Charge Notice evader is defined as a vehicle that has three or more outstanding Penalty Charge Notices with no representation or appeal outstanding. The on-street enforcement service is also effective in the enforcement of vehicles that are not registered with the Driver Vehicle and Licensing Agency.

As detailed earlier, TfL's ability to effectively identify and enforce against persistent evaders improved in 2005 through the introduction of the 'Locust Van'.

In addition to the clamping and removal of vehicles kept by persistent evaders and vehicles not displaying a valid tax disc, TfL's Congestion Charging Division and its service providers are actively involved in periodic on-street 'Filter' operations with Transport Policing and Enforcement Directorate, the Metropolitan Police and other enforcement agencies such as the Driver Vehicle and Licensing Agency and the Vehicle Inspectorate. Such exercises co-ordinate intelligence-led enforcement activities to target vehicles that are of interest to TfL, the police and the other enforcement agencies. The total number of vehicles clamped and removed during 2005 was 1,126.

From September to December 2005 operations were carried out which resulted in the identification of 190 persistent evaders and 44 vehicles with tampered number plates, no valid insurance or no valid tax disc.

The exercises have also proved helpful to the police in the identification of more serious criminal activity such as burglary, assault, drug related crimes and weapons. TfL expects the joint exercises to continue throughout 2006 with increasing effectiveness.

11 Monitoring an extended congestion charging zone

11.1 Introduction

This section sets out the main elements of the planned monitoring programme for the extended central London congestion charging zone for the next five years. It considers TfL's proposed approach to monitoring the western extension area as well as the ongoing monitoring of the current central London charging zone. It also provides an early indication of conditions within the extension zone, in advance of a full baseline analysis to be published in the *Fifth Annual Monitoring Report*, to be published in 2007.

Extending the central London congestion charging zone

In September 2005, the Mayor of London confirmed the Scheme Order for the extension westwards of the central London congestion charging zone. The extension will be bounded by Harrow Road (with a number of deviations), the West Cross Route, the inner southbound arm of the Earls Court One Way System and Chelsea Embankment. There will be no charge for using these boundary routes, and also no charge for using the elevated section of the A40 (Westway) and the western arm of the Inner Ring Road (Edgware Road, Park Lane, Grosvenor Place and Vauxhall Bridge Road).

Figure 11.1 Kensington High Street, Kensington, a main shopping street within the western extension to the congestion charging zone.



11. Monitoring an extended congestion charging zone

Figure 11.2 The extended central London congestion charging zone.

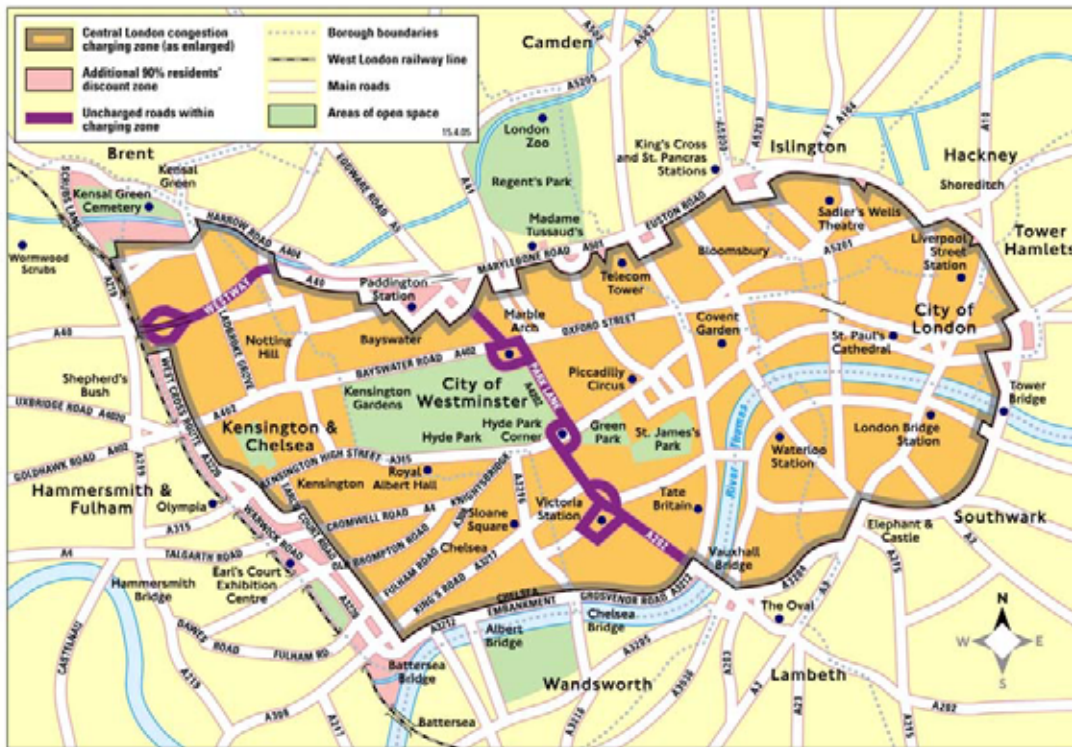


Figure 11.3 Map comparing extended central London congestion charging zone to Greater London.



The Scheme Order includes provision for the residents' discount to apply to the area inside the outer arm of the diversionary route where this differs from the location of the extended zone boundary. In addition, there are three further extensions to the residents' discount zone to alleviate potential parking and severance issues:

- The area between Grosvenor Road and the river Thames.
- Houseboats moored on the Thames west of Battersea Bridge.
- The area between the outer (northbound) arm of Earls Court One Way System and the West London rail line.

To coincide with the western extension becoming operational, the finish time for charging within the whole of the enlarged charging zone will move back to 18.00.

Monitoring the extended zone

A key component of the western extension of the congestion charging zone is a comprehensive programme of impacts monitoring. This will allow actual impacts to be measured; provide early indications of any problems that might arise; and contribute to the ongoing assessment and review of the performance of the scheme.

Full baseline data collection for the extended zone commenced in early 2006, running concurrently with on-going monitoring of the existing central London scheme. Monitoring of the extended scheme is planned to continue for a further four years – to 2010 in the first instance.

The monitoring arrangements applicable to the central London scheme were described in TfL's *First Annual Monitoring Report* and have been updated, where necessary, in subsequent Annual Reports. In general, these arrangements have proven satisfactory. Therefore, the overall approach to monitoring the extension is to extend these arrangements to cover the key areas, issues and quantities of interest in the extended zone, revised where appropriate to build on lessons learned from the central scheme monitoring work and to accommodate local issues.

Design of the monitoring programme has also taken account of comments received during the public and stakeholder consultations on the extension undertaken in 2004 and 2005.

The western extension, and the new charging finish time of 18.00, will have implications for conditions in the existing central zone. Indeed, following the implementation of the extension, the combined scheme will operate as one extended charging zone. Key implications for the central zone monitoring arrangements are also therefore summarised.

Impacts monitoring work packages

The aim of the monitoring programme will be to achieve a robust understanding of scheme impacts in the following five areas:

- Impacts on road traffic volumes and road network performance.
- Impacts on public transport operations and travel behaviour.
- Impacts on people in general and specific groups in particular.
- Impacts on the economy, in general and in relation to specific activities.
- Impacts on the environment, principally air quality.

The content of each of these monitoring work packages is outlined below, illustrated with some examples of the data and key indicators that will be available. The monitoring reports will also cover scheme revenues, scheme operations and enforcement to ensure that all aspects of the extended scheme and its ongoing operation are appropriately monitored and disseminated.

The monitoring programme is intended to be flexible in its scope, and it is expected that the scope and coverage of the work will evolve over time in response to emerging interests and requirements.

Structure and management of the impacts monitoring programme

The impacts monitoring programme will be managed by a team of permanent TfL staff, with independent contractors undertaking many of the data collection elements. It is anticipated that key indicators relating to the operation and enforcement of the western extension will arise primarily from the service providers for the scheme.

The monitoring programme takes place within the wider context of other existing or planned monitoring work in London. This means that, as with the existing central London scheme, much of the monitoring programme will involve the collation of data from external sources, either from within the TfL and GLA family, or from outside.

Publications strategy

Impacts monitoring outputs will be published in definitive Annual Reports, commencing with a comprehensive statement of pre-extension conditions, to be published in 2007. Reports will be published in hard copy and on the internet. It is anticipated that a series of 'interim bulletins' will be produced over the first 18 months of the extension scheme to give early indications of scheme impacts.

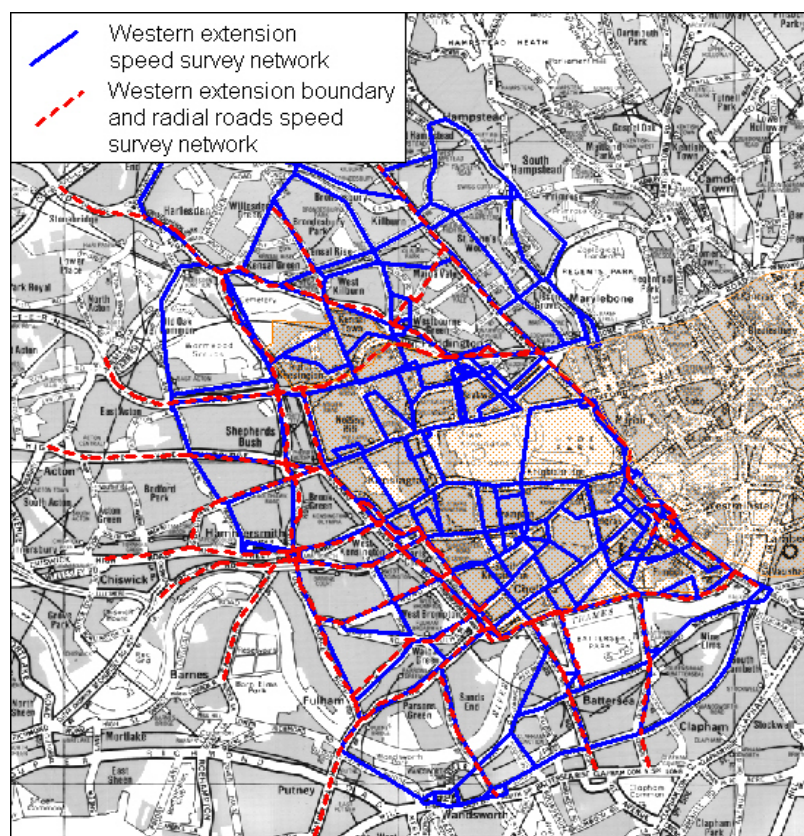
11.2 Traffic congestion and journey time reliability

Reduced congestion is the primary objective of the extension. Congestion is defined in terms of additional, or 'excess' delays, expressed in terms of a travel rate over and above that which would be experienced under uncongested conditions.

Moving car observer surveys

Moving car observer surveys of congestion, whilst limited in terms of statistical precision, have provided a good time-series dataset for the central zone. New surveys have been developed for the extension zone, operating on a continuous basis from the start of 2006. These comprehensively cover the extension zone, the boundary roads and a wider 'annulus' of inner London surrounding the extension zone (Figure 11.4).

Figure 11.4 Map of the western extension speed survey network.



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These surveys will operate in conjunction with the continuing central London scheme surveys and will provide the primary indicator of congestion for the extended central London scheme.

Automatic number plate recognition camera data

Vehicle number plate data, available as a by-product of the scheme enforcement process, will be adapted to give a secondary indicator of congestion, taking full account of data protection considerations. In this case, two sets of cameras are expected to be used. The first set, monitoring-only cameras, use simple semi-fixed, non-evidential cameras. These are already in place and generating data. The second set would comprise enforcement cameras when these become available closer to the implementation date of the extension. These two sets of cameras would operate in a similar way to, and in conjunction with, existing central zone cameras.

ITIS Data

Data from ITIS, a satellite-based vehicle tracking system, offers many possibilities for enhancing our understanding of congestion trends, mainly by virtue of the volumes of data potentially available. It is planned to develop a series of ITIS based indicators for networks across the extended zone. These would provide additional data and allow a greater depth of analysis of specific issues such as localised congestion changes. The characteristics of these data are described in Section 3.

Indicative findings

Congestion occurs when vehicles impede the progress of other vehicles. Congestion intensifies as the amount of traffic on the network (measured as vehicle-kilometres) increases. It is experienced as delay (measured as vehicle-minutes) by road users. When there is very little traffic on the road network, 'free-flow' conditions are said to apply. In practice, night-time conditions are used to derive the 'free-flow' travel rate.

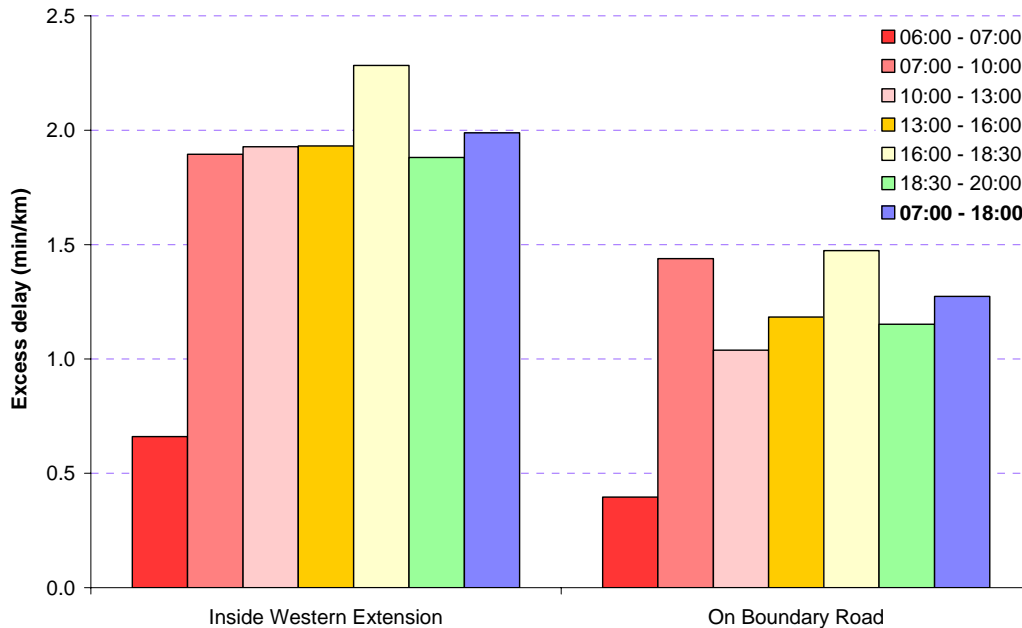
Congestion, or 'excess delay', is the amount of time spent travelling over and above that under 'free-flow' conditions, and is measured as minutes per kilometre. It is experienced by road users mainly as time spent in queues at junctions.

It is important to note that on policy, economic and operational grounds, it is not desirable to remove all congestion from a road network. A precise 'optimum' level of congestion is difficult to determine, but in central London during weekday charging hours is likely to be about half the level prevailing without charging.

Moving car observer congestion surveys carried out in the western extension at intervals between Autumn 2003 and 2005 show that the average excess delay inside the western extension area is around 2 minutes per kilometre and the average speed is 17 kilometres per hour. In comparison, observed excess delays in the charging zone during charging hours are now typically 1.7 minutes per kilometre. Note that different values for 'free-flow' conditions apply to the two networks, and that the PM peak period has been adjusted to reflect the changed charging hours that will apply to the extended charging

zone (Figure 11.5).

Figure 11.5 Average excess delays by time of day (minutes per kilometre) in the western extension, all available moving car observer surveys 2003-2005.



11.3 Traffic patterns

With minor adaptation, traffic volume surveys already in place for the central zone would continue. These would measure trends in traffic volumes in the existing central zone and any 'consequent' effects of the extension on this area. A range of new indicators would be developed to monitor traffic volume changes in the western extension zone. As in the central zone, a combination of automatic traffic counts and manual classified counts would be used, each to best effect.

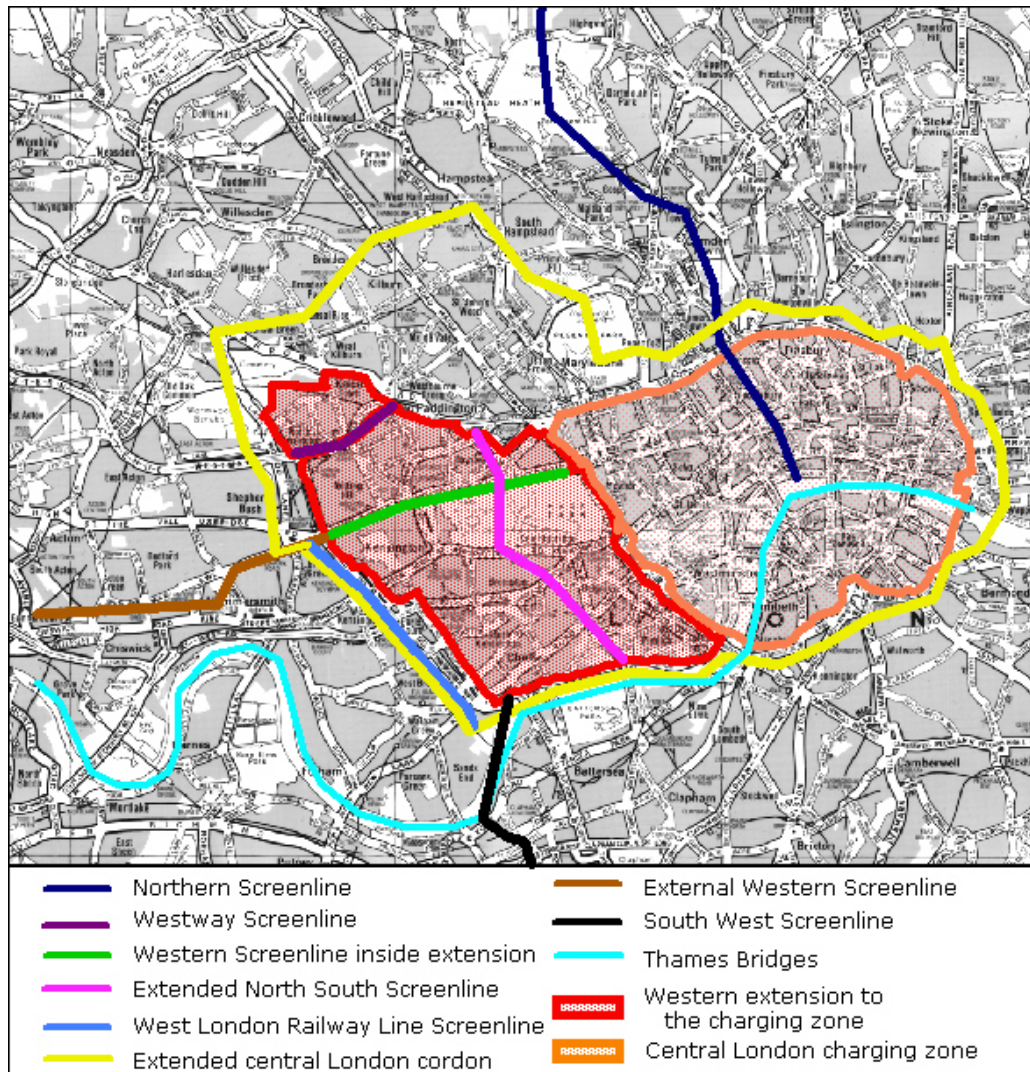
The following western extension-specific traffic change indicators would be measured:

- Entering and exiting traffic (boundary crossing counts, automatic and manual classified counts).
- Circulating traffic (using internal screenlines and an indicative vehicle-kilometre based estimate).
- Traffic volumes on the boundary routes and alternative nearby orbital routes (automatic and manual classified counts).
- Traffic on the 'free through route', from the Westway to Vauxhall Bridge.
- Radial traffic approaching the extended charging zone, across two cordons, one just outside the boundary, and one further out running through inner west London.
- Orbital traffic moving around the extended zone across a series of radial screenlines.

11. Monitoring an extended congestion charging zone

- Traffic on local roads, generally via additional automatic counters in collaboration with host boroughs.

Figure 11.6 Principal cordons and screenlines used for traffic monitoring.



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In relation to the existing central London charging zone, the following would feature:

- Maintenance of existing arrangements for boundary crossing and internal traffic, increasing frequency of surveys around the date of implementation of the western extension.
- Maintenance of existing arrangements for the remainder of the Inner Ring Road and for measuring traffic on local roads surrounding the charging zone.
- Supplementary surveys along the eastern side of the 'free through route' to measure trips made between the existing and extended areas of the charging zone.

The smaller scale traffic impacts forecast for the western extension generally require more frequent counts. These, in turn, are best directed to higher-flow links. The general approach to counting western extension-specific indicators would therefore be to partially count each up to six times per year. These would allow both 'conventional' annualised indicators and a series of 'period-specific' indicators more appropriate for assessing short-term effects. Established indicators for the existing zone would be aligned with these where feasible, giving a corresponding set of indicators for the full extended zone.

Particular attention would be paid to local traffic impacts that are likely to be of specific interest. The following are examples:

- The White City development.
- Developments around Paddington.
- Thames Bridges.
- Non-adjacent orbital routes (eg Hammersmith Gyratory).
- The new 18.00 finish to charging hours.

Indicative findings

Traffic counts carried out in the western extension area show that, at present, 217,000 vehicles with four or more wheels enter the western extension zone on a daily basis during charging hours. Table 11.1 shows the projected impact of the charging zone extension on traffic levels, by vehicle type.

Table 11.1 Traffic entering western zone before and after introduction of an £8 congestion charge 07.00 to 18.00.

		Cars	Vans	Lorries	Potentially chargeable vehicles	Taxis	Buses, Coaches	Total 4(+) wheeled vehicles
Current conditions (modelled)	CZ payers	56,000	14,000	5,000				
	Non CZ payers							
	-Terminating	41,000	11,000	2,000	54,000			
	-Through	21,000	6,000	1,000	28,000			
	-Exempt/discounted	17,000	2,000					
	Total	135,000	33,000	8,000	82,000	33,000	8,000	217,000
Post-charging (modelled) lower sensitivity	CZ payers	56,000	14,000	5,000				
	Non CZ payers							
	-Terminating	23,000	11,000	2,000	36,000			
	-Through	9,000	4,000	1,000	14,000			
	-Exempt/discounted	17,000	2,000					
	Total	106,000	31,000	8,000	50,000	36,000	9,000	189,000
	% change	-22%	-6%	0%	-39%	9%	10%	-13%
Post-charging (modelled) higher sensitivity	CZ payers	55,000	13,000	5,000				
	Non CZ payers							
	-Terminating	17,000	10,000	2,000	29,000			
	-Through	7,000	4,000	1,000	11,000			
	-Exempt/discounted	17,000	2,000					
	Total	96,000	29,000	7,000	40,000	37,000	9,000	178,000
	% change	-28%	-12%	-3%	-51%	10%	15%	-17%

Note: figures have been rounded.

11.4 Public transport

Underground

Changes to Underground patronage and revenue will continue to be monitored using the same datasets and time periods currently in place for the central London scheme, disaggregated to cover western extension related indicators in detail. Patronage changes are monitored through average passenger exits and entries over four-weekly periods during the morning peak period and charging hours. Trends in average revenue taken at the same stations over the same four-weekly time periods will be included for comparison.

Stations within the extended charging zone are currently included in the group termed 'Remainder of Fare Zone 1'. Stations of particular interest will be included in one of four new key groups:

- inside central zone;
- inside extended area;
- boundary;
- remainder of Fare Zone 1.

National Rail

The observed net change in National Rail patronage corresponding to the introduction of the central London scheme was small. Nevertheless, full counts of rail passengers will be undertaken at stations within or immediately adjacent to the western extension area. Initial counts were undertaken during Spring 2006, and will be repeated during comparable periods in 2007, after the extension is implemented. National Rail counts are undertaken between 06.00 and 20.00 for passengers travelling outbound from the zone and between 07.00 and 10.00 for passengers arriving in the zone by National Rail.

Bus

To determine the trends in bus service supply and patronage corresponding to the implementation of the extension zone, a comprehensive programme of cordon of counts will be undertaken before and after the implementation of the extended scheme. These surveys will include:

- Full counts of stage buses and passengers entering the extended zone.
- Counts at the eastern side of the 'free through route' boundary to measure any changes in the number of passengers entering the central zone due to increased patronage from the extension zone.
- Counts at a selected number of the busier sites within the extension zone in order to determine how buses are coping with any increased patronage.

Indicators of bus reliability and journey time trends will continue to be provided on a rolling four-weekly basis. These data will be provided for the following geographical areas, as at present:

- central;
- Inner Ring Road;
- other inner;
- outer;
- network-wide average.

Additionally, new analysis will be carried out in parallel including additional geographical areas. The size of these will depend on available data but could include for example:

- western extension;
- Inner Ring Road West;
- Inner Ring Road East;
- 'free through route'.

11.5 Travel behaviour change

A comprehensive understanding of travel behaviour change in relation to congestion charging is highly desirable but difficult to achieve. The implications of travel behaviour change on people's wider lives, budgets and well-being can never be fully understood in the absence of a comprehensive understanding of those changes.

The group of most specific interest will be change by those who drove to, within or through the western extension area before the introduction of the extended charging zone. There are many other interests that can also be addressed under this heading, such as the dynamics of modal shift, business travel implications and the effect of the extended residents' discount zone on travel to the existing central zone.

A survey framework along the following lines is planned:

- Good 'segmentation' of travellers to, within and through the western extension area, achieved primarily through a comprehensive programme of roadside interviews, focused around the boundary, including the 'free through route'.
- Measurement of volume and (travel) segment change via repeated surveys, together with the development of a 'context' framework for estimating total effects.
- Use of respondents from roadside interviews to develop a suite of 'panel surveys', each focusing on one specific aspect of travel behaviour change (but collectively building into a comprehensive picture). For example, travellers on business by economic activity sector, taxi users, those benefiting from the 'inter-available' residents' discount.

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- Use of ITIS traffic speed/congestion data and (forthcoming) estimates of chargepayer compliance costs to enable a segment-specific estimation of overall costs and benefits.

As well as serving specific travel behaviour related requirements this work would interface directly to two other important considerations. The first would be to provide a sample frame for studies, for instance, of potential the impact of the extension on potentially-vulnerable groups. The second would be to provide a sample frame for work to quantify the costs and benefits to business-related travel segments. In both cases, it would be possible to quantify findings in terms of travellers directly impacted by the extension.

11.6 Social impacts

Social impacts can be defined as the effects that the extension to the scheme has on people and communities particularly in relation to access to services; social behaviour and available time; and the cost of living and financial hardship. An understanding of the social impacts of the scheme can help to explain trends observed elsewhere in the monitoring work, and contribute to an informed assessment of the contribution of the scheme to the daily lives of Londoners.

The social impacts of the western extension will be monitored primarily by two surveys, to be carried out at regular intervals before and after the implementation of the scheme. These are:

- A survey of 'Londoners' – to provide a representative sample of those living within the M25, which can be disaggregated to be representative of smaller sub areas. This will provide a set of standard indicators that can be tracked over the series of surveys, whilst remaining flexible enough to incorporate emerging areas of interest. The sample will be a cross-sectional survey, re-drawn for each survey wave.
- A survey of 'western extension users', those that travel into and within the western extension – to provide robust trend and change data, by tracking the same panel of individuals, before and after charging. This will also be able to track responses to standard questions, whilst remaining flexible enough to incorporate emerging areas of interest.

The surveys are by their nature large scale and quantitative. This can provide a statistically reliable response, but limits the amount of 'exploration' that can be carried out into the reasons behind individual responses. Additionally, it is recognised that some groups within the population may be affected more than others, and that some of these groups may be hard to reach through the main surveys. A further programme of small-scale and mainly qualitative surveys will be put in place to monitor the impacts on particular groups and explore responses in depth.

In the first instance, these are likely to incorporate surveys of key public sector workers; shift workers; people with disabilities and their carers; ethnic minority, religious and cultural communities; boundary residents; and tourists

and one-off visitors. This part of the survey programme will be flexible enough to incorporate emerging issues, and is likely to include follow-up work from the main surveys.

11.7 Economic and business impacts

Achieving robust estimates of the nature and scale of any impacts on business activity is difficult as there are limited data available that will allow the detection and attribution of these effects against the backdrop of more general economic trends.

TfL has developed the planned business and economic monitoring programme in collaboration with GLA Economics, and will continue to build on the relationship between the two organisations.

The planned programme incorporates the following elements:

- Development of a quantitative approach to segmentation of business travel, and measurement of costs and benefits, through an extensive road side interview-based recruitment exercise and other surveys.
- A review of available 'assessment frameworks' with a view to developing one suitable for more closely quantifying the impacts of congestion charging on business.
- Development of new indicators for the western extension area for retail, activity, business turnover, and property prices, alongside established similar indicators for the central zone and appropriate 'control' areas.
- Closer liaison with the business community through the established and GLA-led Business Reference Group, providing feedback and a 'sounding board'.
- Surveys of visitors to shops, restaurant and other shop front service providers (such as hairdressers, banks and so on) in the western extension area, to be carried out before and after the implementation of the extended zone.
- Surveys of businesses in the current charged area, the western extension area and related 'control' areas to investigate the perceived impacts of congestion charging on business performance among those operating locally.

In addition, a number of quantitative case studies are being examined, to gather specific information on interventions or issues that are likely to be significant over the timescale of the monitoring.

Key among these is the possible effect of the White City development on retail activity. Alongside specific traffic surveys identified above, comprehensive footfall and turnover based indices at the site, together with corresponding 'vulnerable' sites within and outside of the western extension area, will be involved. Other candidates for case study research include key retail sites in the western extension, boundary business effects and the leisure/tourism sector.

Economic characteristics of the western extension

The business population of the western extension zone is significantly different to the existing central London charging zone. The Annual Business Inquiry in 2004 indicated that the number of business units in the western extension area was about 27 percent and the number of employees around 18 percent that of the existing charging zone (Table 11.2).

Table 11.2 Employees and business units, Annual Business Inquiry 2004.

	Western extension area	Existing charging zone	Greater London zone
Number of business units	21,692	81,667	365,126
Employee jobs	218,477	1,235,257	3,953,351

Source: Annual Business Inquiry, December 2005.

The business sector composition of the two areas is also significantly different in terms of employee jobs, as shown in Table 11.3.

Table 11.3 Employee jobs by business sector, Annual Business Inquiry 2004.

	Western extension area		Existing charging zone		Greater London zone	
	Employee jobs	% of zone	Employee jobs	% of zone	Employee jobs	% of zone
Primary and utilities	988	<1	3,406	<1	11,139	<1
Manufacturing	6,317	3	41,242	3	215,591	5
Construction	2,106	1	13,733	1	119,125	3
Wholesale	5,752	3	34,063	3	212,190	5
Retail	30,181	14	73,886	6	379,905	10
Hotels and restaurants	35,682	16	95,681	8	289,125	7
Transport and communications	11,048	5	86,612	7	305,210	8
Financial and business services	61,539	28	604,896	49	1,249,903	32
Public administration	14,095	6	85,529	7	229,987	6
Education and health	32,624	15	99,515	8	665,798	17
Other services	18,145	8	96,694	8	275,378	7
Total	218,477	100	1,233,257	100	3,953,351	100

Source: Annual Business Inquiry, December 2005.

The western extension area is relatively under-represented in sectors such as financial and business services compared to the existing charging zone; and is over-represented in sectors such as retail, hotels & restaurants, and other services.

TfL's Economic and Business Impact Assessment of the western extension to the congestion charging zone concluded that, overall, the net aggregate economic and business impacts of the western extension would be broadly

neutral. Table 11.4 shows the anticipated potential economic impact by business sector.

Table 11.4 Potential aggregate impact of the western extension by business sector.

Business sector	% area jobs	Potential net aggregate business impact
Primary & utilities	<1	Negligible
Manufacturing	3	Negligible
Construction	1	Neutral
Wholesale	3	Neutral
Retail	15	Marginal negative impact
Hotels & restaurants	17	Marginal negative impact
Transport & communications	6	Positive impact
Financial & business services	25	Marginal positive impact
Public administration	4	Neutral
Education & health	15	Neutral
Other services	11	Marginal negative impact

11.8 Environment

Although expected to be small in scale, the air quality impacts of the western extension will be of interest.

As with the existing central London scheme, air quality impacts will be assessed in two ways. The first is to use observed traffic change data to calculate emissions change through the established London Atmospheric Emissions Inventory framework. The second is to use data from existing air quality monitoring sites located in and around the extended charging zone. In this regard, the extended charging zone is relatively well provided for. Taking into account the particular requirement here for lengthy baselines of pre-implementation data, no additional monitoring sites are proposed.

Existing TfL noise survey sample sites, measured annually, in and around the extended charging zone will continue to be surveyed to provide indications of any significant changes in local noise climates that may have arisen from the extension, although the available evidence from the central zone suggests that this is unlikely to be significant.

Perceptions of changed environmental quality of residents and travellers within the extended zone will be addressed through the social impacts framework described above.

11.9 Accidents

Road and traffic accident data will continue to be available on a monthly basis through the TfL Road Safety Unit.

The standard geographical areas reported will be restructured to include;

- central zone;
- extension zone;
- Inner Ring Road West;
- Inner Ring Road East;
- 'free through route';
- rest of London.

11.10 Boundary effects

As with the existing central London scheme, most elements of the monitoring programme will have a boundary-related dimension. Examples include the extension of traffic and congestion surveys to comprehensively cover the area outside the extended charging zone, and the inclusion of 'boundary' and 'control' areas into the economic and business research. Owing to the diversity of local issues and locations around the boundary of the western extension, it is considered that monitoring of boundary impacts is best taken forward through extension of general surveys to cover the boundary, coupled with specific studies of issues of particular interest (eg the White City development). It is not therefore proposed to designate a 'boundary case study' area in relation to the western extension, although existing activity in relation to the central zone in Islington and Hackney will continue.

One aspect of boundary conditions that will require particular attention is changes to parking behaviour and supply. Surveys to address this are being developed, and these would most appropriately be taken forward on an area-specific basis.

11.11 Scheme revenues

An important impact of the extended scheme is the surplus revenues it generates. By law, these must be spent on measures to further the Mayor's Transport Strategy in accordance with an appendix to the Scheme Order approved by the Secretary of State for Transport. TfL is required to report every four years to the Secretary of State on the expenditure of scheme revenues.

The cumulative costs and revenues of the extended scheme and an indication of the allocation of net revenues to transport programmes will be reported in due course.

11.12 Scheme operation and enforcement

Data describing aspects of the operation and enforcement of the extended congestion charging zone will become available from service providers for the scheme and be reported in due course. These data will cover the following broad areas:

- Service provision and performance of the main service provider, including the quality of service at the call centre and via other payment and information channels, such as the web.
- Congestion charge payment trends, broken down by full and discounted charge payments, and by method of payment; and trends in registration for discounts including the fleet scheme.
- Trends in Penalty Charge Notice issue and payments; representations and appeals; and debt collection and persistent evasion.

Glossary

ANPR	Automatic number plate reading
Dun & Bradstreet	Dun & Bradstreet Limited
DVLA	Driver and Vehicle Licensing Agency
Ernst & Young	Ernst & Young Limited Liability Partnership
Experian Business Strategies	Experian Business Strategies Limited
GLA	Greater London Authority
GPS	Global positioning system
Investment Property Databank	Investment Property Databank Limited
ITIS	ITIS Holdings Public Limited Company
IVR	Interactive voice response
MCO	Moving car observer
NCP	National Car Parks Limited
PCN	Penalty Charge Notice
SMS	Short Message Service
SPSL	Solution Products Systems Limited
TfL	Transport for London
The Beta Model	The Beta Model Limited
VAT	Value Added Tax