Transport for London

Central London Congestion Charging

Impacts monitoring

Fifth Annual Report, July 2007

MAYOR OF LONDON

Transport for London

CCS0000129718

Table of contents

Overview

Part 1: Recent developments with the central London congestion charging scheme

Overview

Congestion charging was introduced into central London in February 2003. In February 2007 the original central London congestion charging zone was extended westwards, creating a single enlarged congestion charging zone.

Congestion charging contributes directly to the achievement of four of the Mayor's transport priorities, as set out in the Mayor's Transport Strategy:

- 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.

Furthermore, by reducing traffic levels it has also contributed to reduced vehicle emissions. It also generates net revenues to support the Mayor's Transport Strategy more generally.

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

In June 2003 Transport for London (TfL) published the *First Annual Impacts 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 and understood. 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.

The *Second Annual Impacts Monitoring Report* was published in April 2004 and described the available information on the impacts of the scheme after approximately one year of operation.

TfL's *Third and Fourth Annual Impacts Monitoring Reports* were published in 2005 and 2006. These updated and extended the assessment of the impacts of congestion charging based on two and three further years of data following the start of the scheme.

This *Fifth Annual Impacts Monitoring Report* draws on the most recent data for 2006, reflecting four years of operation of the scheme, alongside previously published findings. It is in three parts.

- Firstly, it extends and consolidates the body of knowledge and understanding now available in relation to the original central London scheme, enabling commentary on the development of post-charging trends and the significance of charging to them, as well as comparisons with conditions before charging started in 2002. It also provides a fuller analysis and valuation of the benefits of the original congestion charging scheme in central London.

- Secondly, it also provides details of the monitoring approach adopted by TfL for the western extension scheme, and sets out key indicators describing conditions before the implementation of the extension across the range of monitoring indicators involved. It builds on experience with the original scheme.
- Finally, it also allows consideration of some early findings from the monitoring work following the introduction of the western extension in February 2007. These emerging results generally accord well with TfL's expectations for the extension of the scheme.

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

Part 1

Developments in the original central London congestion charging zone during 2006

- During 2006, congestion charging 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 2006. Traffic entering the charging zone (vehicles with four or more wheels) was 21 percent lower than in 2002, creating opportunities over this period for re-use of a proportion of the road space made available.
- Traffic circulating within the zone and on the Inner Ring Road, the boundary route around the zone, remained comparable to previous years following the introduction of the scheme.
- During 2006, TfL has observed a sharp increase in congestion inside the central London charging zone. This has occurred despite the fact that traffic levels have continued to remain stable. Congestion levels are being influenced by an increase in activity that has affected the capacity of the road network for general traffic – particularly an increase in roadworks in the latter half of 2006, notably by utilities.
- In addition, there is some evidence, as first reported in TfL's *Fourth Annual Impacts Monitoring Report*, of a longer-term 'background' trend of gradual increases to congestion. This is likely to reflect a combination of traffic management programmes that have contributed to fewer road traffic accidents, improved bus services, a better environment for pedestrians and cyclists, and improvements to the public realm and general amenity. But these interventions have also reduced the effective capacity of the road network to accommodate general vehicular traffic.
- The impact of congestion charging therefore needs to be assessed in this context. The reduced levels of traffic mean that, when compared to conditions without the scheme, congestion charging is continuing to deliver congestion relief that is broadly in line with the 30 percent reduction achieved in the first year of operation.
- The factors discussed above mean that a comparison of congestion levels in 2006 against pre-charging baseline is potentially misleading. However, carrying this comparison through, congestion was 8 percent lower in 2006.

- The scheme generated net revenues of £123 million in 2006/2007 (provisional figures). These are being spent on transport improvements across London, in particular on improved bus services.
- Public transport continues to successfully accommodate displaced car users; and bus services continue to benefit from the reduced congestion and ongoing investment of scheme revenues.
- The overall buoyancy of the London economy has contributed to growth in public transport patronage, although volumes of travel to the charging zone by Underground in 2006 were only slightly higher than those that prevailed in 2002.
- Further economic trend data and comparative analyses continue to demonstrate that there have been no significant overall impacts from the original scheme on the central London economy. General economic trends are considered to have been the predominant influence on the performance of central London businesses over recent years. The central London economy has performed particularly strongly since the introduction of congestion charging, with recent retail growth (value of retail sales) in central London at roughly twice the national growth rate.
- Reductions in road traffic casualties and in emissions of key traffic pollutants in and around the charging zone continue to be apparent, alongside continuing, favourable 'background' trends in both of these indicators for 2006.
- The operation and enforcement of the scheme continue to work well, with several further improvements and innovations introduced during 2006, alongside TfL's preparations for the introduction of the western extension scheme in early 2007.
- The availability of five years of monitoring data in relation to the original central London congestion charging scheme allows a longer-term perspective on the role of congestion charging.
- In general, charging is seen to have helped accentuate trends that were positive, such as reduced road traffic accidents and emissions; to have helped counteract trends that were negative, such as increasing congestion; whilst having a broadly neutral impact on general economic performance.
- A cost-benefit analysis of the central London scheme suggests that the identified benefits exceeded the costs of operating the scheme by a ratio of around 1.5 with an £5 charge, and by a ratio of 1.7 with an £8 charge.

Part 2

Monitoring arrangements and baseline for the western extension scheme

- TfL has put in place a comprehensive programme of impacts monitoring work for the western extension to the central London congestion charging scheme. This builds on experience with the monitoring work for the original charging scheme, adapted to take account of lessons learned, stakeholder comment and specific local issues. This will work in conjunction with the existing monitoring arrangements for the central zone, which will continue.

- Extensive traffic counts in and around the western extension measure the amount of traffic entering and leaving the extension zone; circulating inside the zone; on the boundary routes; approaching the zone through inner London, and the interactions between the two components of the extended central London charging zone. Key measurements representing conditions before the introduction of the extension zone are given for each of these indicators in 2005 and 2006.
- Congestion trends in the western extension are being measured through a programme of moving car observer surveys; these are complementary to those already in place for the original central London zone. Measurement of baseline conditions commenced at the start of 2005, giving a robust time-series of data against which changes observed following the introduction of the extension can be set.
- Monitoring arrangements for the impacts of the western extension on aspects of public transport patronage, road traffic accidents, vehicle emissions and air quality generally build upon similar arrangements for the original central zone, and good baseline datasets are available.
- TfL's arrangements for monitoring the impacts of the western extension zone on business and economic activity have developed, following experience with the original central zone and stakeholder engagement. Maximum use has been made of available macro-economic trend datasets, adapted where possible to give a robust differentiation between the western extension zone and other parts of London. Several new quantitative indicators of key trends, such as retail footfall to measure shopper activity, have been created specifically for this task.
- The impacts of the extension on individuals' travel behaviour and wider daily lives will be examined through a new programme of social and behavioural surveys. These include a large-scale programme of quantitative roadside interview surveys, designed to quantify the disaggregate components of observed net travel change.
- Information relating to aspects of the operation and enforcement of the extended scheme will be provided, as with the original central London scheme.

Part 3

Western extension zone: the first three months

- The western extension to the central London congestion charging zone was successfully introduced on schedule on 19 February 2007. From this date, the extension zone operated alongside the existing central London zone, creating an enlarged central London congestion charging zone.
- From the outset all major operational elements of the scheme functioned well, and there were no traffic or other problems of significance.
- Early findings from the monitoring work indicate a set of outcomes that accord closely with TfL's expectations for the scheme. However, these results must still be regarded as provisional and more data is required to confirm and consolidate the longer-term picture.

- Traffic entering the extension zone over the first three months of operation is typically down by between 10 and 15 percent against equivalent levels in 2006.
- The volume of traffic circulating within the extension zone is typically down by 10 percent against comparable values in 2006.
- Traffic on the free passage route running between the original and extended zones (Edgware Road to Vauxhall Bridge via Park Lane) is effectively unchanged in aggregate terms by the extension scheme.
- Traffic on the remainder of the western extension boundary route has increased in aggregate by a small amount (generally up to 5 percent), as expected by TfL. There is no evidence of any significant traffic operational problems on this key route.
- There is some evidence from counts of traffic entering the original central zone of small increases (generally up to 4 percent) following the introduction of the scheme, as anticipated by TfL. However, indicators of traffic circulating within the original charging zone are tending to indicate small reductions.
- TfL's current assessment would therefore be that aggregate traffic volumes in the original central zone have not changed significantly as a result of the extension scheme. Similarly, congestion levels in the central zone during this period are commensurate with those in 2006, and do not appear to have been affected by the introduction of the western extension zone.
- The first comprehensive survey of congestion in the western extension suggests that congestion has reduced by between 20 and 25 percent against comparable values in 2005 and 2006. A value for excess delays of 1.2 minutes per kilometre for March/April 2007 compares to a value for equivalent months in both 2005 and 2006 of 1.5 minutes per kilometre.
- Overall, these early results are highly encouraging. TfL's monitoring of the impacts of the western extension will continue throughout 2007.

1. Introduction

1.1 Orientation

This is the fifth in a series of annual impacts monitoring reports describing the impacts of congestion charging in central London.

As with previous reports in this series, it provides a summary and interpretation of the growing body of evidence and insight from across the monitoring programme relating to the central London congestion charging scheme. It makes comparisons with conditions before charging started and, where appropriate, with Transport for London's (TfL's) expectations for the scheme before it was launched. This report also considers the impact of important variations to the original scheme, such as the increase in the daily charge from £5 to £8, implemented in July 2005.

February 2007 saw the successful implementation of the western extension to the original central London congestion charging zone. As with the original scheme, TfL has put in place an extensive programme of impacts monitoring, designed to measure and assess the key impacts of the extension scheme. This report outlines the monitoring approach employed by TfL, and sets out key indicators of conditions before the implementation of the extension, against which emerging data representing conditions after implementation can be set.

Finally, this report allows consideration of some initial data representing conditions in the early months of 2007 following the implementation of the western extension zone. These 'early results', reflecting approximately three months of operation of the western extension scheme, are summarised in the latter part of this report.

The contents of this report reflect the Mayor's and TfL's commitment to a comprehensive programme of monitoring of TfL's road user charging schemes. TfL's monitoring covers not only the more immediate traffic and transport impacts of charging, but also the 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 it is possible to publish in a report of this nature. This report therefore provides a summary of key findings and emerging appreciations that are likely to be of general interest.

1.2 Report contents

The remainder of this section summarises the key features of the original central London congestion charging scheme, and outlines key developments to the scheme during 2006. This report is then presented in three parts.

Part 1 (Sections 2 to 7) summarises findings for 2006 from the continuing monitoring programme for the original central London scheme. It contains the following sections:

- **Section 2: traffic patterns** considers trends in traffic volumes and characteristics in and around the central London zone during 2006, in relation to key changes and trends observed since the start of the monitoring programme in 2002.
- **Section 3: congestion** considers changes to traffic congestion, drawing on extensive surveys and research during 2006.
- **Section 4: business and economic impacts** summarises the latest evidence relating to the impacts of the scheme on business and economic activity in central London.
- **Section 5: public transport, accidents and air quality** looks at developments in public transport patronage, road traffic accidents and air quality during 2006.
- **Section 6: scheme operation, enforcement and revenues** reviews indicators relating to the operation and enforcement of the scheme during 2006.
- **Section 7: a retrospective look at the central London congestion charging scheme** looks back at TfL's experiences with developing, implementing, operating and monitoring the original central London scheme over the period 2001 to 2007, to a point just before the introduction of the western extension scheme.

TfL's continuing work in respect of the social impacts of charging schemes is considered in the context of the western extension below.

Part 2 (Sections 8 to 13) sets out TfL's approach to monitoring the impacts of the western extension, and summarises key indicators describing traffic and other conditions during 2005 and 2006 before the implementation of the scheme. These exemplify the benchmarks available to TfL to assess changes brought about by the extension zone as data relating to conditions after implementation become available. It contains the following sections:

- **Section 8: a description of the western extension zone** describes the main features of the western extension to the central London congestion charging zone. It summarises how the scheme operates and its key interactions with the original central London zone.
- **Section 9: traffic patterns** describes how TfL is measuring the traffic impacts of the extension and sets out available indicators of traffic conditions prior to implementation.
- **Section 10: congestion** sets out available indicators of congestion in and around the western extension zone, and explains the methods and definitions being used.
- **Section 11: public transport, accidents and air quality** sets out TfL's approach to measuring changes in public transport patronage, road traffic accidents and air quality resulting from the western extension.
- **Section 12: business and economic impacts** explains TfL's approach to understanding the impacts of the western extension on business and economic activity, and describes the range of available data outlining conditions before implementation.
- **Section 13: social and behavioural impacts** describes work designed to help TfL understand the implications of the western extension for individuals and households, and to examine how travel behavioural change contributes to the aggregate traffic changes observed elsewhere.

Part 3 (Section 14) presents a summary of emerging scheme operational indicators and findings from the traffic and congestion monitoring work describing the early impacts of the western extension, reflecting approximately three months of operation of the extended scheme.

1.3 Overview of the monitoring programme and incorporation of the western extension scheme

The scope of the monitoring work for the central London congestion charging scheme was described in TfL's *First Annual Impacts Monitoring Report*. This consisted of five key work streams, designed to assess the range of traffic, other transport, social, economic and environmental impacts of congestion charging.

Subsequent reports have provided updates on key methodological developments as the monitoring work has evolved. The basic approach has proved satisfactory, and has provided many insights into both the immediate impacts of charging, and the general background evolution of trends in road traffic, congestion, economic activity and many other aspects of life in and around central London.

The findings for 2006 described in Part 1 of this report reflect the continuation of these initial arrangements. During 2006, conditions in the central London zone were essentially unaffected by preparations for the western extension, but were subject to a wide range of other influences.

Following some preliminary monitoring work in the western extension zone during 2003 and 2004, TfL's monitoring work was significantly extended during 2005 and 2006 to gather comprehensive baseline 'before' data in anticipation of the implementation of the western extension.

From the start of 2005, a comprehensive programme of measurements was put in place to gather 'baseline' information, against which data obtained following implementation of the extension scheme could be set. The general approach adopted for this closely followed that used for the central zone, taking account of lessons learned. The scope and intensity of this work also took into account specific features of the western extension scheme that required adaptations to the ongoing programme for the original central zone. An example of this was the change to the charging hours from 07.00-18.30 to 07.00-18.00, which accompanied the introduction of the extension zone on 19 February 2007. Findings from this work are described in Part 2 of this report.

The western extension may have consequential impacts on the original central zone. Although TfL expects these to be relatively small in scale, they may be significant for the monitoring work. One example is the possible impact of the residents' discount, with residents of the western extension zone able, from the date of approved registration of their discount application, to drive within the original central zone at the 90 percent discounted charge rate.

On implementation of the extension zone in February 2007, the area of the western extension zone underwent a 'step' change, reflecting the transition from uncharged

area to charged area. Monitoring in the western extension during 2007 will therefore focus on detecting change in this area, as well as any consequential impacts in the original central zone. From 2008 onwards, the monitoring will track developments in the operation of the extended zone from a 2007 baseline in both components of the extended central London congestion charging scheme.

1.4 The central London congestion charging scheme

Congestion charging was successfully introduced in central London on 17 February 2003. It contributed directly to four of the Mayor's transport priorities, as set out in the Mayor's Transport Strategy:

- 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 generated revenues to support the Mayor's Transport Strategy more generally, and has led to environmental and safety improvements.

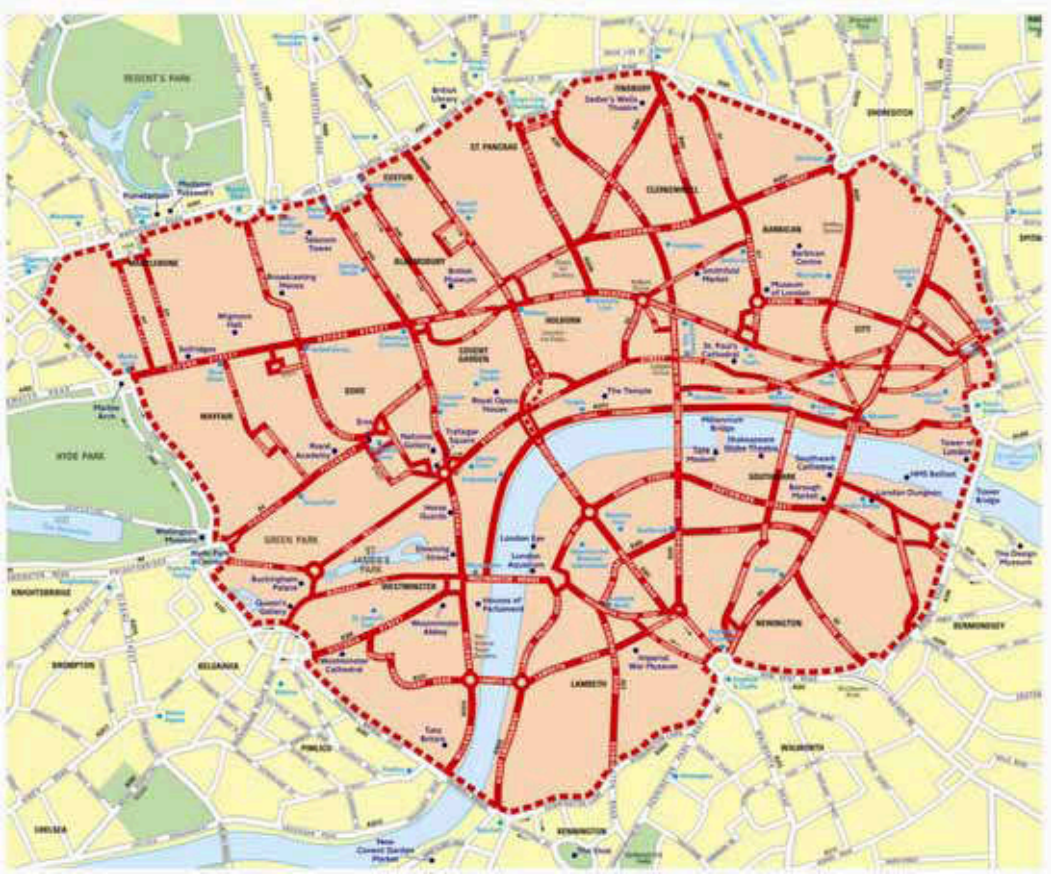
Until July 2005 the congestion charge was a £5 daily charge for driving a vehicle on public roads within the congestion charging zone between 07.00 and 18.30, Monday to Friday, excluding weekends and public holidays. Since July 2005 the basic daily charge has been £8, with a discount for monthly and annual payments, and for vehicles registered on the TfL 'fleet scheme'.

The original 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.

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 wholly exempt from the charge. Certain categories of vehicle users can register for discounts. For example, residents of the central London congestion charging zone can register for a 90 percent discount (for a minimum weekly payment) and disabled persons' Blue Badge holders and drivers of certain alternative fuelled vehicles are eligible for a 100 percent discount and pay no charge.

Figure 1.1 The original central London congestion charging zone.



1.5 Key developments to the original central London congestion charging scheme

The original 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, 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*.

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 to confirm the change (with or without modifications) and make it part of the Scheme Order.

TfL's *Fourth Annual Impacts Monitoring Report*, published in June 2006, listed three variations to the Scheme Order that had been consulted upon during the previous year. These were:

- **Variation Order 2005**: introducing the western extension (which is dealt with elsewhere in this report) and confirming the 'Pay Next Day' facility to commence in September 2006 (subsequently further amended).

  Following consultation, the Mayor confirmed this Variation Order on 29 September 2005.

- **Variation Order (No. 2) 2005**: removing an anomaly and ensuring that a resident could not benefit from monthly or annual charges at the discounted rate for a period beyond which their vehicle was registered for the discount.

  Following consultation, the Mayor confirmed this Variation Order on 9 December 2005.

- **Variation Order 2006**: bringing forward the implementation date for the Pay Next Day facility from October 2006 to June 2006, and providing an incentive for residents in the western extension residents discount zone and Blue Badge holders to apply for their respective discounts early. This was intended to avoid excessive demand on the congestion charging contact centre close to the start date of the western extension.

  Following consultation, the Mayor confirmed this Variation Order on 5 May 2006.

Two further Variation Orders were made and confirmed in 2006. These dealt with minor changes to the boundaries of the original congestion charging zone and the proposed western extension, removed some administration charges, and amended the eligibility for some exemptions and discounts.

The Variation Orders were:

- **Variation Order (No. 2) 2006**: changing the boundary of the original central London congestion charging zone at North Carriage Drive to allow egress from the car park operated by National Car Parks under Hyde Park.

  Following consultation, the Mayor confirmed this Variation Order on 23 August 2006.

- **Variation Order (No. 3) 2006**: changing the boundary of the western extension, exempting certain three-wheeled vehicles, removing administrative charges for adding 9+ seat vehicles to the fleet scheme, adding emergency response vehicles to the categories of vehicles eligible for 100 percent discounts and generally clarifying the wording within the Greater London (Central Zone) Congestion Charging Order 2004.

  Following consultation, the Mayor confirmed this Variation Order on 29 September 2006.

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

1.6 Findings from the monitoring work so far

Since the introduction of congestion charging, TfL has produced a series of reports detailing emerging results from the monitoring work. This *Fifth Annual Impacts Monitoring Report* is informed by a further year of evidence from the monitoring work, enabling a more thorough appreciation of the impacts of the original central London scheme to date. In general, the key traffic impacts of the scheme have been maintained, despite other factors now combining to erode the decongestion benefits from the scheme. The main elements of the scheme continue to operate satisfactorily, and there remains a general absence of traffic or other problems arising from the scheme.

Congestion charging was introduced against a backdrop of wider changes to travel patterns in London, brought about by 'background' social and economic change and by the implementation of other elements of the Mayor's Transport Strategy and other policies. 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 has not therefore usually been possible to identify precisely a 'congestion charging effect', although in many cases the available evidence allows a reasonable judgement to be made.

The key volumetric changes to travel patterns arising from the introduction of the scheme in 2003 established themselves very quickly. Traffic adjusted almost overnight, and changes in the period since have tended to reflect wider traffic trends that are visible both in the longer-term data time series and in other parts of London. In some cases these 'background' trends, which continue to develop year-on-year, are now becoming the more pervasive influence on traffic and other patterns, rather than charging itself, and this tendency is apparent throughout this report. In most cases, however, charging-related impacts have either contributed significantly to positive background trends (such as reduced road traffic accidents and vehicle emissions) or reversed, to some degree, negative background trends (such as the tendency towards increasing in congestion throughout London).

The scale of the monitoring work in central London in connection with the congestion charging scheme was unprecedented. Many new indicators were measured, and the frequency and intensity of the traffic survey effort was such that patterns and relationships that were previously unrecognised (such as the seasonal variability in congestion levels) became visible for the first time. This provided valuable new insights while at the same time compounding the interpretation task. Furthermore, as time passes since the introduction of the original scheme in February 2003, the data gathered by TfL increasingly reflect the influence of other developments and background trends in central London unrelated to the scheme itself.

To be set against this is the possibility that the introduction of charging and other traffic and transport schemes in London also have effects that develop more slowly over the longer-term. Charging may well have been a factor in people's location and lifestyle choices; but changes that people make in pursuit of these choices, for example, moving employment location, are not often made immediately.

Consequently, although the impacts would not show up clearly in the aggregate traffic and transport data, any interpretation of longer-run or 'background' trends must take them into account. A section of this report takes a retrospective view of the insights gained from the monitoring work and experiences with the original scheme over four years, and begins to address some of these wider issues.

Part 1:

Recent developments with the central London congestion charging scheme

2 Central zone: traffic patterns

2.1 Introduction

This section reviews trends in traffic activity in and around the original central London congestion charging zone during 2006. It builds upon previous analyses and now provides a perspective on four years of operation of congestion charging in central London.

2.2 Developments during 2006

During 2006, the operation of the scheme in central London was largely unaffected by preparations for the introduction of the western extension in February 2007. Following the variations to the scheme in July 2005, in which the basic daily charge was increased from £5 to £8, and the central London bombings at about the same time, 2006 saw no major changes to the operation of the scheme or significant disruption to the transport network.

From late October 2006, residents of the western extension zone and certain clearly defined buffer areas were able to register for their residents' discount for this zone. This also conferred discounted status for trips to, from and within the original central London zone at the discounted charge from the date of approved registration. This would have been expected to lead to some increases to trips in the original charging zone by these residents, perhaps working through to small net increases to traffic in the zone during the latter weeks of 2006.

2.3 Key findings from previous reports

Congestion charging was expected to deliver decongestion benefits by reducing the volume of traffic entering and circulating in and around the central London 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). Vehicles 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 significantly increased traffic outside scheme operational hours or in the area surrounding the charging zone. Traffic approaching the zone on radial routes had reduced, and the balance of evidence

was pointing to an overall 'background' decline in traffic in central and inner London.

- On selected local roads in boroughs 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 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 vehicles 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, maintaining the reductions observed in relation to 2002.
- Traffic levels on selected local roads in boroughs 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.

Key findings for 2005, after three years of operation of the scheme, increasingly reflected incremental changes such as the increase in the daily charge to £8, and were that:

- The main indicators of traffic volumes were comparable to those previously observed in 2003 and 2004, with evidence of modest overall reductions in traffic coinciding with the increase to the charge in July 2005.
- Counts of traffic entering the central London zone gave an average 'annualised' reduction for 2005 of 3 percent against 2004, notionally representing the impact of the charge increase to £8, which represented an overall reduction of 21 percent compared to pre-charging levels in 2002.
- Available indicators of traffic circulating within the charging zone for 2005 suggested broadly stable or slightly declining traffic levels.
- Measured vehicle-kilometres driven on the Inner Ring Road again fell slightly during 2005, returning to levels closely comparable to pre-charging values in 2002.
- There continued to be no evidence of any adverse traffic impacts on roads surrounding the charging zone, and the previously-noted tendency towards small

year-on-year 'background' declines to traffic in and around central London appeared to have persisted.

2.4 Key findings for 2006

TfL's traffic monitoring has continued throughout 2006, providing a comparable set of indicators to those previously reported.

Key findings for 2006 are that:

- Most key measures are indicating traffic conditions closely comparable to 2005, the balance of evidence suggesting further small incremental declines in total traffic in and around the central London charging zone. The overall patterns of traffic established following the introduction of the scheme in 2003 have again remained largely unchanged.
- The relatively indistinct aggregate traffic volume response to the charge increase to £8 in July 2005, previously noted in TfL's *Fourth Annual Impacts Monitoring Report*, has persisted into 2006, with a general trend towards small increases in non-chargeable vehicles counterbalancing small declines in potentially chargeable vehicles.
- Traffic entering the central London charging zone during charging hours in 2006 was 21 percent lower than before charging in 2002 (vehicles with four or more wheels).
- Road network issues continue to affect the comparability of counts for traffic circulating within the central London charging zone. TfL's assessment is that aggregate traffic circulating in the zone in 2006 was very marginally down on 2005, maintaining the potential benefits from reduced traffic originally seen in 2003 with the introduction of the scheme.
- Traffic on the Inner Ring Road remained stable during 2006, aggregate flows now being virtually unchanged compared to 2002 before the introduction of charging.
- As in previous years, available traffic indicators outside the central London charging zone have continued to indicate small background declines to overall traffic levels, with no evidence of significant adverse effects.

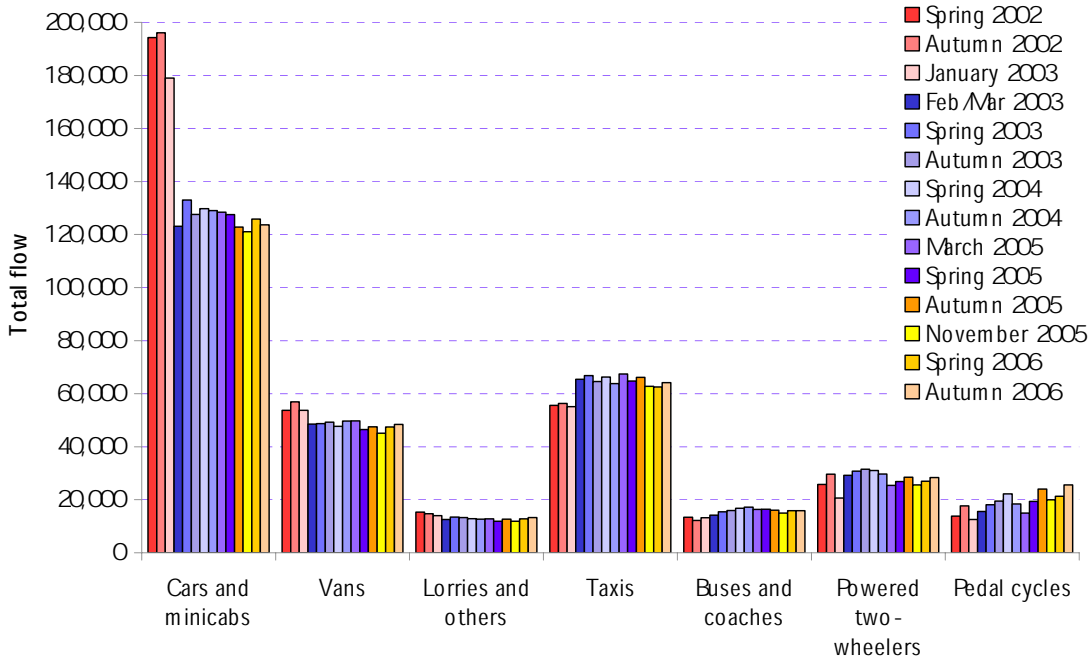
2.5 Traffic entering the charging zone

Comprehensive manual classified counts of weekday traffic entering and leaving the central London 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. These were complemented by 16 permanent automatic traffic counters located at a sample of high-flow entry points to the zone. Additional manual classified counts have also been undertaken at other times, particularly before the introduction of the scheme in 2002, and before and after the July 2005 Variations to the scheme.

Figure 2.1 shows the available time-series from manual classified counts for vehicles 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 central London charging zone during charging hours (07.00-18.30)



The overall picture for 2006 is of broadly comparable levels of traffic to previous post-charging years. Headline 'annualised' results for 2006 in relation to pre-charging conditions in 2002 are: reductions of 16 percent in total vehicles, 21 percent in vehicles with four or more wheels and 30 percent in potentially-chargeable vehicles (see also Table 2.1). The significant reductions to traffic entering the original charging zone observed after the introduction of charging in 2003 therefore continue to be maintained.

In relation to the July 2005 charge increase, and noting that this indicator was then counted twice in both Spring and Autumn, traffic entering the zone in 2006 across most vehicle types was slightly higher than in the latter half of 2005, but slightly lower than in the first half of 2005. However, most of these changes are within the statistical precision of this indicator for total traffic of plus/minus 4 percent at the 95 percent confidence level, and normal seasonal variation and on-going background declines to traffic will also be factors. The precise traffic impact of the July 2005 Variations therefore remains relatively unclear in these counts.

Table 2.1 Key year-on-year changes in traffic entering the central London charging zone during charging hours (07.00-18.30)

	Change in inbound traffic				
Vehicle type	2003 vs 2002	2004 vs 2003	2005 vs 2004	2006 vs 2005	2006 vs 2002
All vehicles	-14%	0%	-2%	0%	-16%
Four or more wheels	-18%	0%	-3%	0%	-21%
Potentially chargeable	-27%	-1%	-3%	+1%	-30%
- Cars and minicabs	-33%	-1%	-3%	0%	-36%
- Vans	-11%	-1%	-3%	+2%	-13%
- Lorries and other	-11%	-5%	-4%	+6%	-13%
Non chargeable	+18%	+1%	-4%	-1%	+16%
- Licensed taxis	+17%	-1%	0%	-3%	+13%
- Buses and coaches	+23%	+8%	-4%	+3%	+25%
- Powered two-wheelers	+12%	-3%	-9%	0%	0%
- Pedal cycles	+19%	+8%	+7%	+8%	+49%

Note: values for 2005 in the table above are based on the established 'Spring' and 'Autumn' pair of counts only. To allow examination of the impact of the July 2005 Variations, additional counts for 2005 were undertaken in 'early Spring' and 'late Autumn'. Some changes between 2004 and 2005 quoted in *TfL's Fourth Annual Impacts Monitoring Report* were based on an average of all four counts, and will therefore differ slightly from those quoted in the table above.

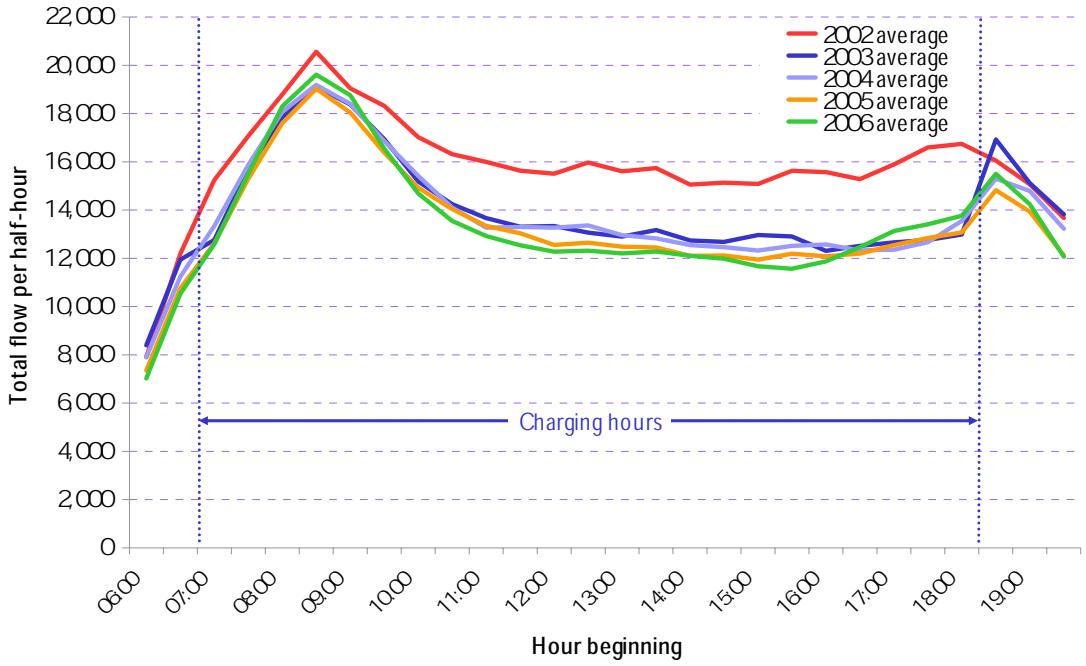
Table 2.2 shows the absolute number and percentage share of total traffic for each of the main types of vehicles entering the central London charging zone during charging hours in 2002 (before charging), 2003 (immediately after charging) and 2006. The immediate impacts of charging in 2003 are clear, in reducing the number and proportion of potentially-chargeable vehicles. Conversely, non-chargeable vehicles such as licensed taxis, buses and two-wheelers have all increased, although in lower absolute terms. Comparing values for 2006 against those for 2003, further declines across most vehicle types are seen, reflecting on-going background declines to traffic in and around central London and factors such as the increase to the charge in July 2005, and perhaps longer-term adaptations to the original £5 charge.

Figure 2.2 shows how volumes of traffic entering the central London charging zone are distributed across the day. Noting that the 'counting day' extends either side of charging hours (from 06.00 to 20.00) and that the five lines represent 'annualised' counts for 2002, 2003, 2004, 2005 and 2006 (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.

Table 2.2 Trends in composition of traffic entering the central London charging zone during charging hours.

	2002		2003		2006	
Vehicle type	Vehicles (000s)	Percentage share	Vehicles (000s)	Percentage share	Vehicles (000s)	Percentage share
All vehicles	378	100%	324	100%	316	100%
Four or more wheels	334	88%	274	85%	265	84%
Potentially chargeable	266	70%	193	59%	186	59%
- Cars and minicabs	195	52%	130	40%	125	39%
- Vans	55	15%	49	15%	48	15%
- Lorries and other	15	4%	13	4%	13	4%
Non chargeable	112	30%	131	41%	130	41%
- Licensed taxis	56	15%	66	20%	63	20%
- Buses and coaches	13	4%	16	5%	16	5%
- Powered two-wheelers	28	7%	31	10%	28	9%
- Pedal cycles	16	4%	18	6%	24	7%

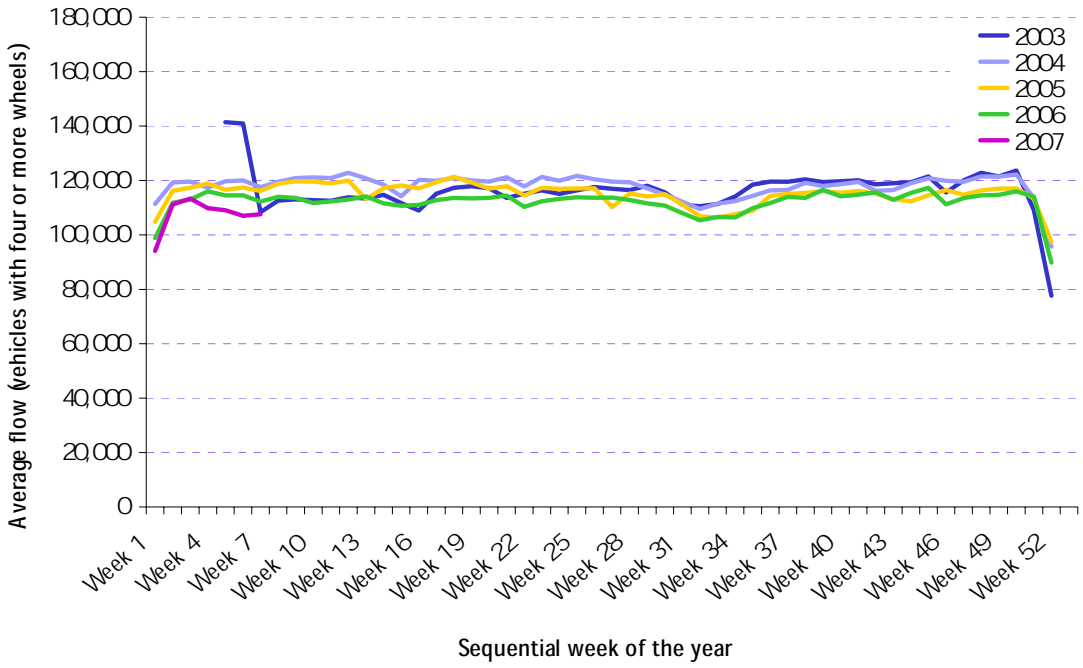
Figure 2.2 Traffic entering the central London charging zone by time of day. Annualised weekdays for 2002 (pre-charging) and 2003, 2004, 2005 and 2006 (post-charging) all vehicles.



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 40percent of traffic entering the zone during the morning peak period. Although biased towards the busier roads, they nevertheless provide a useful indicator of both short- and long-term variations in traffic entering the zone.

Figure 2.3 shows weekly average daily flows at these 16 locations since shortly before charging began in early 2003. Complete data are shown for every week up until mid-February 2007. At this point, the series was re-based for the introduction of the western extension (see Sections 9 and 14), taking account of the change to the operational hours of the scheme and the inclusion of some additional permanent counters for western extension monitoring purposes.

Figure 2.3 Traffic entering the central London charging zone across 16 busier inbound roads. Average weekly flows, charging hours, vehicles with four or more wheels.



The overall picture is very similar to the manual counts in Figure 2.1, with the initial reductions following the introduction of charging in 2003 clearly visible, alongside a pervasive trend towards small year-on-year reductions to traffic entering the zone for each of the subsequent years. Of particular note is the relatively indistinct response to the increase to the daily charge in July 2005, although the prevailing year-on-year 'background' decline in traffic may in part reflect longer-term responses to both the original £5 charge and the subsequent increase to £8. The unusually low flows at the start of 2007 may in part reflect poor weather conditions.

2.6 Traffic leaving the charging zone

As in previous years, very similar trends in total vehicles and for the individual vehicle types have been observed for traffic leaving the charging zone during charging hours. Figures 2.4 and 2.5 show the available data series, presented firstly by main vehicle type (from manual classified counts) and, secondly, in terms of a profile across the counting day. The shape of the profile in Figure 2.4 (outbound traffic) is noticeably and consistently different from that in Figure 2.1 (for inbound traffic), reflecting the nature of central London as a daytime trip attractor.

It is also noticeable that this indicator is suggesting that total volumes of traffic leaving the charging zone during 2006 were marginally higher than 2005, particularly in the evening peak period.

Figure 2.4 Traffic leaving the central London charging zone during charging hours (07.00-18.30)

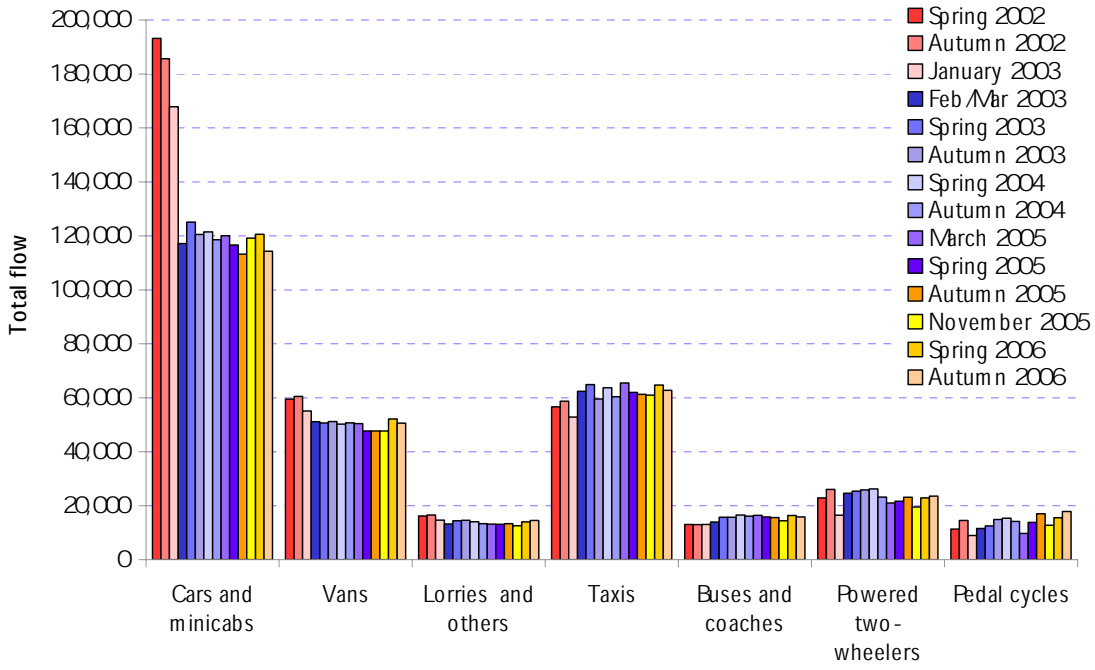
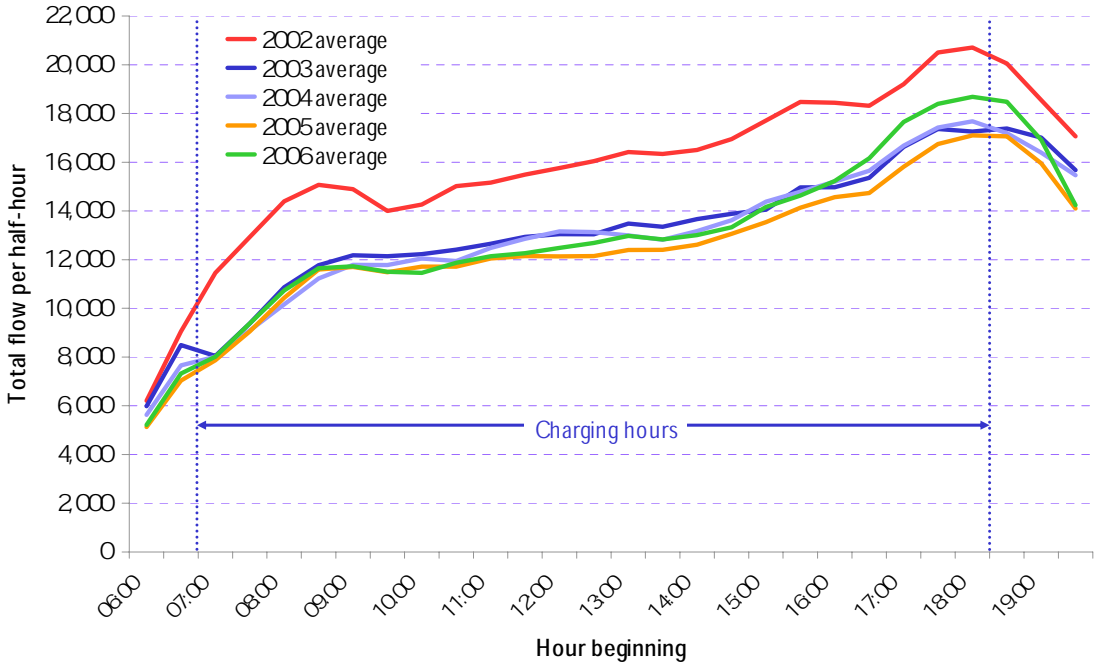


Figure 2.5 Traffic leaving the central London charging zone by time of day. Annualised weekdays for 2002 (pre-charging) and 2003, 2004, 2005 and 2006 (post-charging) all vehicles.



In considering these results for traffic entering and leaving the charging zone it should be noted that:

- The majority of the indicated changes between recent years are not statistically significant at the 95 percent level.
- The overall picture is of strong increases in pedal cyclist numbers since the introduction of charging, although cyclist volumes are particularly affected by variations in the weather at the time that different counts are taken.
- 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 conventional buses by larger articulated buses on some routes over the review period.

2.7 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 upper end of the range of TfL's prior expectation of between 10 and 15 percent and was confirmed by independent analysis undertaken on behalf of the London boroughs

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. Counts for 2005 suggested little overall change against 2004, despite the expected reductions to traffic following the charge increase of July 2005. TfL concluded that this reflected road network inconsistencies between the 2004 and 2005 counts, and that the indicators for 2005 were probably more representative, suggesting overall reductions of up to 20 percent in traffic circulating within the charging zone (vehicles with four or more wheels) in relation to 2002.

The findings for 2006 for vehicle-kilometres driven within the charging zone are shown in Table 2.3. The table also includes the percentage of total traffic accounted for by each of the main vehicle types as well as data for years from 2002 for comparison. Table 2.4 summarises the year-on-year changes. Note that these are central estimates, subject to significant sampling error.

Table 2.3 Vehicle-kilometres driven (millions) within the central London charging zone and percentage contribution to total traffic during charging hours. Annualised weekdays for 2002 (pre-charging), 2003, 2004, 2005 and 2006 (post-charging)

Vehicle type	2002		2003		2004		2005		2006	
All vehicles	1.64	100%	1.45	100%	1.38	100%	1.40	100%	1.41	100%
Four or more wheels	1.44	88%	1.23	84%	1.16	84%	1.16	83%	1.17	83%
Potentially chargeable	1.13	69%	0.85	58%	0.80	58%	0.79	56%	0.82	58%
- Cars and minicabs	0.77	47%	0.51	35%	0.47	34%	0.47	33%	0.49	35%
- Vans	0.29	18%	0.27	19%	0.26	19%	0.25	18%	0.26	19%
- Lorries and other	0.07	4%	0.07	5%	0.06	5%	0.07	5%	0.07	5%
Non-chargeable	0.51	31%	0.60	42%	0.58	42%	0.61	44%	0.59	42%
- Licensed taxis	0.26	16%	0.31	21%	0.29	21%	0.30	22%	0.29	20%
- Buses and coaches	0.05	3%	0.07	5%	0.07	5%	0.07	5%	0.07	5%
- Powered two-wheelers	0.13	8%	0.14	9%	0.13	10%	0.13	10%	0.13	9%
- Pedal cycles	0.07	4%	0.09	6%	0.09	7%	0.10	7%	0.10	7%

Table 2.4 Year-on-year percentage change in vehicle-kilometres driven within the central London charging zone during charging hours by main vehicle category. Annualised weekdays for 2002, 2003, 2004, 2005 and 2006.

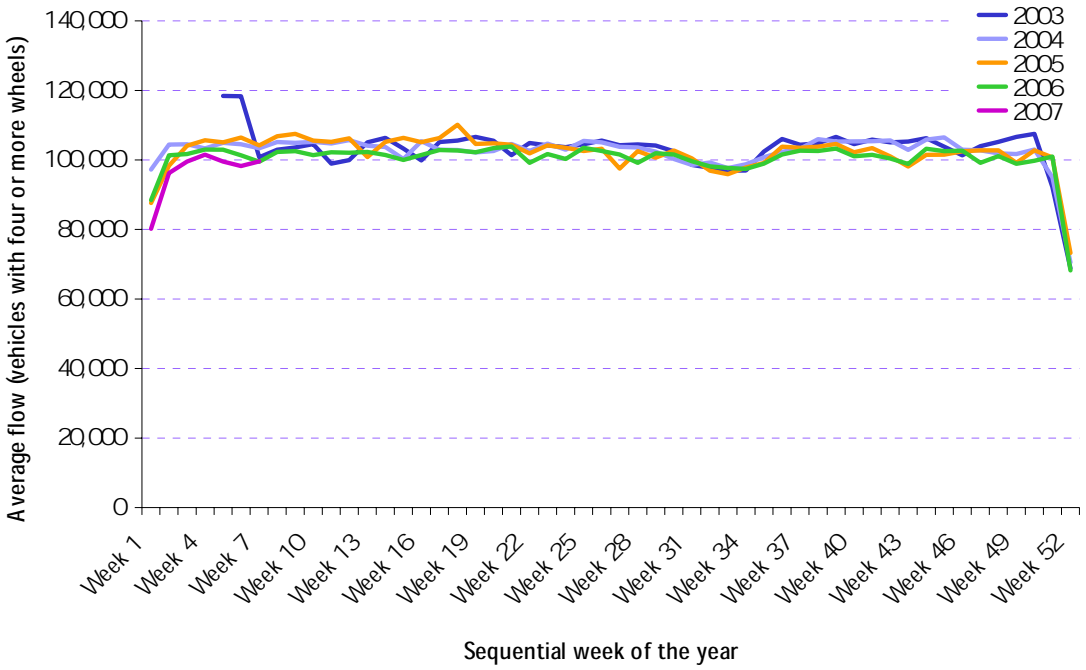
Vehicle type	2003 vs 2002	2004 vs 2003	2005 vs 2004	2006 vs 2005	2006 vs 2002
All vehicles	-12%	-5%	+1%	+1%	-14%
Four or more wheels	-15%	-6%	0%	+1%	-19%
Potentially chargeable	-25%	-6%	-1%	+3%	-28%
- Cars and minicabs	-34%	-7%	-1%	+4%	-37%
- Vans	-5%	-4%	-4%	+3%	-9%
- Lorries and other	-7%	-8%	+8%	+2%	-7%
Non chargeable	+18%	-3%	+4%	-3%	+16%
- Licensed taxis	+22%	-7%	+5%	-5%	+12%
- Buses and coaches	+21%	+5%	-1%	+3%	+25%
- Powered two-wheelers	+6%	-2%	0%	-3%	0%
- Pedal cycles	+28%	+4%	+14%	-2%	+43%

This indicator suggests that traffic circulating within the charging zone in 2006 was very similar to 2005. Most of the indicated year-on-year changes are not statistically significant, although a tendency towards small increases in potentially-chargeable vehicles in comparison to 2005 is noted.

Figure 2.6 shows equivalent data from permanent automatic traffic counters located at a representative selection of sites within the charging zone. Traffic flows are again seen to be similar to those of 2005, although in this case the indicator is pointing

towards small year-on-year decreases in circulating traffic, continuing the established trend. Although the precision of this indicator in terms of traffic at the sampled sites is much tighter than that for the manual counts in Table 2.3, the sites comprising the sample are different, and additional uncertainty arises with both counts in the degree to which the sites counted are representative of total traffic circulating within the central London zone.

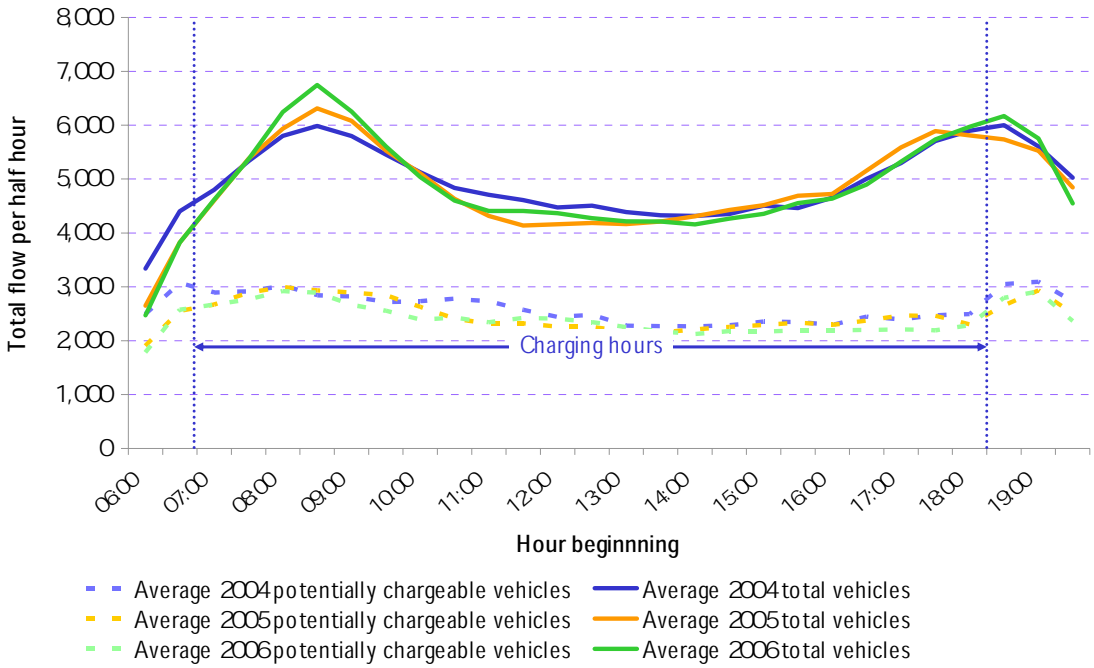
Figure 2.6 Traffic circulating within the central London charging zone across a sample of 15 one-way permanent counting sites. Average weekly flows, charging hours, vehicles with four or more wheels.



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. TfL's *Fourth Annual Impacts Monitoring Report* noted that both of these indicators were potentially affected by road works during 2005/2006. Results for 2006/2007 are tending to confirm this hypothesis, producing an overall picture that is more in-line with established trends and other indicators of charging zone traffic.

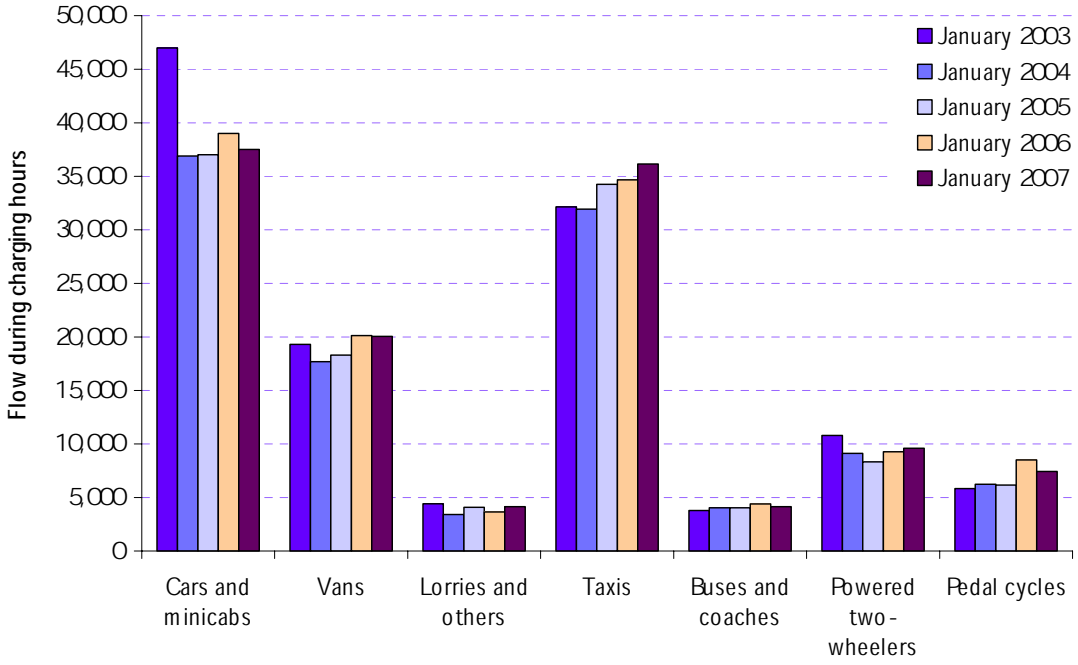
Figure 2.7 shows flows across the Thames screenline within the charging zone by time of day. Total flows in 2006 are broadly comparable to those of 2004 and 2005. However, this disguises possible discontinuities attributable to the prolonged closure of Battersea Bridge (to the west of the charging zone) during 2005, as described in TfL's *Fourth Annual Impacts Monitoring Report*. A tendency towards increased volumes in the peak periods is also noted, perhaps reflecting a similar feature to that noted in Figure 2.5.

Figure 2.7 Flows across the Thames screenline within the central London charging zone, 2004-2006



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 data series is summarised in Figure 2.8. These exclude flows on the Inner Ring Road itself at St Pancras.

Figure 2.8 Flows across the TfL northern screenline within the central London charging zone. January 2003, 2004, 2005, 2006 and 2007.



The counts for early 2007 suggest very similar flows to early 2006, with most of the indicated changes between these years not being statistically significant. However, looking across the available time series and noting that the 2005 and 2006 counts were thought to be particularly affected by road network changes in the Strand/Victoria Embankment area, it is apparent that this screenline is now tending to indicate substantially increased traffic to that seen immediately after the introduction of charging in early 2004.

Further examination of the site-by-site data (Table 2.5) confirms that major roads in the Charing Cross area carry the bulk of the traffic intercepted by the screenline and that there were substantial increases in the flow on these routes between January 2003 and subsequent years, primarily associated with network changes around Trafalgar Square.

Table 2.5 Change in flow across the TfL northern screenline within the charging zone. January 2003, 2004, 2005, 2006 and 2007 by main vehicle category. Charging hours (07.00-18.30)

Vehicle category	2003 base (pre-charging)	Percentage change 2004 vs. 2003	Percentage change 2005 vs. 2003	Percentage change 2006 vs. 2003	Percentage change 2007 vs. 2003
All vehicles	124,000	-12%	-9%	-3%	-3%
Four or more wheels	107,000	-12%	-8%	-5%	-4%
Potentially chargeable vehicles	71,000	-18%	-16%	-11%	-13%
Non chargeable vehicles	53,000	-2%	0%	+8%	+9%
- Licensed taxis	32,000	-1%	+6%	+8%	+12%
- Two wheels	17,000	-7%	-13%	+7%	+2%

As in previous years, available indicators of traffic circulating within the charging zone for 2006 provide a more mixed picture than those of traffic entering and leaving the zone. Based on the available evidence, TfL concludes that:

- Traffic circulating in the charging zone during 2006 remained broadly comparable to previous years following the introduction of charging.
- Permanent and long-term changes to the road network in the charging zone have increasingly affected the comparability of the counts, leading to a tendency for the individual indicators to diverge in relation to their respective pre-charging baselines, and between individual years in the available time series.
- The data are tending, however, to consistently suggest increases to the numbers of non-chargeable vehicles circulating within the zone. It may therefore be the case that at some locations within the zone, where traffic is particularly dominated by taxi and bus flows, traffic volumes on specific links have substantially increased over the period following the initial post-charging changes,

perhaps reflecting road network changes such as those in the vicinity of Trafalgar Square.

2.8 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, taking account of reduced traffic entering and leaving the charging zone and the consequent scope to re-balance traffic signal settings.

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 and 2005 suggested that traffic on the Inner Ring Road during weekday charging hours declined very slightly overall compared to 2003, and that flows in 2005 were very closely comparable with pre-charging conditions in 2002.

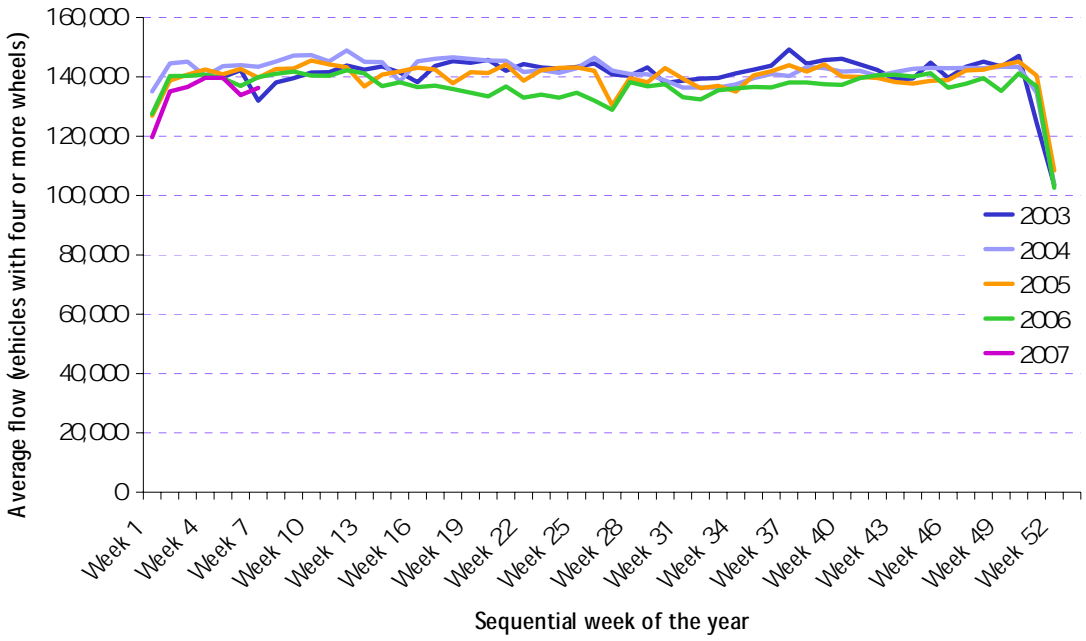
Measurements for 2006 present a similar picture, with no significant changes of note. The values in Table 2.6 are necessarily rounded to two significant figures, in view of the limited statistical precision of this indicator. Comparing un-rounded flows for 2006 with those of 2002, indicated decreases in cars (8 percent), increases in vans and lorries (both up 6 percent), buses and licensed taxis (up 12 and 20 percent respectively) and pedal cycles (up by as much as 80 percent) are particularly noteworthy, if subject to very wide statistical uncertainty. In interpreting these latter changes, it is necessary to bear in mind the varying percentage contribution of each vehicle type to total traffic. Pedal cycles, for example, account for no more than 2 percent of all vehicle kilometres travelled on this route. In addition, the aggregate changes described may conceal local changes of greater magnitude (see, for example, TfL's *Third Annual Impacts Monitoring Report*).

Table 2.6 Vehicle-kilometres driven (millions) on the Inner Ring Road during charging hours. Annualised weekday for 2002 (pre-charging) compared to 2003, 2004, 2005 and 2006 (post-charging).

Vehicle type	2002	2003	2004	2005	2006
All vehicles	0.65	0.68	0.66	0.66	0.66
Four or more wheels	0.61	0.62	0.61	0.61	0.61
Potentially chargeable	0.51	0.50	0.51	0.50	0.49
- Cars and minicabs	0.37	0.35	0.35	0.36	0.34
- Vans	0.10	0.12	0.12	0.11	0.11
- Lorries and other	0.04	0.04	0.04	0.03	0.04
Non chargeable	0.14	0.17	0.16	0.15	0.17
- Licensed taxis	0.08	0.09	0.08	0.08	0.09
- Buses and coaches	0.02	0.03	0.03	0.03	0.03
- Powered two-wheelers	0.03	0.04	0.04	0.03	0.04
- Pedal cycles	0.01	0.01	0.01	0.01	0.01

Data from permanent automatic counters located around the Inner Ring Road show a very similar picture, of continuing stability in total traffic flows (Figure 2.9). The apparent decline in traffic volumes during Spring and early Summer 2006 is thought to be related to temporary roadworks in the King's Cross area. Flows for the latter part of 2006 returned to levels consistent with a continuing small 'background' decline to traffic against 2005.

Figure 2.9 Traffic flows on the Inner Ring Road. Average weekly flows, charging hours vehicles with four or more wheels.



TfL again concludes that, although congestion charging and related infrastructure changes clearly resulted in some re-distribution of traffic on individual links, 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.

2.9 Radial traffic approaching the charging zone

TfL expected that congestion charging would lead to some reduction in radial traffic on routes in inner London approaching the charging zone, particularly for 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.

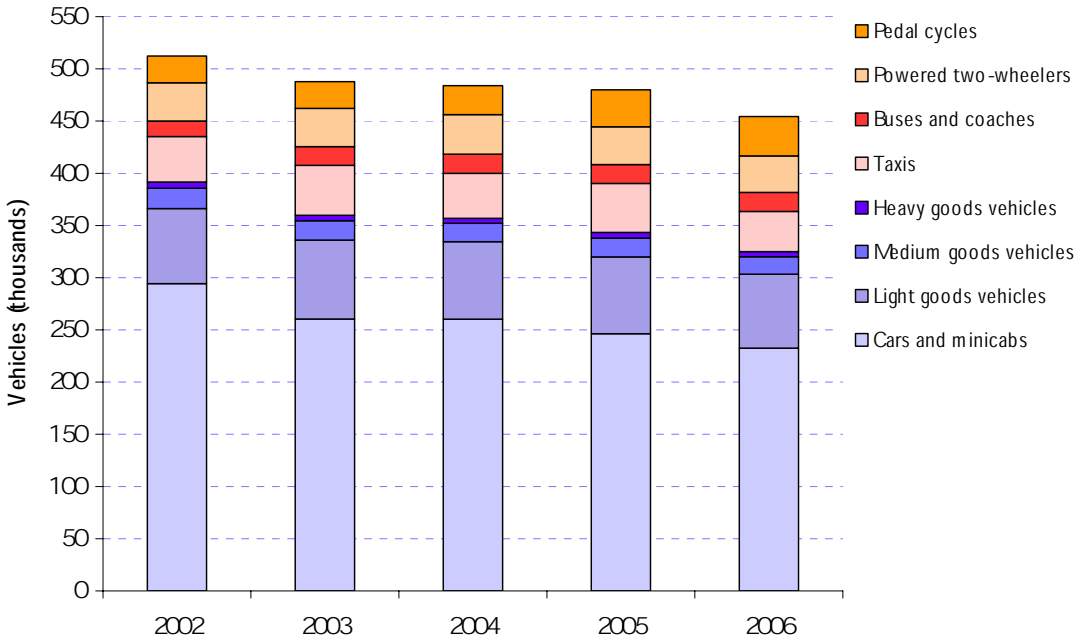
For 2003, TfL had reported overall reductions of 5 percent in inbound traffic with four or more wheels during charging hours against pre-charging levels in 2002. It was noted that the category cars and minicabs had reduced by 12 percent, and that this indicated change was towards the lower end of TfL's expectation for this cordon. 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. For 2005 against 2004, the equivalent figures were a 2 percent decrease inbound, and a 1 percent increase outbound. These more recent changes were again indicative of the overall pattern of small background declines in traffic observed elsewhere, but were not of themselves statistically significant.

Figure 2.10 summarises the flows observed in the inbound direction at this cordon between 2002 and 2006. The data for 2006 indicate relatively sharp further declines in comparison with 2005. Vehicles with four or more wheels declined by 7 percent in the inbound direction, and by 5 percent in the outbound direction. Equivalent reductions for potentially chargeable vehicles were 5 percent and 7 percent respectively. The largest indicated percentage reduction was for goods vehicles (down 10 percent). Buses were unchanged in each direction, and increases of 6 percent inbound and 7 percent outbound were indicated for pedal cycles.

The reason for these relatively large year-on-year declines between 2005 and 2006 at this cordon is not clear, particularly as they are not mirrored at the charging zone boundary (see Figure 2.1). The overall trend towards continuing declines to traffic in both central and inner London is, however, a consistent feature across this and other indicators.

Figure 2.10 Traffic at the TfL central London cordon (extended version wholly outside the charging zone). Inbound direction only, charging hours (07.00-18.30). Autumn surveys.



2.10 Traffic on selected local roads

Traffic on a number of roads surrounding the central London charging zone has been monitored at the request of individual boroughs (Table 2.7). These sites do not provide statistical indicators of the overall traffic change within a borough or more widely, and they may also be affected by factors other than charging. However, collectively they are a useful indicator of traffic change on local, mostly orbital, roads surrounding the charging zone that were potentially likely to experience additional traffic as a result of the scheme.

Table 2.7 Traffic changes on selected local roads surrounding the charging zone. Vehicles with four or more wheels, weekday charging hours (07.00-18.30)

Borough and number of sites	2003 vs pre-charging	2004 vs pre-charging	2005 vs pre-charging	2006 vs pre-charging	2004 vs 2003	2005 vs 2004	2006 vs 2005
Southwark (3)	+1%	+1%	0%	-1%	0%	-1%	0%
Kensington and Chelsea (10)	0%	+1%	-2%	+1%	1%	-3%	3%
Tower Hamlets (6)	-8%	-10%	-6%	-7%	-2%	+4%	-1%
Camden (3)	-9%	-10%	-12%	-13%	-2%	-2%	-1%
Westminster (7)	-2%	-2%	-3%	-8%	0%	-1%	-5%
All sites (29)	-3%	-3%	-4%	-5%	0%	-1%	0%

TfL has previously reported that the overall picture at these sites was of slowly-declining traffic, and that there was no evidence from these data of significant

adverse traffic impacts on local roads that might have resulted from charging. The indicators for 2006 continue this trend, with traffic levels on the whole noticeably down on pre-charging values in 2002. This mirrors the general background decline to traffic in central and inner London as highlighted elsewhere in this report.

2.11 Other indicators

Two indicators previously reported in this section – traffic on selected local roads in the London Borough of Wandsworth, and orbital traffic crossing the western radial screenline outside the charging zone – are fully reported in Section 9, as they are particularly relevant to the monitoring of the Western Extension. In summary, however:

- Traffic on selected local roads in Wandsworth (vehicles with four or more wheels) declined by 8 percent overall between 2002 and 2005 (charging hours, vehicles with four or more wheels). This was in contrast to the expectation of possible small increases resulting from traffic making wider orbital movements (beyond the Inner Ring Road) to avoid paying the charge. Aggregate flows for 2006 are effectively unchanged from 2005, now standing 9 percent below pre-charging levels in 2002.
- Traffic crossing the western radial screenline (measuring orbital traffic and now extended for western extension monitoring purposes) has similarly shown small but consistent year-on-year declines.

2.12 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 a prevailing and long standing trend of 'background' declines to traffic levels in and around central London emerging as a key context to the introduction of the scheme. There remains no evidence of any significant traffic-related problems arising from the scheme. The charge variations in July 2005 appear to have had very little impact on overall traffic levels.

Traffic indicators for 2006 show little overall change on those previously reported. The traffic reduction impacts of charging have therefore been maintained and have intensified during 2006.

As time passes, however, the comparability of established indicators is increasingly being affected by changes to the central London road network. Furthermore, wider influences on vehicle use, travel behaviour and traffic composition, reflecting general economic conditions and the implementation of other elements of the Mayor's Transport Strategy and Borough Plans, are becoming increasingly important in any assessment of traffic trends over the period since 2001.

3. Central zone: congestion

3.1 Introduction

This section reviews trends in congestion in and around the central London congestion charging zone to the end of 2006, updating and extending the material presented in previous annual impacts monitoring reports.

3.2 Developments during 2006

- During 2006, congestion charging has continued to meet its principal traffic and transport objectives; and the scheme continues to operate well.
- As first identified in TfL's *Fourth Annual Impacts Monitoring Report*, there appears to be a longer-term 'background' trend of gradual increases to congestion. This is likely to reflect a combination of traffic management programmes that have contributed to fewer road traffic accidents, improved bus services, a better environment for pedestrians and cyclists, and improvements to the public realm and general amenity. But these interventions have also reduced the effective capacity of the road network to accommodate general vehicular traffic.
- TfL has observed a particular increase in congestion in the central London charging zone during 2006. This has occurred despite the fact that traffic levels have remained stable. Congestion levels are also therefore being influenced by shorter-term interventions that are also affecting the capacity of the road network, particularly an increase in streetworks in the latter half of 2006.
- The impact of congestion charging therefore needs to be assessed in this context. The reduced levels of traffic mean that, when compared to conditions without the scheme, congestion charging is continuing to deliver congestion relief that is broadly in line with the scale of reduction achieved in the first year of operation of the central London scheme – of about 0.7 minutes per kilometre.
- For the reasons set out above, any direct comparison against pre charging conditions needs to be interpreted with caution. However, comparing average congestion levels for 2006 against a pre-charging baseline, congestion was 8 percent lower in 2006. This compares with an average reduction of 30 percent in 2003, the first year of the scheme.

3.3 Key findings from previous reports

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 in charging hours.

TfL's *Fourth Annual Impacts Monitoring Report* described findings to the end of 2005, drawing principally on moving car observer surveys of congestion in and around the charging zone. Comprehensive data were available covering both the year immediately before the introduction of charging (2002) and almost three full years following the introduction of the scheme to the end of 2005. Supporting data were

available for a longer-term historical time-series, and also from camera-based measurements taken in the charging zone at intervals over the period 2003 to 2005. Section 10 of this report gives an explanation of congestion and how it is measured.

TfL's key conclusions to the end of 2005 were as follows:

- During 2003 and 2004, following the introduction of the scheme, levels of congestion in the charging zone were typically around 30 percent lower than those that applied in 2002. These corresponded to TfL's expectations for the scheme, which was for reductions in the range of 20 to 30 percent, and represented a reduction in delays equivalent to about 0.7 minutes per kilometre.
- During 2005, it became apparent that there was some reduction in the level of decongestion inside the charging zone, such that the average congestion reduction, comparing 2005 with 2002, was 22 percent. Although this was still within TfL's range of expectation, the tendency towards slightly higher excess delays was a consistent feature of the 2005 data.
- It was provisionally concluded that these trends needed to be understood in the context of longer-term trends to congestion in central and inner London. It was thought that they reflected both increased levels of streetworks (which, in later analysis, have been found to be particularly significant in 2006) and progressive adjustments to the effective vehicular capacity of the road network in pursuit of other priorities by the various agencies involved in managing London's traffic over recent decades.
- These other priorities included, 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 had been adjusted downwards in favour of the people-moving capacity of the network.
- In view of this longer-term trend, TfL also concluded that comparison of post-charging results against a pre-charging baseline for 2002 was increasingly inappropriate.
- By comparing with an estimated 'without congestion charging' position based on a projection of longer-term trends, TfL estimated that road users in the central London charging zone are still experiencing broadly comparable reductions in the intensity of congestion to those originally experienced, of around 0.7 minutes per kilometre.
- Continuing surveys of congestion on the Inner Ring Road and main radial routes approaching the charging zone suggested that conditions in 2005 remained comparable to 2004, with both networks continuing to show small congestion improvements relative to pre-charging conditions in 2002.
- Measurements of congestion on main roads in inner London (outside the charging zone) for 2005 showed increased congestion relative to previous surveys, with average delays of 1.5 minutes per kilometre, compared to 1.3 minutes per kilometre in 2002. Again, this appears to continue a longer-term historical trend.
- The evidence from traffic volume counts across central and inner London points to a continuing trend of small year-on-year background declines in traffic levels. Given the observed upwards trend in congestion, this suggests that changes to the effective capacity of the road network for vehicular traffic, reflecting

permanent reallocation of road space and – particularly in late 2006 – streetworks is the primary cause of the observed congestion trends since charging was introduced.

3.4 Congestion within the central London charging zone

TfL's *Fourth Annual Impacts Monitoring Report* set out a range of statistics describing trends in congestion inside the charging zone. These had been measured by regular bi-monthly moving car observer surveys, which have continued throughout 2006 into 2007. Key statistics previously reported have been:

- When congestion charging was introduced, TfL expected to observe reductions in congestion of between 20 and 30 percent against a baseline value of 2.3 minutes per kilometre prior to the introduction of congestion charging.
- Surveys in 2003 following the introduction of charging suggested that average delays were then 1.6 minutes per kilometre, representing a reduction of 0.7 minutes per kilometre over 2002, a reduction of 30 percent.
- Equivalent values for the reduction in congestion across the 2004 and 2005 calendar years were 26 and 22 percent respectively, compared with the 2002 pre-charging baseline.

Figure 3.1 Congestion in the central London congestion charging zone during charging hours (07.00-18.30). Moving car observer surveys.

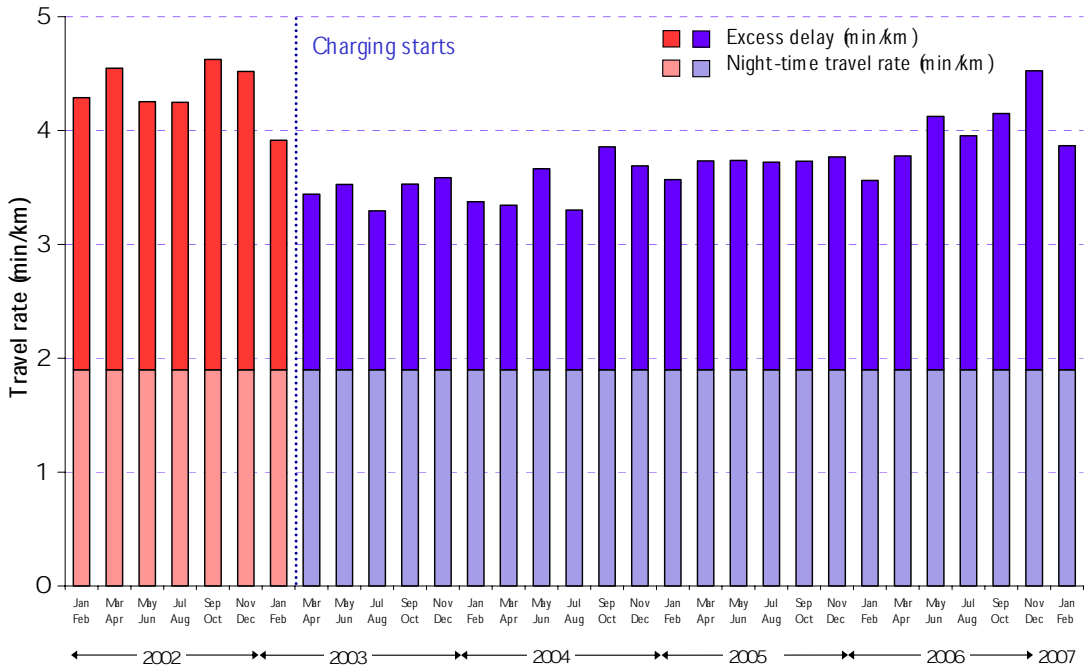
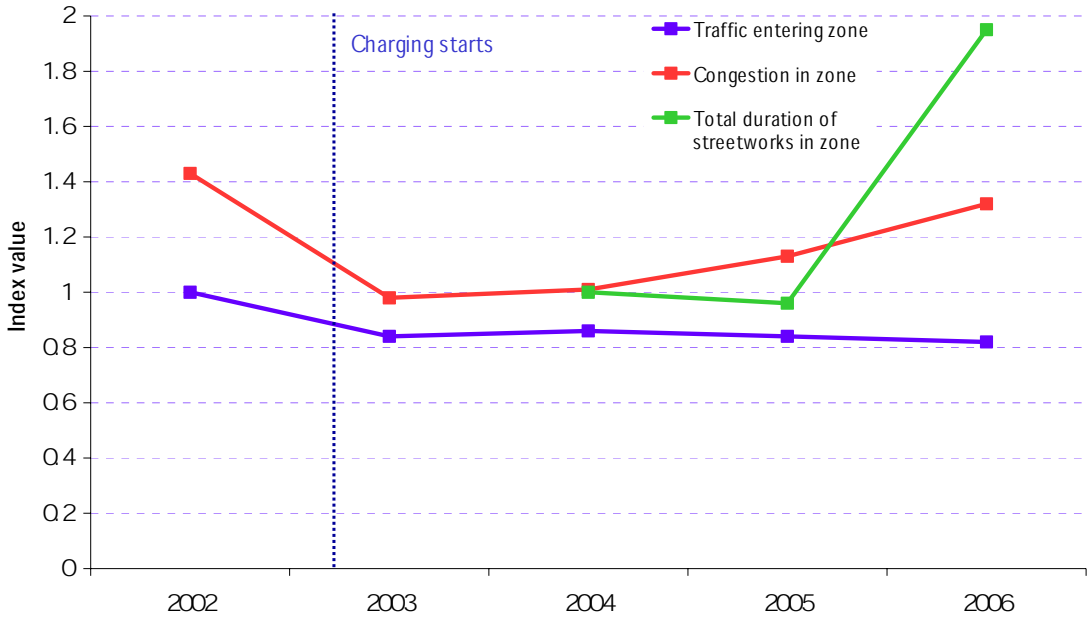


Figure 3.1 shows the updated time series of measurements to the start of 2007. During 2006, despite the continued reduction in traffic, it is apparent that there was a marked increase in congestion compared to 2005 overall. Although surveys in the first four months of 2006 suggested that delays were comparable to those that had applied during 2005, surveys for the remainder of the year suggested that

decongestion benefits were significantly reduced compared to the first two years after the introduction of the scheme.

Figure 3.2 shows that this observed recent increase in congestion correlated closely with a sharp increase in streetworks within the central London charging zone.

Figure 3.2 Indicators of traffic volumes, congestion and streetworks. Central London charging zone.



The figure shows congestion, traffic and street works in the zone, with values averaged on an annual average or total basis and indexed as follows:

- traffic (in terms of four wheeled vehicles entering the charging zone during charging hours) from 2002 (=1.0);
- congestion (in terms of excess delays, minutes per kilometre during charging hours) from 2003, reflecting conditions in the first year after the introduction of charging (=1.0);
- street works (in terms of total duration in hours for these works within the charging zone) from 2004 – the first year for which comprehensive data are available (=1.0).

Looking at this figure:

- The effect of charging on reducing the amount of traffic entering the charging zone is clear. Immediate and continuing reductions of approximately 20 percent are shown.
- The trend in congestion shows the immediate impacts of charging between 2002 and 2003 (note that for statistical reasons index values are not directly comparable with the percentage change figures quoted elsewhere in this report), together with the trend towards increasing congestion in 2005 and 2006.

- The trend for street works (by utilities in particular) shows a very steep rise between 2005 and 2006 (over 90 percent). This reflected the need to replace ageing infrastructure, and corresponded to the sharp deterioration in congestion observed during that year.

More disaggregate analysis of these data show a remarkably close correspondence between the total duration of street works and the observed delay values for successive moving car observer surveys during 2006. There is therefore a close statistical correlation between the increased volume of streetworks and the level of congestion in 2005 and 2006.

Of all roadworks in London, those by utilities account for about one-third, works undertaken by boroughs for general maintenance and improvement account for about half, and TfL works account for about 10 percent. However, the unplanned nature of many utility streetworks can make them particularly disruptive to traffic, and the Mayor has been pressing central Government to introduce regulations that allow better co-ordination of roadworks to reduce their congestion impacts.

The overall conclusion is therefore that an increase in streetworks significantly increased congestion within the charging zone in 2006.

Returning to Figure 3.1, interpretation is complicated by the increase in streetworks in 2006 and to a lesser extent in 2005, and the post-charging time series is too short to establish a long-term trend with confidence. However, from the early post-charging measurements in 2003 to the early part of 2006, the data suggests there was an 'average' increase in congestion of up to 0.1 minutes per kilometre. In the later half of 2006 however, the increase was a further 0.5 minutes per kilometre – a 'step change' in observed congestion levels.

Given the factors set out above, and in particular the marked impact on congestion of streetworks in the second half of 2006, a direct comparison of 2006 congestion levels with the pre-charging baseline is potentially misleading. However, carrying through this comparison gives an average 8 percent reduction in congestion in the 2006 calendar year compared to the 2002 pre-charging baseline, although it should be noted that the intensity of congestion varied considerably throughout 2006.

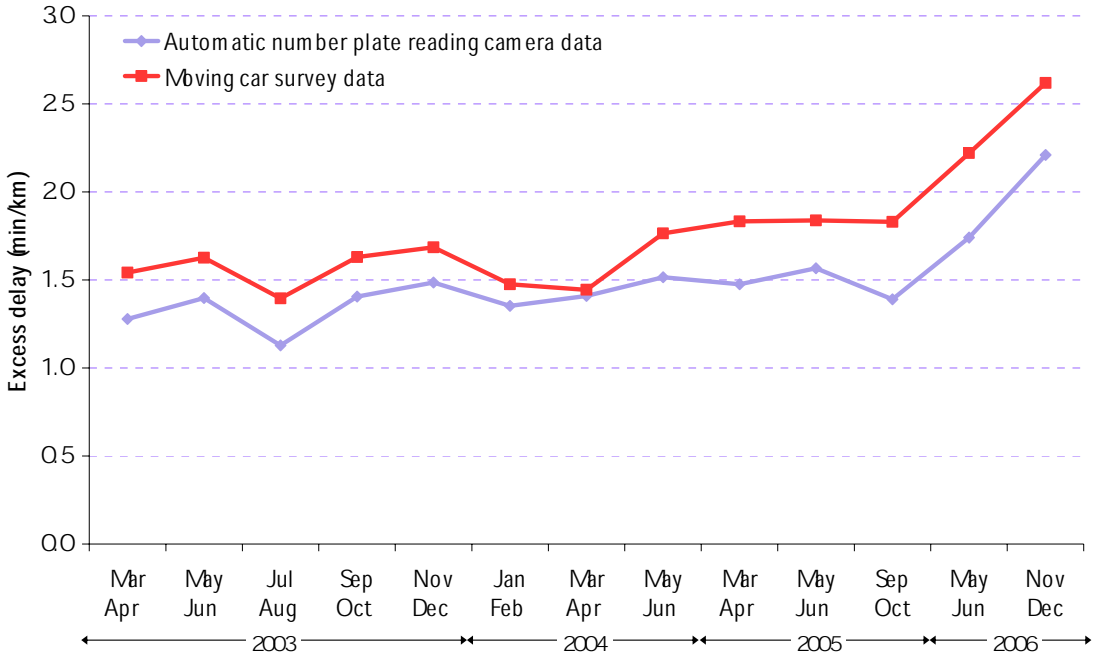
Figure 3.1 also includes a value for the January/February 2007 survey. Whilst this indicates a significantly lower absolute level of congestion than any of the four immediately preceding surveys, the most appropriate comparison is with the surveys at the same date in previous years. In this context, the early 2007 value is seen to be relatively high.

As previously described, data from automatic number plate reading cameras located in and around the charging zone can also be used to derive a second, independent measure of congestion. This works by matching observations of individual vehicles moving between pairs of cameras, where both time and distance are known. This method of measuring congestion has different characteristics to the moving car observer surveys, resulting in different absolute values for average travel times and delays. Automatic number plate reading data tends to indicate slightly lower absolute delays, perhaps reflecting the predominant location of camera sites on the major road

network. It is nevertheless quite clear from Figure 3.3 that these data are indicating a comparable picture in terms of the trend in congestion since the introduction of charging.

The reader should note that the camera measurements used in Figure 3.3 are discontinuous, with periodic camera-based measurements paired with equivalent bi-monthly moving car observer surveys.

Figure 3.3 Congestion in the central London charging zone during charging hours (07.00-18.30). Automatic number plate reading cameras and moving car observer surveys compared.



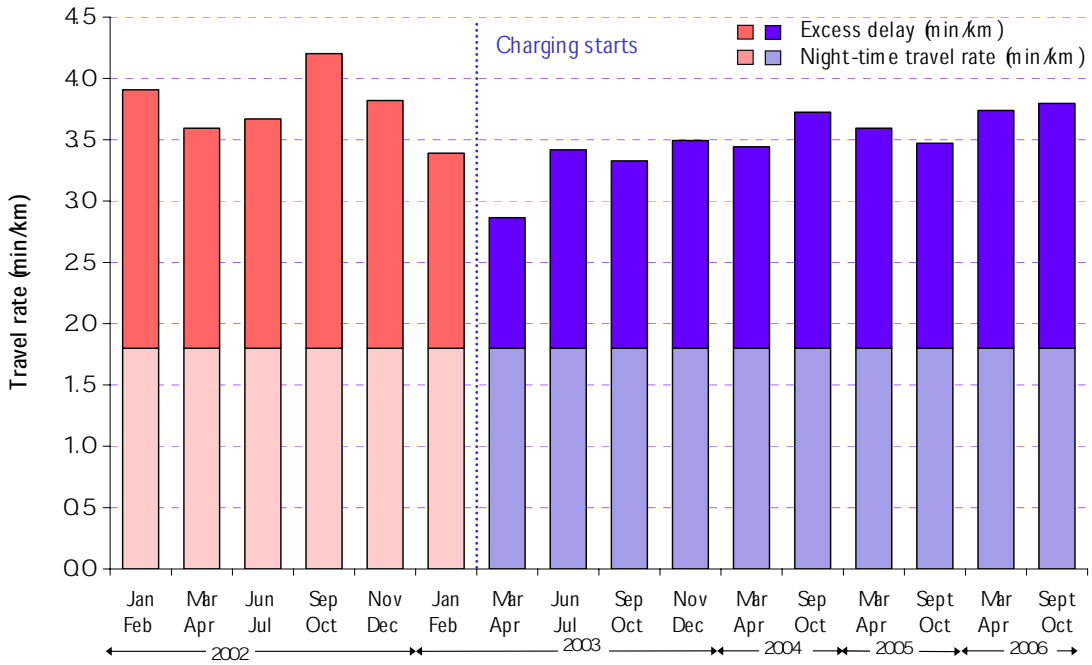
Note that the time-series for this graphic is not continuous. Camera observations have been taken at specific times of the year and paired with appropriate measurements from corresponding moving car observer surveys.

3.5 Congestion on the Inner Ring Road

The Inner Ring Road forms the boundary of the central London 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 on this important primary distributor road. In the event, improved traffic management arrangements combined with broadly unchanged traffic volumes on this route meant that TfL in fact recorded reductions in congestion of up to 20 percent compared with pre-charging conditions in 2002. Surveys for 2005 reported in TfL's *Fourth Annual Impacts Monitoring Report* suggested that useful gains of up to 10 percent were still being experienced.

Congestion on the Inner Ring Road has been measured by dedicated moving car observer surveys, which have been carried out at intervals since 2002. Ten surveys have now been completed since the start of charging, and these can be compared with the six surveys that were carried out before charging began (Figure 3.4).

Figure 3.4 Congestion on the Inner Ring Road during charging hours (07.00-18.30). Moving car observer surveys.



Delays for the two surveys undertaken in 2006 were 1.9 and 2.0 minutes per kilometre, compared with the pre-charging reference value of 1.9 minutes per kilometre. TfL's assessment would be that in 2006, which as noted above was affected by an increase in streetworks, conditions on the Inner Ring Road were closely comparable to those that applied before the introduction of charging. It is noteworthy that vehicle-kilometres driven on this route in 2006 were also closely comparable to pre-charging conditions (see Table 2.6), but this has also been the case for much of the period following the introduction of charging.

Conditions on the Inner Ring Road in 2002 before the introduction of the central London scheme were particularly affected by major infrastructure schemes such as Vauxhall Cross and the 'Shoreditch Triangle' scheme. Discounting both 2002 and the first survey following the introduction of congestion charging, there is also some evidence of slightly increasing congestion on the Inner Ring Road. However, the available data for 2006 do not yet allow any trends to be explored further.

3.6 Congestion on radial routes approaching the central London charging zone

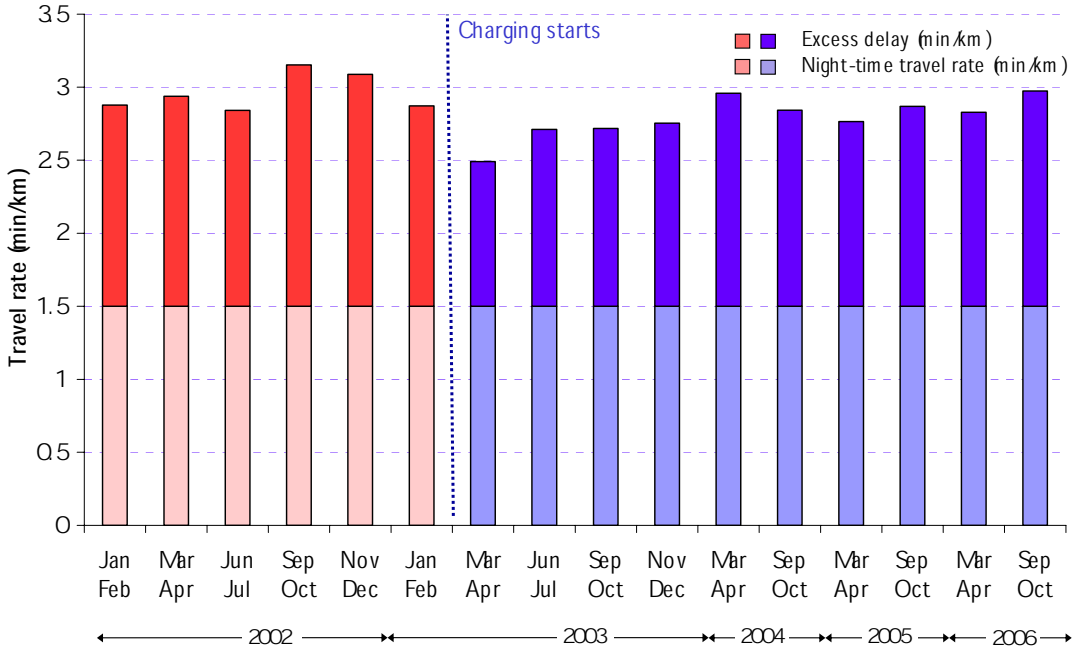
Congestion on main radial routes approaching or leaving the charging zone has been surveyed as part of the intensified moving car observer survey arrangements for the Inner Ring Road. These surveys cover a representative selection of main radial routes up to a distance of three to five kilometres from the charging zone. They are intended to measure any effects arising from changes to traffic moving to and from the charging zone (Figure 3.5).

For the purpose of this report, the measured night-time travel rate for main roads in inner London of 1.5 minutes per kilometre is used to represent uncongested conditions, giving a representative value for congestion (ie excess delay) before charging, during charging hours, of 1.5 minutes per kilometre.

The 2003 post-charging surveys saw decreases in congestion on these roads averaging 0.3 minutes per kilometre (reductions of up to 20 percent), with typical delays during charging hours averaging 1.2 minutes per kilometre. Surveys undertaken during 2004 and 2005 produced more mixed results, but all returned values below the pre-charging representative value of 1.5 minutes per kilometre, indicating continuing small gains on these routes.

Two surveys were undertaken during 2006. These continue to indicate some small gains over pre-charging conditions, with average delays of 1.4 minutes per kilometre. Again however, discounting 2002 and the first survey after the introduction of charging, both of which may have been atypical, there is some suggestion of a trend towards slightly increasing congestion here.

Figure 3.5 Congestion on main radial routes approaching the central London charging zone during charging hours (07.00-18.30). Moving car observer surveys.



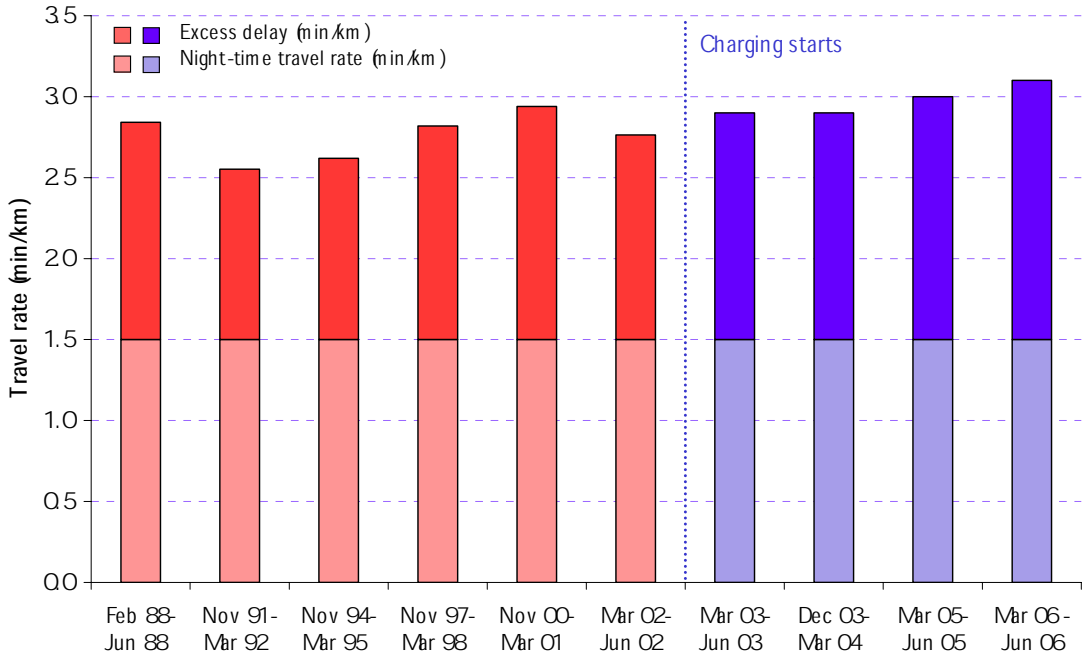
3.7 Congestion on main roads in inner London

Inner London in this context covers the network of main roads outside 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.

Surveys of night-time travel rates returned a value of 1.5 minutes per kilometre, representing notional free-flow speeds of around 40 kilometres per hour. TfL estimated representative pre-charging delays to be around 1.3 minutes per kilometre.

Surveys have been undertaken every year since the introduction of charging, and all have indicated levels of congestion that are higher than the pre-charging reference value (Figure 3.6). The latest survey for 2006 continues this trend, with indicated delays of 1.6 minutes per kilometre – some 0.3 minutes per kilometre or 23 percent higher than the pre-charging reference value. Once again, there is the suggestion of an 'average' increase in congestion of around 0.1 minutes per kilometre per year, occurring alongside stable or declining traffic levels.

Figure 3.6 Congestion on main roads in inner London 1988 to 2006. Charging hours equivalent. Moving car observer surveys.



TfL's assessment would be that this survey is now also tending to reflect a wider trend across central and inner London towards increased congestion, although the picture is confused by the different 'seasons' during which historic surveys have been carried out. Again, this apparent trend appears to be unrelated to changes in traffic levels and to any effects of congestion charging. It most probably therefore reflects changes to effective road network capacity.

3.8 Congestion on main roads in outer London

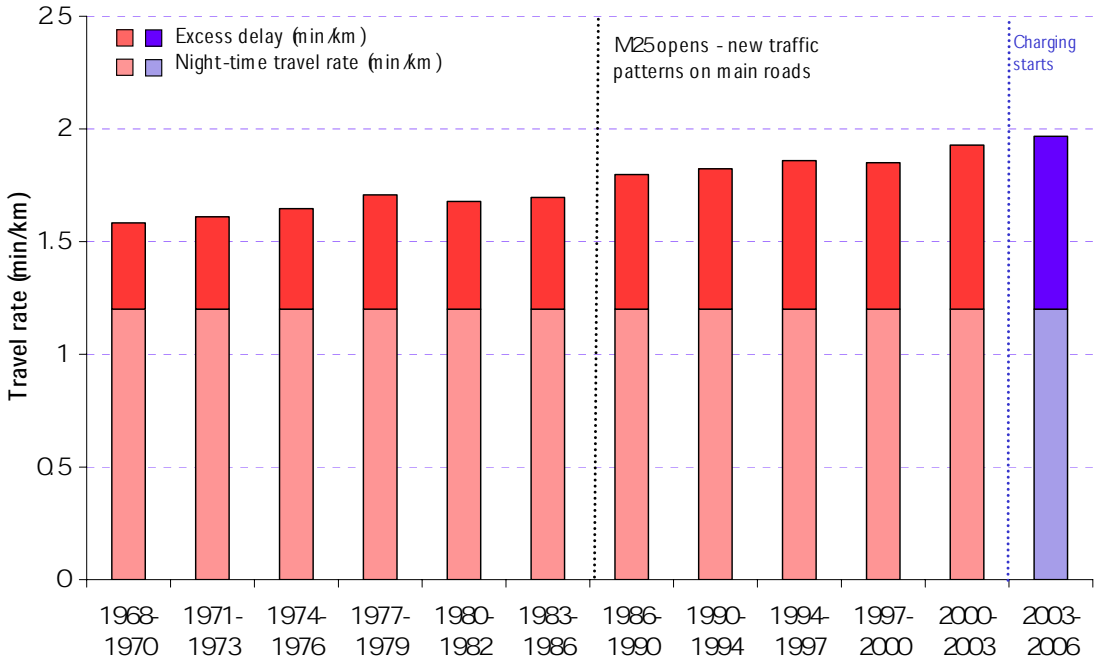
Although not part of the congestion charging monitoring work, TfL continues to undertake periodic moving car speed surveys on the network of major roads in outer London – between the North and South Circular Roads and the Greater London boundary. The available historic time-series for these measurements is shown in Figure 3.7, as they are relevant to an understanding of recent congestion trends in and

around the congestion charging zone. The surveys have been undertaken on a three to four year cycle.

The most recent (2001) night-time survey of this network returned a representative value for travel rates under uncongested conditions of 1.2 minutes per kilometre, equivalent to an average speed of just over 50 kilometres per hour.

In terms of excess travel rate, the pattern is one of consistent progressive increases. Congestion has increased by about 50 percent since the early 1970s but this is from a much lower base, reflecting lower intensities of congestion overall. Congestion trends in outer London over recent decades have nevertheless shown a similar pattern to those in central and inner London. Here the 'average' absolute increase in congestion in recent years has been somewhat smaller – around 0.03 minutes per kilometre per year.

Figure 3.7 Congestion on main roads in outer London. Charging hours equivalent. Moving car observer surveys.



3.9 Relationship of congestion to traffic volumes

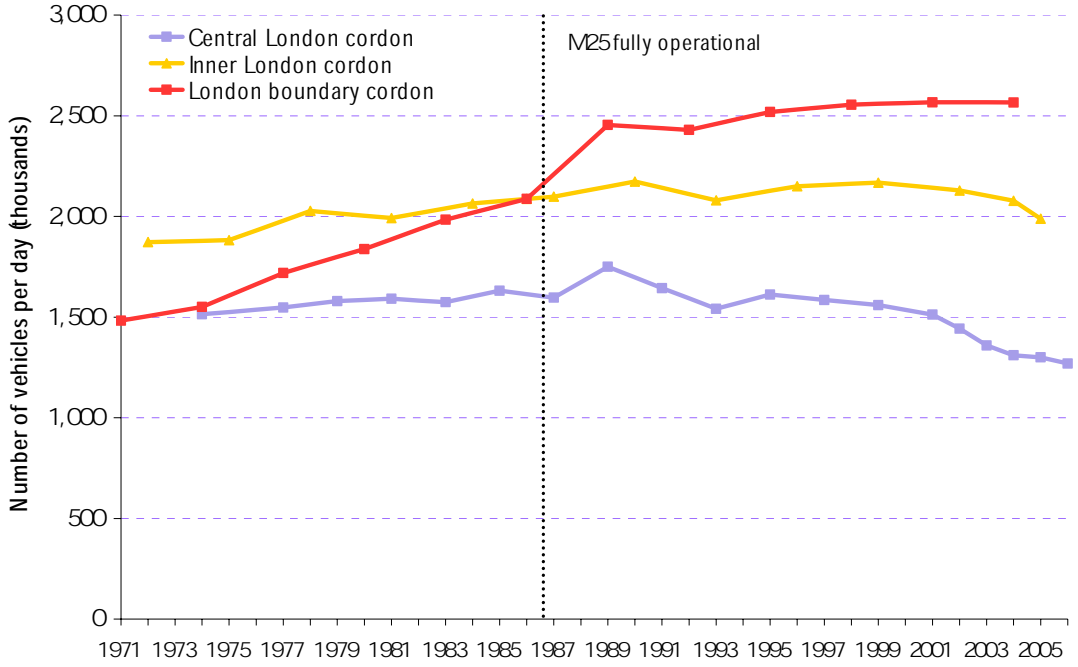
If the effective capacity of the road network remained stable, then trends in travel rates and hence congestion would be expected to directly reflect changes in traffic levels.

TfL's *Fourth Annual Impacts Monitoring Report* reviewed long-run traffic trend data and observed that increases in congestion, at least in central and inner London, were generally occurring in the context of long-term 'background' declines to traffic volumes. Figure 3.8 updates this analysis to include new traffic flow data for 2005 and 2006.

The overall trend for traffic levels during working weekdays shows a continuing trend of small year-on-year reductions to traffic entering and leaving central London and inner London. The trend for traffic crossing the outer London cordon during the 1980s reflected changes related to the opening of the M25.

Data for recent years shows that traffic growth here has now virtually levelled off. However, Figure 3.8 shows that the rate of decrease in average speeds in outer London has been relatively consistent for the past three decades, despite the much larger variation in traffic levels during the 1980s, significant enhancements to capacity at this time, and the comparative stability of both in more recent years.

Figure 3.8 Long term traffic trends across three strategic cordons in London.



3.10 Summary of recent trends

- Congestion data for 2006 for central and inner London shows an increase in congestion of a significantly greater magnitude than the gradual 'background' trend recognised in TfL's *Fourth Annual Impacts Monitoring Report*. This probably reflects a particularly high number of roadworks in the latter half of 2006, particularly in central London.
- Comprehensive traffic counts in and around the charging zone (see Section 2 of this report) suggest that this intensification of congestion was not directly related to traffic volumes, which are themselves continuing an established 'background' trend of small year-on-year declines.
- Taken alone, the 2006 surveys for the charging zone show a sharp deterioration in network conditions against previous years, such that average congestion across the year as a whole was 8 percent lower than the pre-charging reference value. This compares to an average 22 percent reduction for 2005 and a 30 percent reduction for the first two years following the introduction of charging.

- These observations for the congestion charging zone are supported by independent trend data derived from congestion charging automatic number plate reading cameras.
- Surveys of congestion on the Inner Ring Road and main radial routes around the charging zone are showing some signs of mirroring the wider trend towards increasing congestion, although conditions here remain comparable to, or marginally better than those in 2002 before the introduction of charging.
- Latest results for major roads in inner London show that delays to road users here are now about 10 percent higher than typical values before 2003, despite falling traffic volumes. Conditions here may also have been influenced by decreasing effective network capacity due to permanent and short-term interventions, although TfL have not yet examined the available data for this area in detail.
- Data for congestion on main roads in outer London post-dating the opening of the M25 mirrors the trends seen in inner and central London, though the available data points for this cover 3 years and therefore are only of value in assessing long term trends.

Furthermore, as described elsewhere in this report:

- Reliability of bus services in central London remains significantly improved over conditions before 2003. However, data for the average speeds of buses in and around central London, described in Section 4 of this report, also shows a consistent trend towards lower average speeds. Although bus speeds are in part influenced by a different set of factors to general traffic, the prevailing trend is similar to that for traffic more generally.
- Baseline congestion data has been compiled for assessing the impacts of congestion charging in the western extension zone, and this is discussed further in Section 10 of this report.

3.11 Interpretation

TfL's *Fourth Annual Impacts Monitoring Report* explored these recent trends in congestion. It was noted that the causes of these trends were likely to be complex and multi-faceted, such that it would not be feasible to arrive at a definitive understanding in the medium-term. Substantial further research would be required, and TfL was putting in place several initiatives towards this end.

In summary, TfL's *Fourth Annual Impacts Monitoring Report* concluded that:

- A trend towards slow, 'background' increases to congestion is a long-term and widespread phenomenon that can be traced back two decades or more.
- It was not, at least in recent years, directly related to changing traffic volumes on the road network.
- It therefore appeared to be primarily a manifestation of reduced effective capacity on the road network, ie the achievable vehicle throughput of the network.
- Conditions in the central London congestion charging zone in 2006 appear to have reflected an additional set of factors, causing conditions to deteriorate much more sharply, unlike the gradual long-term trend. A key factor in 2006 that is

correlated with the observed congestion measurements over this period is increased streetworks, as discussed above. Whilst many of these works are essential, improved coordination would help reduce their traffic impacts.

- The balance of road network management by highway authorities over recent years has seen increasing interventions designed to bring about a better balance between all users of the road network. These have included, but were not limited to: widespread use of traffic control and road safety measures; measures to assist pedestrians and cyclists at junctions; bus priority measures and increased bus activity and patronage. All of these contribute to achieving the wider goals of the Mayor's Transport Strategy, although TfL is only directly responsible for implementing a fraction of these interventions.
- Most of these interventions have also had beneficial impacts, either directly to selected users of the road network or more generally. Beneficial trends such as the dramatic reductions in reported road traffic accidents in London are at least in part a result of some of these measures, and are explored elsewhere in this report.

Many of these interventions would probably have occurred – to a lesser or greater extent – irrespective of the introduction of congestion charging, and indeed the major interventions in central London, such as part pedestrianisation of Trafalgar Square, preceded charging (albeit they were planned with the impacts of charging in terms of reducing traffic in mind).

Furthermore, the traffic reductions brought about by congestion charging have meant that the impacts on congestion of roadworks and in particular the sharp increase in streetworks in 2006, has been much reduced compared to a non-charging scenario.

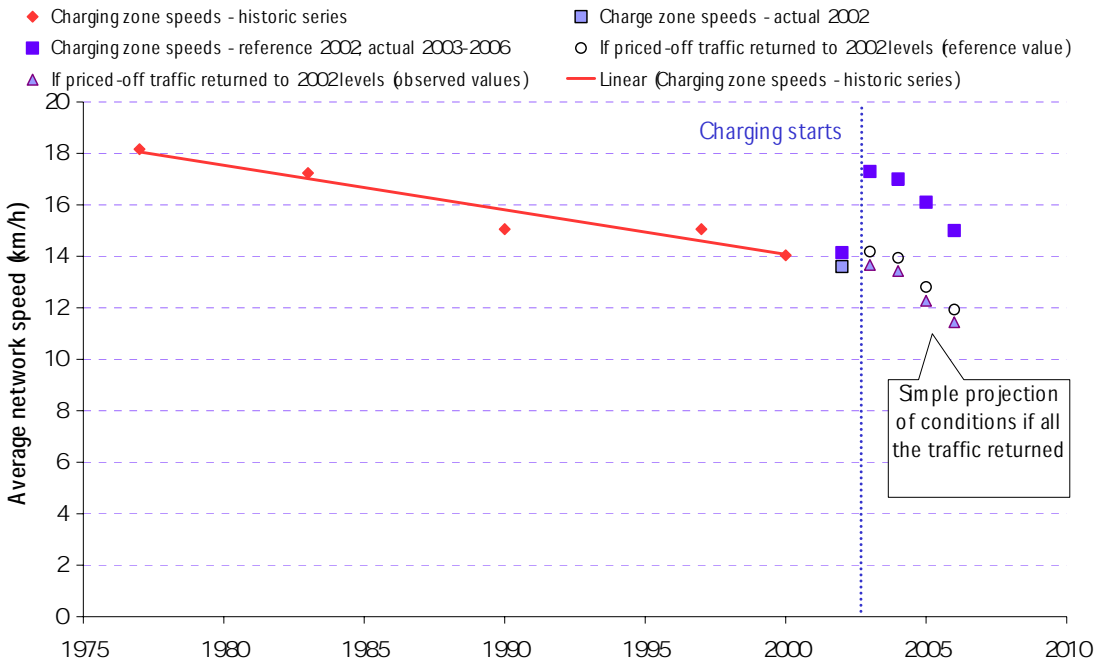
Figure 3.9 compares observed conditions in the central zone (in terms of average network speeds) over recent years with a simple projection of what conditions might have been like had charging not been introduced in 2003. The figure also shows the long-term historic trend towards increased congestion in central London. It is seen that:

- The trend towards increased congestion or reduced average network speeds is a long-term feature of the central London road network. Average network speeds during 'charging hours' in 2002 were about 14 kilometres per hour.
- The introduction of congestion charging in 2003 substantially increased speeds and reduced congestion almost overnight, bringing average network speeds during charging hours back to levels last seen in the early 1980s, at approximately 17 kilometres per hour.
- Since 2003, average observed charging hours speeds have progressively fallen back, to about 16 kilometres per hour in 2005 and 15 kilometres per hour in 2006. Given the impacts of streetworks in 2006, this latter figure should not necessarily be regarded as typical of the long term trend.
- Assuming that similar road network conditions prevailed but that charging had not been introduced, the graphic shows that network speeds in the years after charging would be substantially below those observed, with projected average speeds in 2006 perhaps being as low as 11.5 kilometres per hour. This would be

equivalent to a congestion level of over 3 minutes per kilometre, compared with average observed delays of 2.1 minutes per kilometre.

- However, this simple projection may be something of an over-estimate because it does not take into account the possible wider implications of reduced network capacity for traffic levels. Nevertheless, it does suggest that in 2006, users of the road network in the charging zone were probably experiencing effective reductions in congestion comparable to those originally reported by TfL after the introduction of the scheme, with relative savings of around 0.7 minutes per kilometre against equivalent conditions in 2006 in the absence of charging.
- Analysis of recent trends for congestion in inner London reveals a broadly similar picture.

Figure 3.9 Long-term trend in traffic speeds and congestion in the central London charging zone. Charging hours equivalent. Moving car observer surveys.



3.12 Analysis

TfL has continued to investigate these trends under three broad headings:

- nature of increased congestion;
- relationship to known interventions;
- a network capacity inventory framework.

Nature of increased congestion

Congestion varies continuously, both spatially and temporally. Concentration of the trend towards increased congestion in one area, or one particular time period, may provide insight into the causes. The disaggregate data from moving car observer surveys allow some examination of these possibilities, but they are limited in this regard in two related ways:

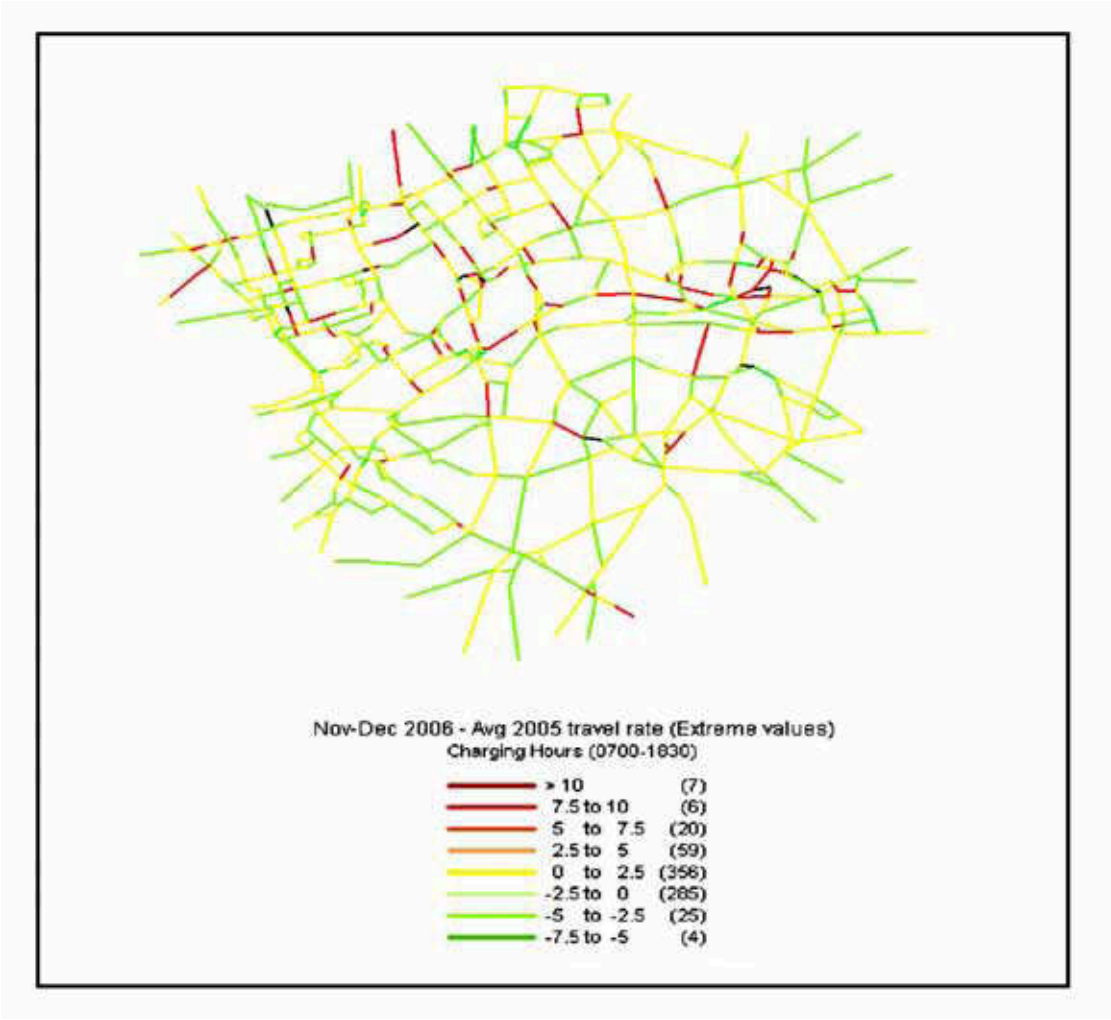
- The surveys are optimised to give a medium-run view of average speeds across the network of interest. Therefore, observations on each link would be subject to considerable 'natural' variability reflecting normal minute-by-minute changes in prevailing traffic conditions, as well as normal statistical sampling error.
- A possible solution to this is to aggregate data from several surveys to give a potentially more robust estimate. However, the tendency here is then for the differences in repeated measurements for the same link to cancel each other out. This is an intended effect at the network wide level. In trying to identify specific locations or time periods with disproportionate change it can however disguise the variations in which we are interested, particularly for shorter-term incidents such as streetworks.

Nevertheless, a number of exploratory analyses are possible. Highly-averaged comparisons between different surveys and repeated, more disaggregate, comparisons between sequential surveys, tend to suggest the following:

- At the more aggregate level, the tendency towards increased delays is widespread and general across the network, rather than being concentrated in particular 'hot-spots'.
- Having said this, disaggregate comparisons suggest that each individual survey is characterised by (often small) parts of the network that show much higher delay values than in comparable surveys at other times.
- Between successive surveys, these 'hot spots' tend to 're-locate' around the network, partly giving rise to the more general effect seen in the more aggregate comparisons.
- It is possible, over successive surveys, to begin to identify areas of the charging zone where these effects are relatively more pronounced, but these localised effects are not very distinct.

Figure 3.10 presents an example of this type of analysis. It shows a comparison of average results from all six moving car observer surveys for 2005 against the individual survey for November/December 2006. The data are for charging hours, and represent an aggregation of 24 individual runs for the 2005 average, and four individual runs for the November/December 2006 average. Individual links are colour coded according to the difference (in minutes per kilometre) between the two sets of average total travel rates (as opposed to delays). The delay value for November/December 2006 indicated the highest level of congestion seen since the introduction of charging, and the figure therefore shows how conditions differed across the network during this relatively extreme period compared to average conditions for the whole of 2005.

Figure 3.10 Excess travel rate for November/December 2006 moving car observer survey compared with average delays for 2005 (all surveys). Difference in congested travel rate.



The following key observations are made:

- Links with positive values (increased congestion) are much more widespread than those with negative values.
- However, the majority of these links with positive values have only small increases on the average value for 2005. Furthermore, as maximum vehicle speed (ie the minimum achievable travel rate) is relatively constrained in comparison with maximum possible delay (ie the maximum observed travel rate), the scope for 'improvement' in any particular comparison is limited, and the ranges used for the graphic would tend to visually over-state the magnitude of the deterioration.
- Bearing in mind the tendency of interventions at particular points to cause delays on surrounding links in the local network, this tends to substantiate the observation that increased congestion is a fairly general effect across the whole network, rather than being exclusive to specific 'hot spots'.
- Extreme positive values (increases in congested travel rate of greater than 5 minutes per kilometre on a link by link basis) are observed in several locations. The incidence of these extreme positive values is an expected feature of these

comparisons, as they partly reflect normal variability between surveys, where certain links are affected by significant road works for example. It is however notable that those in the graphic correspond to areas of known works-related disruption at the time of the November/December 2006 surveys: Tottenham Court Road, Victoria Embankment/Lower Thames Street and parts of the network in the City of London.

Relationship to known interventions

The *Fourth Annual Impacts Monitoring Report* identified four key groups of interventions on the road network that would be expected to have reduced effective capacity for general traffic. Subsequent research by TfL, further to the Network Capacity Inventory initiative outlined below, has broken these down into twenty or so more specific types of intervention that are known to have been widespread in central and inner London in recent years. These can loosely be classified as:

- permanent (eg public realm schemes or carriageway re-modelling such as bus lanes);
- long term (eg new traffic signals or substantial alterations to signal timings);
- short term (eg the more significant streetworks, including utility works);
- transient (eg short term road works or accidents and incidents);
- traffic-related (mainly changes to the composition of traffic including more taxis, articulated buses and more activity by two-wheeled vehicles).

It is likely that:

- All of these interventions would contribute to some degree of reduced effective network capacity for general traffic, although some interventions would be more significant than others, and it is not immediately possible to quantify either the extent of all of the different types of intervention or their relative contribution to the observed congestion effect.
- Research by TfL is suggesting that the incremental effect of successive interventions is a compounding one, in that each individual intervention interacts with subsequent ones, such that the impact of later interventions is larger due to reduced resilience resulting from earlier interventions.

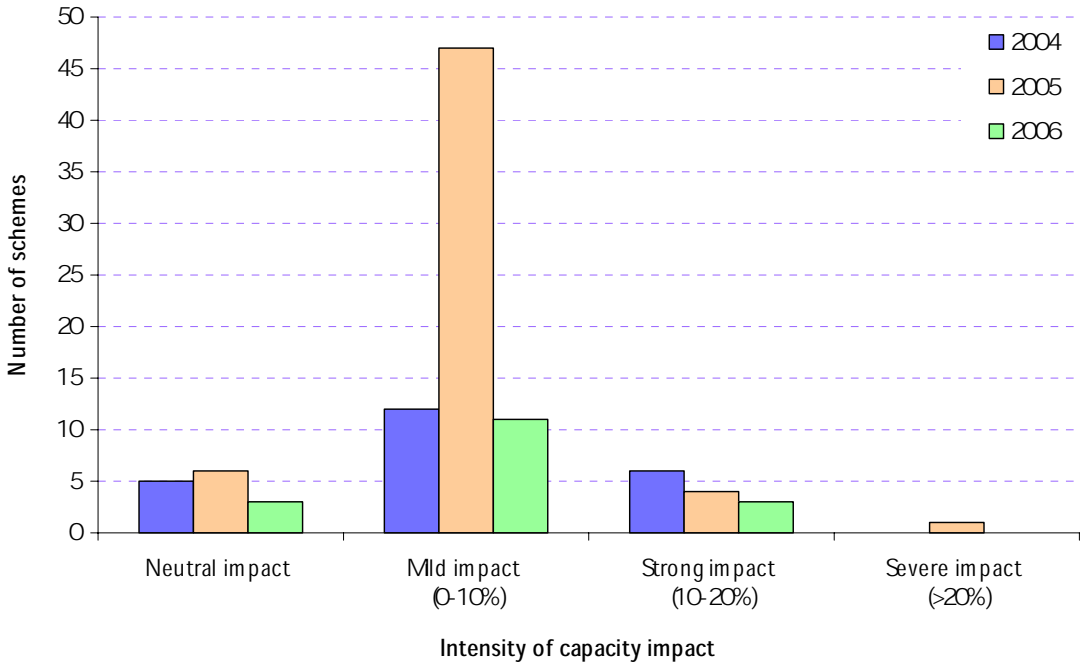
Recent research by TfL has focused on a sub-set of these interventions, and looked at trends since the introduction of congestion charging. The important category of increased streetworks and their relationship to recent congestion trends has already been discussed above. A further category of intervention that has been studied is changes to traffic signals.

Figure 3.11 shows the number of changes to traffic signals in the central zone by year for the period 2004 to 2006. They are grouped according to the severity of the projected impact on local junction capacity for general road traffic. Note that this is not wholly equivalent to effective network capacity, but may for this purpose be taken as a good proxy as it is junctions that largely control the effective capacity of an urban road network. The grouping is on the following basis:

- 'neutral' impact: schemes with a marginal positive, negligible or marginal negative impact on local network capacity;
- 'mild' impact: schemes with a projected reduction in the range 0 to 10 percent for local network capacity;
- 'strong' impact: schemes with a projected reduction in the range 10 to 20 percent for local network capacity;
- 'severe' impact: schemes with a projected reduction in local network capacity of greater than 20 percent.

There were approximately 100 schemes during the period under review. This compares to around 600 schemes conducted across the whole of Greater London in 2006. Schemes apply to junctions, rather than individual signals, and the configuration of signalised junctions varies. Since there are about 540 signals in the charging zone, this activity probably represents changes to about half the junctions within the zone. These changes are of a magnitude that could account for a significant proportion of the overall reduction in road network capacity implied by the congestion measurements in the central London charging zone since 2004.

Figure 3.11 Traffic signal schemes in the central London charging zone, 2004–2006, grouped by impact on local network capacity.



It is clear from the figure that:

- The overwhelming balance of these interventions is towards those that would measurably reduce effective capacity of the road network for general traffic, thereby increasing congestion or traffic delays. Few, if any, schemes have an objective to increase local network capacity, but this is not unexpected given the wider constraints of the central London road network, and the need to achieve a better balance between all users of the road network, including pedestrians.

- The level of activity in 2005 was considerably greater than in both 2004 and 2006. This does not immediately correspond to the sharp increases to congestion observed in late 2006, but may have acted as a 'precursor' by reducing the capacity of the network to cater for subsequent interventions such as the sharp increase in streetworks in the latter part of 2006.
- 'All red' installations are not explicitly shown on the graphic, but there have been seven of these in the central London charging zone over the period covered by the figure. These would fall into the 'strong' or 'severe' impact categories.

A road network capacity inventory

The work described above represents the start of a longer-term research programme that will enable TfL to better understand the nature and causes of the recent trends in traffic and congestion. This will allow TfL to respond more effectively to the 'Network Management Duty' under the Traffic Management Act 2004, which requires TfL to expedite the movement of all traffic, including pedestrians. This work is focused around a proposed network capacity inventory, and has three main elements:

- assembling data describing each of the various categories of intervention, and translation to a common basis which quantifies the resulting reduction in effective network capacity;
- develop a simulation tool that will allow both 'back-casting' and experimentation to establish proportionate cause and effect;
- facilitate better management, co-ordination and policy development by allowing simulation of possible future network activity scenarios.

A pilot project is currently underway in south-east London, and this is expected to lead to a larger-scale exercise, to be undertaken in the western extension itself, together with appropriate 'control' areas, later in 2007.

3.13 Summary of key points

The year 2006 saw a sharp increase in streetworks that correlates with a significant reduction in decongestion achieved within the central London congestion charging zone.

This is in addition to a gradual longer-term trend of increasing congestion across London, reflecting a longer-term phenomenon going back two decades or more.

Research undertaken by TfL suggests that this more gradual 'background' trend reflects the collective impact of a wide range of interventions on the road network. These have included both schemes that would have a long-term capacity reduction effect for general traffic, for example public realm schemes and bus priorities such as bus lanes, and interventions having a shorter term or temporary impact, such as road and street works. These longer-term interventions are generally to achieve benefits for particular groups of road users in safety and amenity. However, the balance of evidence for the charging zone suggests that the main cause of reduced capacity and increased congestion in the zone in the latter half of 2006 is the increase in streetworks.

In view of these factors, comparison of conditions in 2006 against a static baseline from 2002 is increasingly inappropriate. More relevant is a comparison of conditions in 2006 against what might have been the case in the absence of congestion charging, assuming that other aspects of road network management had continued unchanged. Despite the increased prevailing level of congestion, this suggests that drivers in the charging zone during 2006 were probably experiencing comparable absolute levels of congestion reduction to that observed when the scheme was first introduced in 2003, of up to 0.7 minutes per kilometre.

4. Central zone: public transport, accidents and air quality

4.1 Introduction

This section looks at some important secondary indicators of the impact of congestion charging in the original central London congestion charging zone.

Public transport – particularly the bus network – acted as a key facilitator of the central London scheme, by providing a viable alternative for displaced car occupants. In turn, the traffic and mode shift changes brought about by congestion charging had implications for the operation of the public transport networks. This took place against the backdrop of substantial improvements to the bus network, reflecting wider initiatives in the Mayor's Transport Strategy.

The traffic reductions described elsewhere also had implications for road traffic accidents and vehicle emissions in and around the charging zone. In the case of accidents, the new traffic patterns were expected to lead to fewer casualties in the charging zone, alongside a host of other TfL and borough accident reduction schemes that have collectively led to substantial year-on-year reductions in reported casualties across London.

For vehicle emissions, post-charging traffic patterns with fewer vehicles moving with less delay fed through to reductions in emissions of Oxides of Nitrogen, particulate matter and Carbon Dioxide. However, owing to the complexity of the processes involved, these were not necessarily expected to be measurable as reduced pollutant concentrations at air quality monitoring sites.

4.2 Key findings from previous reports

- Passengers entering the central charging zone by bus increased by 37 percent during charging hours in the first year of the operation of the scheme. Up to one half of that growth was estimated to have reflected displaced car travellers transferring to the bus network, and the remainder a 'background' trend reflecting wider improvements to bus services.
- Bus service reliability improved on routes in and around the charging zone following the introduction of the scheme. Excess waiting time – a measure of the unreliability of the service – fell by 30 percent in the first year and by a further 18 percent in the second year after the introduction of charging. Although congestion charging related traffic changes would have contributed substantially to this in central London, the general trend was mirrored throughout the entire London bus network and in part reflected new bus operator contractual regimes.
- 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. However in the third year it increased by 13 percent. This latter change was a general trend reflected across the wider bus network that may have been linked to wider congestion trends, as discussed in Section 3 of this report.

- Contrary to TfL's expectations, the number of passengers exiting Underground stations in and around the central charging zone dropped during the first year of charging, reflecting external factors unconnected with charging such as the Chancery Lane derailment. Over more recent years, the prevailing trend has been towards increasing patronage, with the London bombings of July 2005 having little apparent long-term effect on aggregate patronage.
- The overall number of passengers using National Rail to travel to or from the charging zone was stable over the period spanning the introduction of the scheme.
- Recent years had seen significant year-on-year reductions to reported personal injury road traffic accidents both within the central London zone and across London as a whole, reflecting wider TfL and borough road safety initiatives. This background trend was further enhanced by an estimated 'excess reduction' of between 40 and 70 fewer accidents per year within the charging zone and on the Inner Ring Road.
- Independent statistical treatment of the accumulating time-series of road traffic accident data confirmed that TfL's earlier conclusions regarding the impact of congestion charging on road traffic accidents were reasonable.
- There was no evidence of disproportionate or detrimental changes to the number of reported casualties involving two-wheeled vehicles in or around the charging zone, despite increases to the numbers of these vehicles. The was also no evidence of disproportionate or detrimental accident trends on the Inner Ring Road.
- By reducing the volume of traffic circulating within the charging zone and improving the efficiency with which it circulates, it was estimated that congestion charging had been directly responsible for reductions of 8 percent in Oxides of Nitrogen (NO_x), 7 percent in fine particulate matter (PM_{10}) and 16 percent for Carbon Dioxide (CO_2). These figures related to an annual average 24-hour day for all emissions from road traffic only.
- Trends in actual measured air quality (as opposed to emissions) across London continued to reflect the diversity and dominance of external factors in determining pollutant concentrations and, as such, did not allow the identification of a clear 'congestion charging effect'. Although this measurement outcome was not unexpected, the removal of a proportion of road traffic emissions both contributes to wider initiatives to improve air quality, and to comparatively improved air quality over the long-term.
- Sample surveys of ambient noise in and around the congestion charging zone showed a mixed picture that was more reflective of local and measurement issues than indicating any consistent congestion charging effect.

4.3 Key findings for 2006

- Although there was no direct measure of the number of passengers entering the charging zone by bus in 2006, the number of bus passengers entering a wider definition of central London in the weekday morning peak was 116,000, which was closely comparable with 2005.

- As in previous years, the availability of bus services in and around the charging zone continued to satisfactorily accommodate patronage.
- Reliability of bus services in and around the charging zone has seen some deterioration, with excess waiting time increasing by 2 percent from 2005, although it still remains substantially better than pre-charging levels.
- The percentage of scheduled bus kilometres lost in the central zone due to traffic congestion increased by 28 percent compared with the previous year, to stand at 2.3 percent of scheduled kilometres. This is a substantial increase and is possibly linked to the wider congestion trends discussed in Section 3 of this report.
- The number of passengers using the Underground to travel to and from central London in 2006 increased in relation to 2005, reflecting wider travel and network trends and continuing the recovery from the recent lows of 2003/2004, to stand 1 percent above the pre-charging level of 2002.
- The number of reported personal injury road accidents continued to decrease in 2005/2006 across Greater London, reflecting recent year-on-year trends and ongoing road safety initiatives.
- Trends in reported accidents within the central charging zone during 2005/2006 showed a greater proportionate decline in accidents compared with other areas in London. However, for the first time since the introduction of charging there was evidence of increased numbers of collisions involving pedal cyclists, which may in part reflect greater numbers of these vehicles.
- In the absence of 'step' traffic changes, such as those that accompanied the introduction of congestion charging in 2003, the dominant influence on emissions of key air pollutants over recent years has been vehicle technology improvements. Between 2003 following the introduction of congestion charging and 2006, these changes were estimated to have reduced emissions of NO_x by 17 percent, PM_{10} by 24 percent and CO_2 by 3 percent.
- Trends in measured ambient air quality during 2006 have largely reflected previous years. There is some evidence of a differential reduction in the concentrations of PM_{10} at the roadside in the charging zone compared with other parts of London, but the causes of this are not yet clear. Concentrations of NO_2 have been stable or have increased, particularly adjacent to major roads, reflecting increased emissions of primary NO_2 from diesel fuelled vehicles. The latter is part of a wider national trend and is currently the subject of an active research programme.

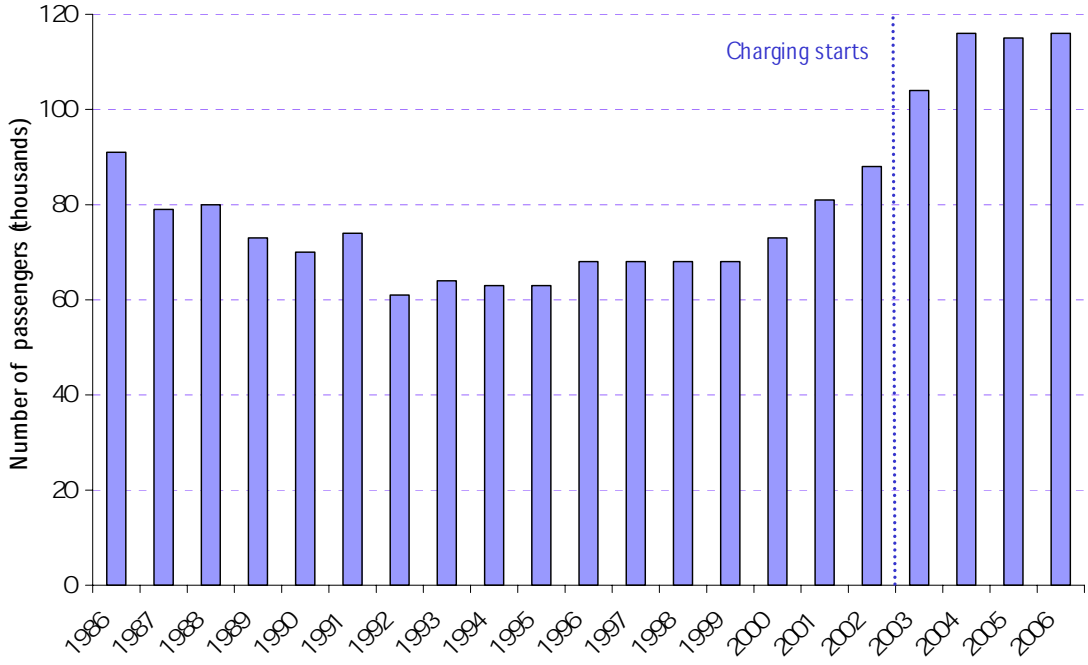
4.4 Buses

Bus patronage

Bus passenger numbers entering the central charging zone are no longer measured directly. In Autumn 2006, the regular survey of bus passengers entering the central London area (a larger area than the central congestion charging zone) was undertaken as part of TfL's Central Area Peak Count. Although the data does not relate directly to the congestion charging zone it provides an indication of bus passenger trends in the area.

Figure 4.1 shows these counts over the last twenty years. The increase in passengers entering central London by bus over more recent years and in particular following the introduction of charging in 2003 is clear. Bus passenger numbers increased by 18 percent and 12 percent respectively during the first and second years after charging. Passenger numbers have since settled at around 116,000 in the weekday morning peak period. The increase in the charge in July 2005 had only a limited impact on the number of cars entering the central zone – too small to have a detectable impact on bus patronage.

Figure 4.1 Bus passengers entering central London, 07.00 to 10.00, Autumn counts, 1986 to 2006. TfL Central Area Peak Count.



A number of factors have affected bus passenger numbers in central London as well as the introduction of congestion charging. Bus fares have been restructured over the last few years. The large-scale move towards off-bus tickets and in particular Oyster pay-as-you-go has led to a real decrease in the average fare that is paid per individual trip. Free travel for specific population groups and concessions are also being extended. From 1 September 2006 free bus travel was introduced for young people aged 16 and 17 in full-time education.

Bus speeds

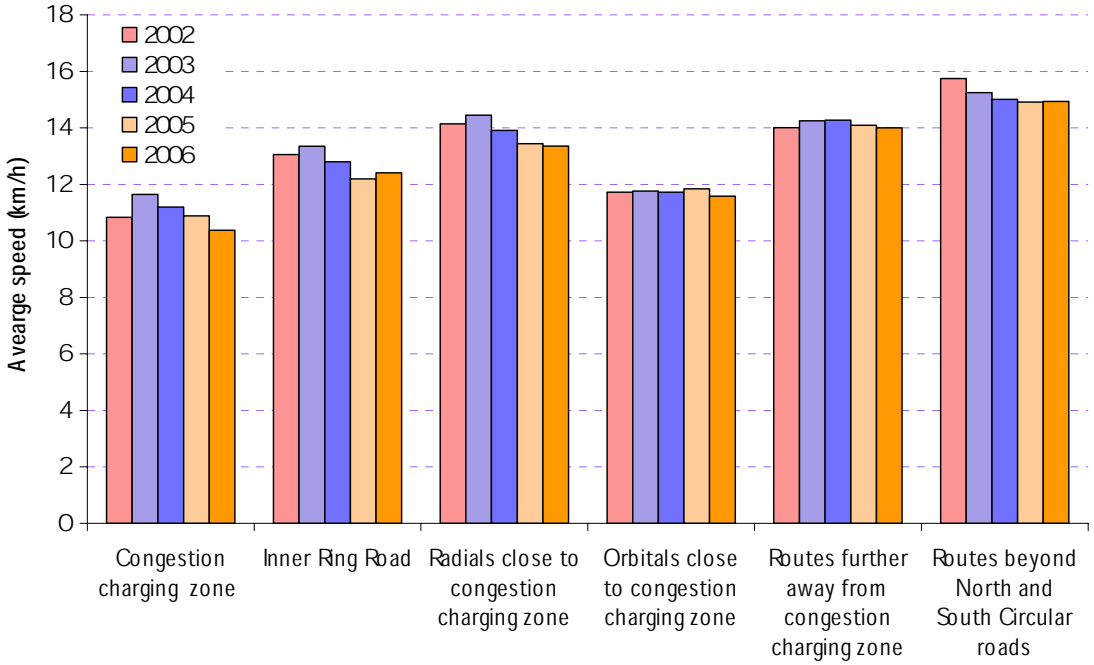
Figure 4.2 shows trends in average bus journey speeds across London from 2002 to 2006. These speeds include the time spent at bus stops and in traffic queues. In the first year following the introduction of charging, bus speeds increased in central London with a particularly marked improvement in the congestion charging zone. Buses operate to a schedule and, furthermore, progress along a route is influenced by passenger boarding/alighting and bus priority infrastructure. Therefore, bus speeds will not bear a direct relationship to more general traffic conditions. Nevertheless, trends in bus speeds would be expected to broadly reflect trends in general traffic, taking these other factors into account.

The figure shows that, between 2002 before the introduction of charging and 2003, bus speeds increased by 7 percent inside the congestion charging zone and by 2 percent on the Inner Ring Road and on radial routes close to the congestion charging zone. Bus speeds for routes beyond the North and South Circular Road, which were not likely to be affected by charging, decreased by 3 percent.

Since 2003 however, bus speeds in all areas have decreased consistently and in the past year alone there has been a 5 percent decrease in bus speeds in the original central London charging zone. Bus speeds on routes on the Inner Ring Road showed a slight increase in the last year of 2 percent. Bus speeds on routes in all other areas in central London showed a decrease in the order of 1 to 2 percent, while routes beyond the North and South Circular road showed no change in average bus speeds.

The overall reduction in bus speeds since 2003 has been 11 percent within the central zone, 7 percent on the Inner Ring Road and 8 percent on radial routes close to the central London charging zone. Areas further away from central London have showed a decrease of the order of 2 percent over this period.

Figure 4.2 Average bus speeds – selected sections of road.



This apparently consistent and widespread trend for buses to become slower therefore also reflects the trends for general traffic explored in Section 3. Whilst there may have been specific reasons for this that are not associated with general traffic, for example increases in bus patronage (see Figure 4.1) there have also been offsetting factors related to payment methods and a general increase in the provision of bus priorities (eg bus lanes, bus priority at traffic signals). TfL is exploring this trend as part of the wider work on understanding the influences on the capacity of the road network.

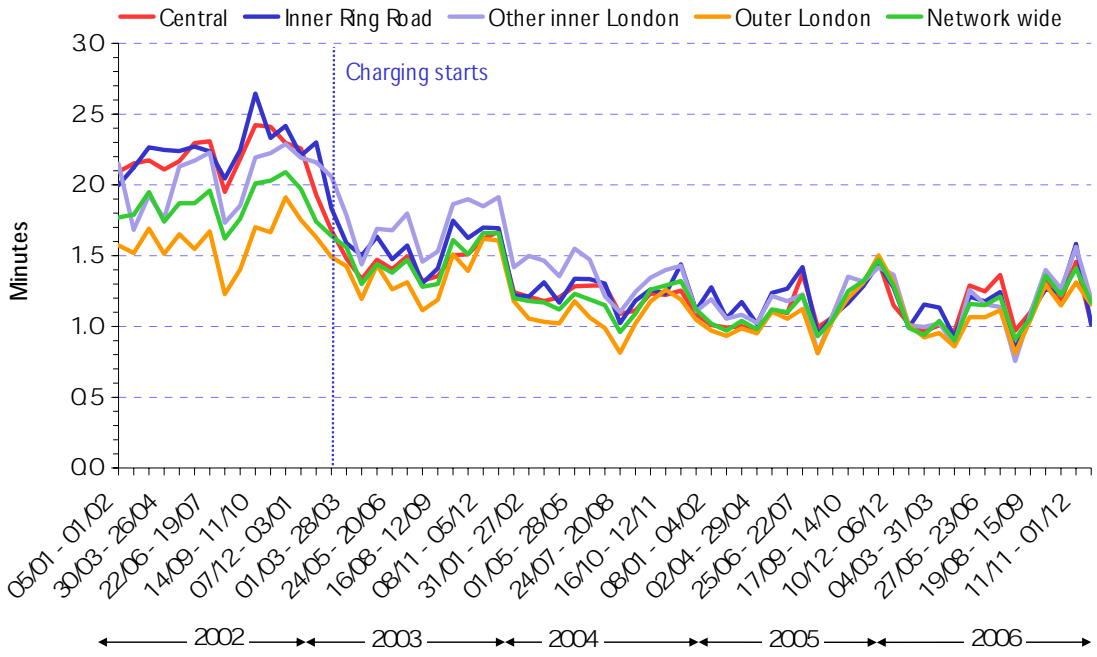
Bus service reliability

Reliability of bus services in central London also improved following the introduction of congestion charging. This reflected a variety of factors, which included: increased investment in robust schedules, enhanced route supervision and the introduction of Quality Incentive Contracts, as well as the introduction of congestion charging itself.

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, excess waiting time decreased in and around the charging zone by around 30 percent, compared with reductions of 20 percent network wide. In the second year after charging, further improvements of 18 percent were made while in the third year there was a smaller scale improvement of 4 percent in the congestion charging zone. After the initial 'step' change in central London, directly reflecting the impact of charging, trends over the following two years in the charging zone followed the pattern of network wide averages.

In the most recent year, bus service reliability has seen a slight deterioration in the central charging zone, with excess waiting time having increased by 2 percent from the previous year. During the same period, the network wide average excess waiting time remained closely comparable to the previous year. Figure 4.3 shows the measured excess waiting time for different parts of the London bus network as well as the network wide average. It illustrates the improvement in bus service reliability in central London over recent years.

Figure 4.3 Excess waiting time – high frequency routes (weekday charging hours)



Further to the improvement in excess waiting time since the introduction of charging in central London, there are also improvements directly linked to improved traffic

conditions. This is reported in terms of 'bus kilometres not operated' compared to those scheduled. During the first year after the introduction of charging, bus routes in and around the charging zone saw the biggest improvement in this indicator, with lost kilometres reduced by 60 percent. In the following years the picture was fairly stable across the network until last year when the trend towards improvement was reversed and some of the earlier gains lost.

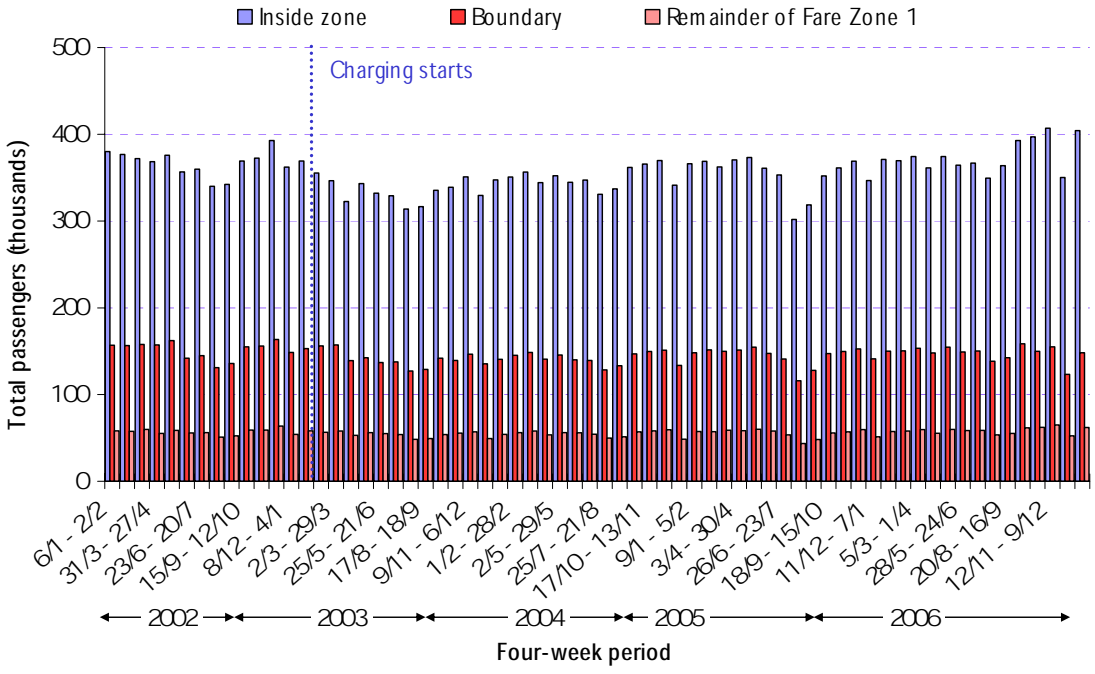
The same picture is apparent in the most recent period and is most evident in the central zone, where kilometres lost have increased by around 28 percent relative to the previous year. This represented 1.8 percent of scheduled bus kilometres in 2005, and 2.3 percent in 2006. However, bus services in central London are still performing better compared to before congestion charging was introduced.

4.5 Underground

Underground patronage

Previous annual impacts monitoring reports have described how Underground patronage decreased in and around the central London charging zone during the first year of charging. This was contrary to TfL's expectation of a small net increase of up to one percent, and was largely the result of prolonged closure of the Central line following the Chancery Lane derailment as well as wider economic factors during 2003. In more recent years passenger numbers have increased, and have now reached and slightly exceeded pre-charging levels. Figure 4.4 updates the trend in Underground patronage in and around the charging zone (with Underground Fare Zone 1 divided into three sectors), based on estimates derived from passenger exits through automatic ticket gates at stations.

Figure 4.4 Passengers exiting Underground stations in and around the central London charging zone and within the rest of Fare Zone 1. Weekday morning peak period (07.00 to 10.00)



The trend in passenger numbers exiting stations inside the charging zone is similar to those for passengers at stations on the charging zone boundary and the remainder of Fare Zone 1. Following the reduction in passengers during the first 12 four-week monitoring periods after the introduction of charging, numbers increased by between 2 and 5 percent in 2004 and by a further 1 percent in 2005. In Figure 4.4 the impact of the disruption caused by the July bombings on passengers on the Underground during the morning peak period is also evident, although largely transitory.

On average, around 523,000 passengers exited stations in and around the central charging zone during the morning peak period in 2006. This compares to 516,000 passengers prior to the introduction of charging in 2002 and to 498,000 passengers in the previous 12 four-week reporting periods in 2005.

Patronage during charging hours at stations in and around the charging zone follows a very similar trend. After a slight decrease of 2 percent in the 12 four-week monitoring periods in 2005, passenger numbers in 2006 have increased by 5 percent, reaching 1,286,000. These compare with 1,226,000 passengers in the equivalent periods of 2005, and represent, a net 1 percent increase from the number of passengers in and around the charging zone prior to the introduction of charging.

4.6 Accidents involving personal injury

Recent years have seen consistent and substantial declines in the number of reported personal injury road traffic accidents across London, with an 'excess' trend within the congestion charging zone, equivalent to between 40 and 70 additional collisions 'saved' per year, notionally attributable to the traffic changes brought about by congestion charging. This general trend has continued to be evident during 2005/2006.

Table 4.1 provides an update on the number of reported personal injury accidents in the charging zone, on the Inner Ring Road and for other parts of London and now includes three comparable 12 month reporting periods since the introduction of congestion charging in 2003.

The number of collisions in the charging zone during charging hours was 11 percent lower in 2005/2006 than the previous 12 month period. The reduction in the Inner Ring Road and rest of London for the same period was 6 percent, a somewhat slower rate of decrease compared to recent years.

Across the whole week, including non-charging hours, there has been a 13 percent reduction in the number of collisions in the charging zone, whilst the reduction on the Inner Ring Road has been slightly lower, at 11 percent. The equivalent reduction across the rest of London has also been lower, at 7 percent.

Although most areas of London show ongoing reductions in the number of reported accidents, the rate of reduction differs across the different parts of London, with the charging zone showing a comparatively high rate, as in previous years.

Table 4.1 Total reported personal injury road traffic accidents by area, 2001 to 2006

		Charging Zone	Inner Ring Road	Rest of London	Total
2001	**Weekdays 07.00-19.00**	**1,644**	**528**	**18,410**	**20,582**
(Feb '01-Jan '02)	Weekdays 00.00-07.00,19.00-24.00	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 07.00-19.00**	**1,418**	**450**	**16,964**	**18,832**
(Feb '02-Jan '03)	Weekdays 00.00-07.00,19.00-24.00	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 07.00-19.00**	**1,270**	**428**	**16,226**	**17,924**
(Mar '03-Feb '04)	Weekdays 00.00-07.00,19.00-24.00	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 07.00-19.00**	**1,131**	**374**	**14,695**	**16,200**
(Mar '04-Feb '05)	Weekdays 00.00-07.00,19.00-24.00	389	172	4,927	5,488
	Weekends all day	346	167	6,202	6,715
	Total	1,866	713	25,824	28,403
2005	**Weekdays 07.00-19.00**	**1,001**	**352**	**13,782**	**15,135**
(Mar '05-Feb '06)	Weekdays 00.00-07.00,19.00-24.00	321	133	4,539	4,993
	Weekends all day	307	147	5,683	6,137
	Total	1,629	632	24,004	26,265

4.7 Pedestrian and non-pedestrian involvement in accidents

Accidents can be divided into two categories: those with a pedestrian involvement and those involving only vehicle occupants and riders. Table 4.2 updates the information previously reported, which indicated that there had been no significant change in the proportion of reported collisions affecting pedestrians compared to vehicle occupants or riders in the charging zone during charging hours.

Table 4.2 Accidents involving personal injury, 07.00 to 19.00, 2001 to 2006

	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%)	748 (66%)	76 (20%)	298 (80%)	3,180 (22%)	11,515 (78%)
2005 Mar 2005 - Feb 2006	350 (35%)	651 (65%)	75 (21%)	277 (79%)	3,105 (23%)	10,677 (77%)

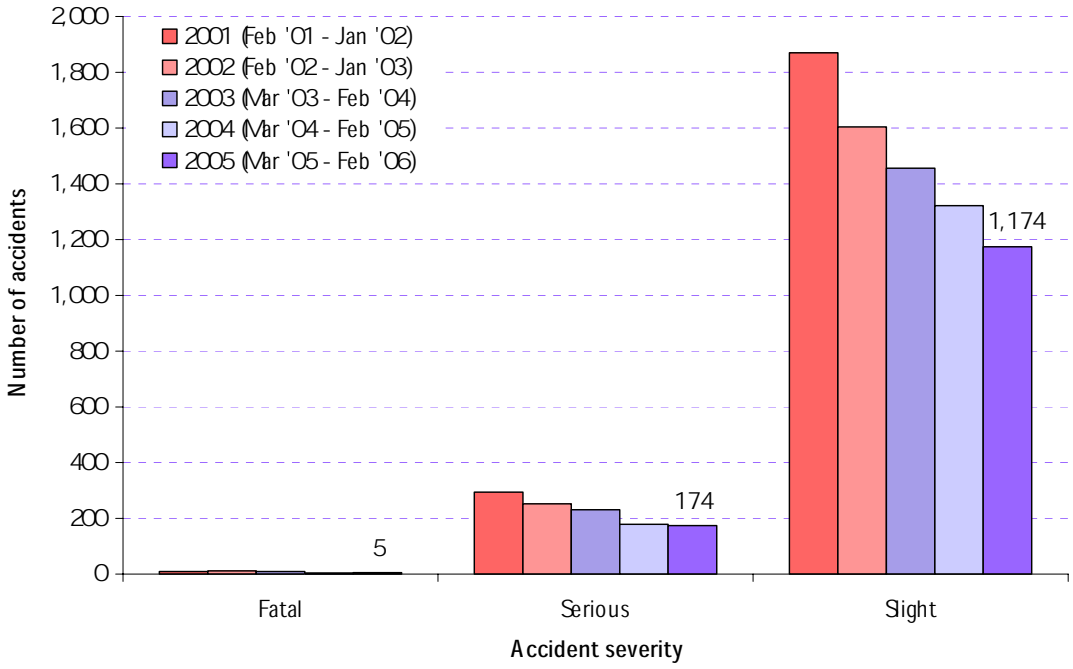
The 2005 and 2006 data supports the previously reported tendency towards a slight increase in the proportion of collisions affecting pedestrians in the charging zone, compared with vehicle occupants or riders. Such a proportionate change, albeit within a reduced overall total, is not apparent in the aggregate data for the rest of London.

4.8 Severity of accidents

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

Figure 4.5 shows the severity of the injuries resulting from reported collisions in the charging zone and on the Inner Ring Road during charging hours. There is a reduction in the number of reported injuries across the 'serious' and 'slight' categories, reflecting the general trend of accident reduction. In the third year after charging the number of fatalities increased to five compared with the previous year (four), although such change cannot be regarded as statistically significant, and the total number of fatalities remains substantially below pre-charging levels. Serious injuries have reduced by 3 percent and injuries classified as slight, which make up the majority of injuries, have reduced by over 10 percent.

Figure 4.5 Reported personal injury road traffic accidents within the central London charging zone and on the Inner Ring Road combined by severity class. 07.00 to 19.00, 2001 to 2006



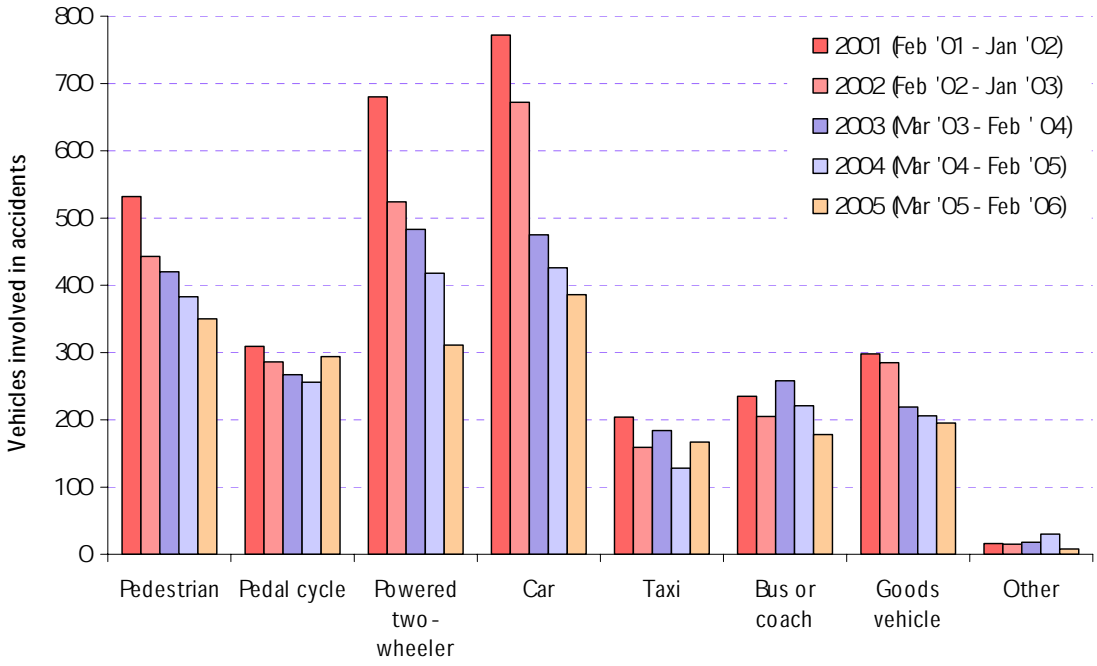
4.9 Vehicle involvement in accidents

Figure 4.6 illustrates trends in the vehicles involved in collisions within the charging zone. The continuing downward trend continues to be evident for most types of vehicles, again reflecting the general trend of reduced accidents.

Comparing data for 2005/2006 with the previous year, the largest percentage reduction was for the number of powered two-wheelers involved in collisions, at 26 percent, followed by buses or coaches, down by 19 percent. Accidents involving cars fell by 9 percent and those involving goods vehicles by 5 percent. The involvement of taxis showed an increase of around 30 percent following the previous year's

reduction, but the total number of collisions involving taxis remains lower than the first year after charging despite increases in taxi volumes of over 10 percent. Finally, the number of pedal cycles involved in collisions increased by 15 percent against the previous year; these now being roughly equivalent in number to pre-charging levels. This could be partly a reflection of the increased number of cyclists in the zone during charging hours, although the accident rate per cycle kilometre remains substantially below pre-charging levels.

Figure 4.6 Accident involvement by vehicle type within the central London charging zone. 07.00 to 19.00, 2001 to 2006.



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

4.10 Vehicle emissions

The beneficial impacts of congestion charging in reducing emissions to air have been set out in previous annual impacts monitoring reports. The introduction of the scheme in 2003 fed through to step-change reductions in emissions of Oxides of Nitrogen (NO_x), particulate matter (PM_{10}) and Carbon Dioxide (CO_2) from road transport in and around the charging zone. These arose from less traffic moving to, from and within the charging zone, and the fact that the remaining traffic was moving around more efficiently.

These reductions occurred against the wider backdrop of beneficial technology changes to the vehicle fleet, much of it driven by European legislation (the 'Euro Standards'), which produces year-on-year reductions to the volumes of pollutants emitted. Moving forward from 2003, the year-on-year reductions from fleet changes

have continued and, all other things being equal, will become the predominant influence on road traffic emissions in central London. The effects from congestion charging would still be present, as an 'excess' reduction over what would otherwise be expected, but would not feature as a step change for subsequent years.

Table 4.3 is reproduced from the *Fourth Annual Impacts Monitoring Report*, with a line added summarising changes between 2003 and 2006 that are attributable to ongoing improvements in the emissions performance of the vehicle fleet since the introduction of congestion charging.

Table 4.3 Principal changes to emissions of NO_X, PM_{10} and CO_2. Percentage change, 2003 compared with 2002. Also showing 'background' fleet change 2003-2006.

	Charging zone			Inner Ring Road		
Change	**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
Additional 'background' change from technology improvement (fleet turnover) 2003-2006	**-17.3**	**-23.8**	**-3.4**	**-17.5**	**-20.9**	**-2.4**

Note: flow and speed changes are calculated on a basis that includes the contribution of tyre and brake wear for PM_{10}. Background 'fleet' changes between 2003 and 2006 do not include this contribution.

On an annual average day basis for all road traffic emissions, it is seen that, between 2002 and 2003:

- The traffic volume and speed changes brought about by congestion charging were estimated to have led directly to reductions of about 8 percent in emissions of NO_x and about 6 percent in PM_{10} within the charging zone. These estimates were lower than those previously published owing to a change in the wider assessment methodology that recognised the large contribution to total road transport PM_{10} emissions made by tyre and brake wear, which were not taken into account in the original estimates, and which remained static between 2002 and 2003.
- On the Inner Ring Road surrounding the central London charging zone, bearing in mind the observed small increase in traffic and some changes to traffic composition, NO_x emissions were assessed as being unchanged, alongside a small net increase of about 3 percent in PM_{10} emissions.

- The influence of improved vehicle technology in the fleet was substantial, estimated reductions of 6 to 7 percent in emissions of NO_x and 9 to 10 percent in emissions of PM_{10} arising from this source between 2002 and 2003. Note that this also applied more widely across Europe.
- Total reductions from all causes between 2002 and 2003 were therefore of the order of 13 percent for NO_x and 16 percent for PM_{10} within the charging zone, and 7 percent for both NO_x and PM_{10} on the Inner Ring Road.
- Congestion charging was also estimated to have led directly to reductions of about 16 percent in CO_2 emissions from traffic within the charging zone, these more directly reflecting the overall traffic reductions and efficiency gains. The equivalent for the Inner Ring Road was a reduction of 5 percent, mainly reflecting the beneficial speed changes that were observed here in 2003.
- Between 2003 and 2004, with congestion charging in steady-state operation, year-on-year vehicle technology changes added typical gains of between 5 and 6 percent for NO_x and PM_{10}, and slightly less than 1 percent for CO_2, these also applying more widely across all traffic in London.
- Over the post-charging period 2003-2006, these vehicle fleet improvements are estimated to have reduced emissions from road traffic, both within the central London charging zone and more widely, by 17 percent for NO_x, 24 percent for PM_{10} and 3 percent for CO_2, assuming a stable traffic mix.
- Congestion increases since 2003, as discussed in Section 3, will have resulted in some reduction to these initial emission gains, although it can be argued that without congestion charging these changes would have been even greater.

4.11 Measured air quality

Previous annual impacts monitoring reports have made the point that, although congestion charging and other changes originally led to substantial reductions to emissions, these would not necessarily feed through to observable improvements to air quality. This reflects the extent and diversity of other influences on ambient air quality measurable at air quality monitoring stations, as opposed to emissions. These influences have a diluting and obscuring effect on the original emissions change, and include the following:

- Congestion charging only operates for approximately one third of the hours in any one year, but covers about two-thirds of the traffic in central London. It also only directly affects less than half of the traffic present in the charging zone during charging hours.
- The proportion of total vehicle kilometres in London affected by congestion charging is small – less than 2 percent.
- Road traffic emissions from vehicle tailpipes are only one contributor to total emissions of a given pollutant. Emissions from other sources such as industrial and domestic activity also contribute to observed concentrations.
- Various chemical reactions occur in the atmosphere between a pollutant being emitted and being observed at an air quality monitor. These can be weather-dependent and can be facilitated or limited according to prevailing climate.

- The weather itself can significantly affect the build-up of pollution, irrespective of the amounts emitted. In particular, stable weather conditions such as those that predominated in the summer of 2003 can lead to elevated pollutant concentrations, as well as the import of pollution from continental Europe.
- The impact of changes to traffic emissions on observed air quality depends in part on the location of the monitoring station in relation to nearby traffic sources.
- Certain statutory National Air Quality Strategy objectives, notably the PM_{10} exceedence day objective, are very sensitive to small changes in concentrations, given the proximity of prevailing concentrations to the objective value.
- Despite the general trend towards cleaner vehicles, certain countervailing trends have emerged, such as an increase in the proportion of NO_x emitted as NO_2 from diesel vehicles (primary or direct NO_2), which may slightly increase NO_2 concentrations.

Trends in ambient PM_{10}

Figure 4.7 shows running annual mean PM_{10} concentrations at congestion charging indicator sites and Figure 4.8 is an equivalent graphic for the National Air Quality Strategy 2005 PM_{10} exceedence day statistic. TfL's *First Annual Impacts Monitoring Report* gives a description of the methodology and site groupings employed. The exceedence day statistic measures the number of days in each year (as a running annual mean) that average concentration of PM_{10} was greater than 50µgm^{-3} (the National Air Quality Strategy Objective for 2005 is not more than 35 days).

Previous annual monitoring reports had observed that:

- Concentrations of PM_{10} at indicator sites both within the congestion charging zone and more widely across London had barely changed over the period 2002 to 2005.
- Because prevailing daily mean PM_{10} concentrations in London are close to 50µgm^{-3}, small fluctuations in PM_{10} concentrations can result in larger fluctuations in the occurrence of daily mean concentrations above 50µgm^{-3}.
- The introduction of congestion charging in 2003 coincided with a stable meteorological period. This led to elevated PM_{10} concentrations, yet because of this mechanism, fed through into large-scale changes in the number of days on which the National Air Quality Strategy objective concentration was exceeded.
- There was no clear evidence of a visible 'congestion charging effect' on PM_{10} concentrations, although the most recent data for the charging zone was suggesting some differential reductions compared to other parts of London.

Figure 4.7 Running annual mean PM_{10} concentrations at congestion charging indicator sites.

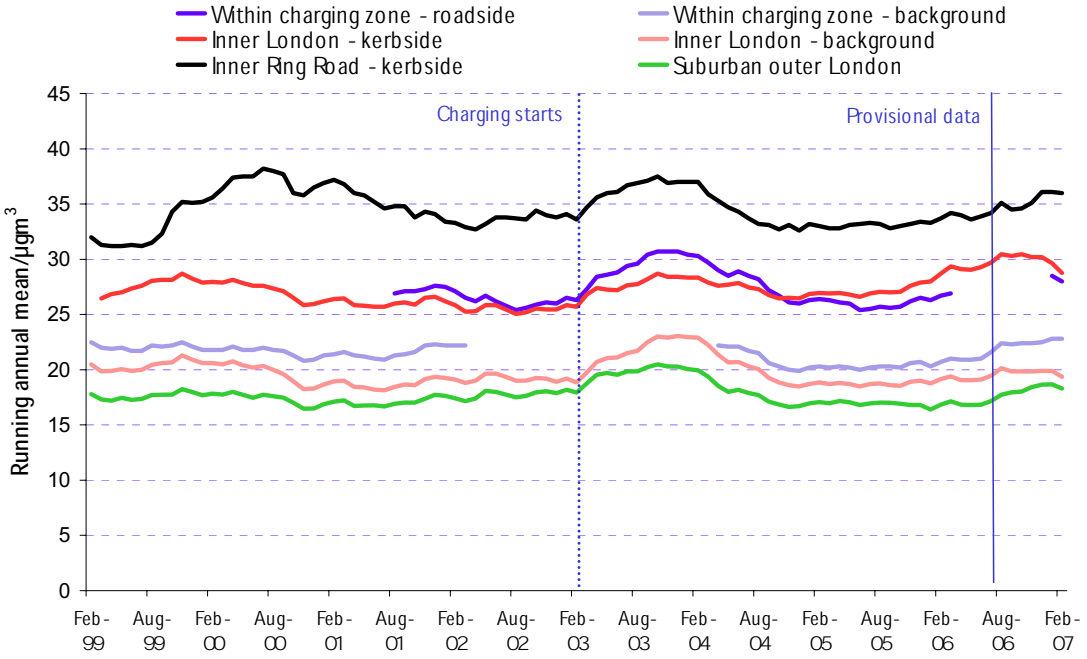
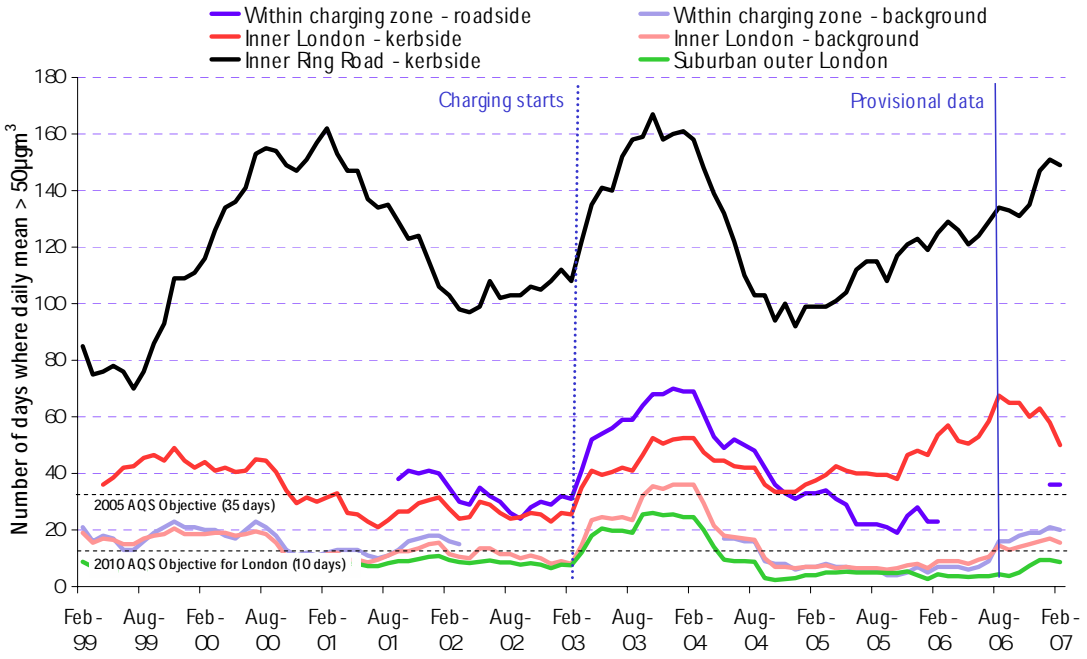


Figure 4.8 Running annual mean count of PM_{10} exceedence days at congestion charging indicator sites.



The updated charts for 2006 continue the same broad picture, with stable overall average concentrations across London, albeit trending upwards slightly during 2006, possibly reflecting weather conditions. This small upward trend has again fed through to disproportionate increases in the exceedence day indicator.

The available data for the charging zone are limited and were affected in 2006 by equipment failure. However, for the 'roadside' site it shows a continuation of the trend first observed in TfL's *Fourth Annual Impacts Monitoring Report*, with the number of days on which the National Air Quality Strategy objective was exceeded reducing, whilst increases were recorded at all other comparator sites. Again, a small relative decrease in average PM_{10} concentrations at this site has fed through to a disproportionate reduction in exceedence days, illustrating the nature of the relationship between these two indices. By contrast, the 'background' site in the charging zone appears to conform to the wider trend, if anything perhaps suggesting a greater proportionate increase in both concentrations and exceedences compared to the overall trend.

Trends in ambient NO_x/NO_2

Oxides of Nitrogen is a collective term for both Nitrogen Oxide (NO) and Nitrogen Dioxide (NO_2). The majority of emitted NO_x consists of NO which is then converted into NO_2 in the atmosphere, primarily through reaction with Ozone. NO_2 is the pollutant to which National Air Quality Strategy objectives apply, and NO the key precursor.

Figure 4.9 shows running annual mean concentrations of NO_x, and Figure 4.10 is an equivalent graphic for NO_2. The updated trends for 2006 are again very similar to previous reports, with a continuation of the pattern of small year-on-year declines to NO_x concentrations. There is some evidence, however, that the recent rate of decline has been slower than has been typical over recent years. The charging zone 'roadside site' was again affected by equipment failure during 2006 but, along with the 'background site' the available data do not suggest any clear differential trends in the charging zone compared to other comparator sites.

In terms of NO_2, TfL had previously reported how the positive effects of a general, London-wide reduction in NO_x concentrations from road traffic were being limited by other factors producing an increase in NO_2 emissions.

Tests on vehicles suggested that the phenomenon largely affected diesel-fuelled vehicles, which have become more prevalent in the UK vehicle fleet over recent years. Furthermore, there was some evidence that developments in engine technology and management systems, and emissions abatement equipment primarily directed at reducing particulate emissions were also significant factors. These were of course wider national-scale developments not directly associated with congestion charging. However, traffic conditions in and around central London would be particularly conducive to their expression.

Figure 4.9 Running annual mean NO_x concentrations at congestion charging indicator sites.

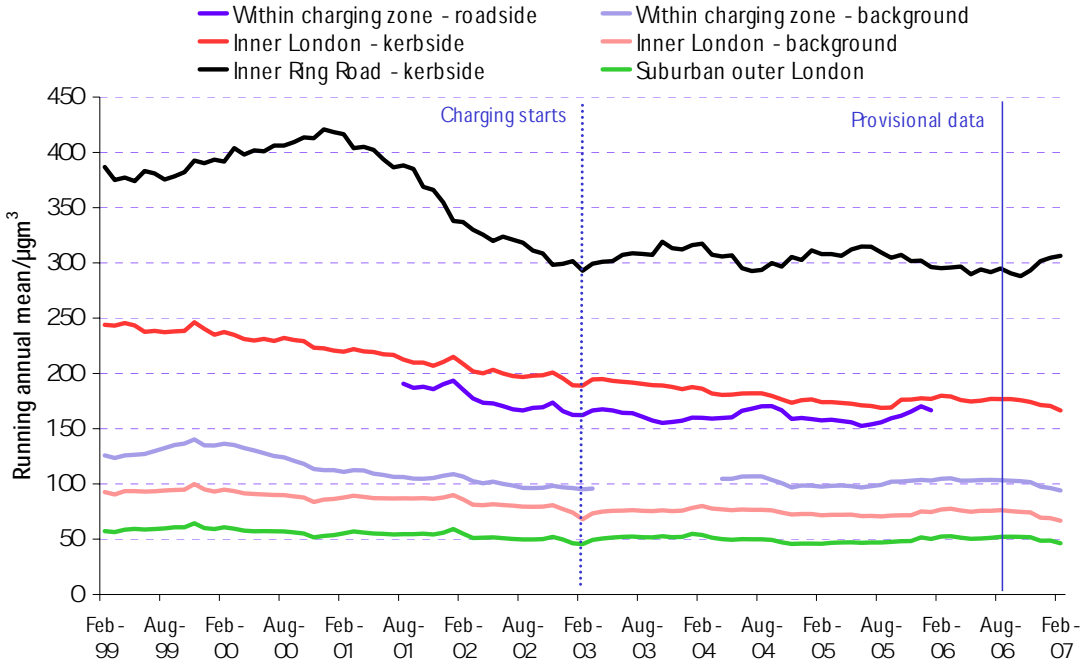


Figure 4.10 Running annual mean NO_2 concentrations at congestion charging indicator sites.

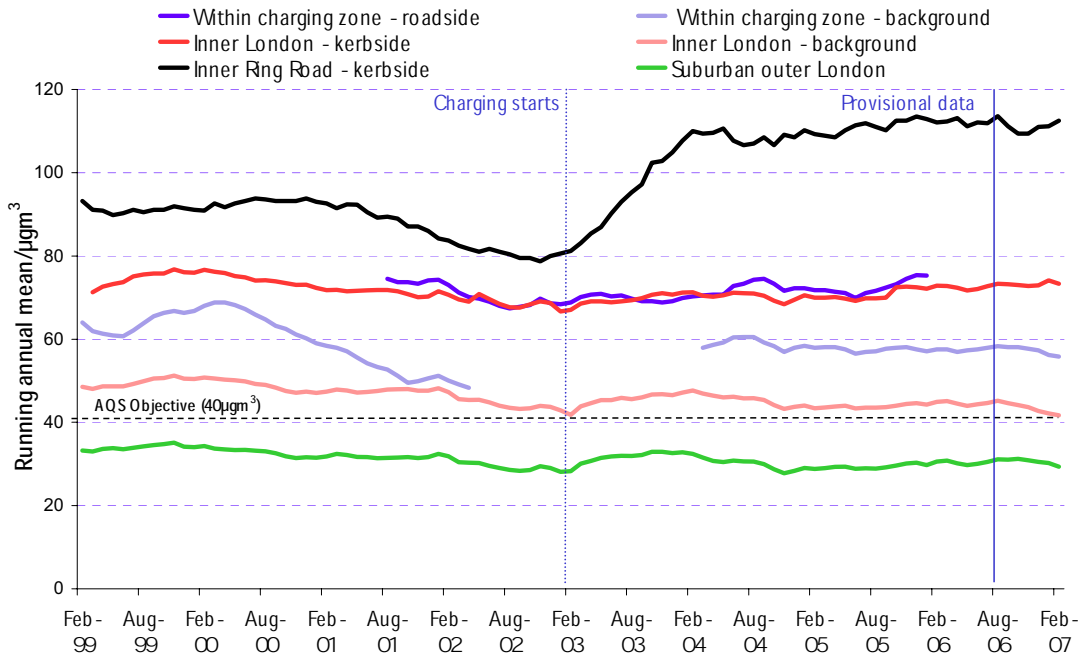


Figure 4.10 demonstrates that, over recent years, NO_2 concentrations have not responded to progressive reductions in NO_x as might be expected. Most site groupings have shown a flat trend. Other sites, exemplified by the site on the Inner Ring Road (a kerbside site located directly adjacent to the traffic stream) have seen substantial increases in NO_2 concentrations.

TfL is continuing to contribute to the wider research effort investigating these trends. It is clear from the data that they are not confined to the charging zone. It is also clear from the research so far that the causes of these trends are not directly related to congestion charging. Although these trends first became noticeable around the time that congestion charging was introduced, the primary issue is a vehicle fleet and technology one that is national or international in scope. Whilst this has implications for the ability to meet National Air Quality Strategy objectives at some sites for NO_2 in the short-term, the effect is thought to be primarily a re-distributive rather than an additive one, and continuing reductions to NO_x emissions would be expected to lead to further falls in NO_2 in the medium/long-term.

4.12 Summary of key points

Following from substantial increases in both bus service provision and patronage in and around the central London congestion charging zone between 2002 and 2003, paralleling the introduction of congestion charging, both patronage and service provision have largely stabilised during 2005 and 2006. Bus service reliability is still benefiting from the wider traffic changes brought about by charging, but there is evidence that the deterioration to general traffic conditions discussed elsewhere in this report is now negatively affecting the performance of the bus network.

Trends in Underground and National Rail travel to the central London charging zone have largely followed wider network trends, with no visible discontinuities that might be associated with charging.

Recent trends in personal injury road traffic accidents in central London continue to reflect traffic changes brought about by charging. The latest findings suggest that reductions in accidents in the charging zone are perhaps slightly greater than might otherwise have been expected, according to the wider trend of reduced accidents, but there is some evidence of possibly detrimental trends to collisions involving taxis and pedal cycles, and these will be kept under close review by TfL.

Following step-change reductions to emissions of key air pollutants upon the introduction of charging in 2003, year-on-year improvements to the emissions performance of the UK vehicle fleet are now the dominant factor reducing emissions in London. Despite substantial reductions to road traffic emissions of roundly one-quarter since 2002 however, trends in measured air pollution remain broadly static. This confirms the important role of non-charging related 'background' factors in determining overall air quality in London.

5. Central zone: business and economic impacts

5.1 Introduction

This section assesses the impact of the central London congestion charging scheme on business and economic activity in London since the introduction of the scheme in 2003.

Since 2002, Transport for London and the Greater London Authority have utilised a wide range of datasets to provide as detailed assessment of the potential macroeconomic and business impacts of congestion charging as possible. This includes the advice, insights and findings of academics, industry specialists and business decision-makers to ensure as robust an evidence base as possible. Nevertheless, the available information is relatively limited, particularly in terms of geographical resolution and timelines, with publication of key third-party data sets often lagging events by 18 months or more.

Our assessments have also taken place in the context of wider events that have effected the central London economy. Key events since the introduction of charging have included:

- the closure of the Central line, owing to the Chancery Lane derailment, and the beginning of the war in Iraq in 2003;
- the central London terrorist bombings in 2005;
- the Bank of England interest rate increases in 2006.

Furthermore, the central London economy is particularly susceptible to trends in factors such as tourism. Any assessment of the attributable impacts of congestion charging on businesses and London's economy is therefore a difficult task and cannot be done in isolation from wider economic factors.

Quantitative macroeconomic assessments of scheme impacts are limited by the quality and quantity of the available input data and the technical assumptions that need to be made. TfL have therefore used the widest possible range of evidence to build as full and comprehensive assessment as is currently possible. A separate microeconomic assessment is set out in Section 7 of this report.

The economic and business sections of previous monitoring reports have largely assessed impacts to businesses and the London economy on a year-on-year basis. Whilst this has been useful for assessing incremental change as it has become visible in the key data sets, this section aims to provide a consolidated overview of the impact of charging to business sectors for the period following the introduction of the scheme.

Based on the data currently available to TfL, it is concluded that since the introduction of the scheme, four years ago, no significant consequences of the original charge or the July 2005 Variations on business activity in aggregate have so far been identifiable. Our monitoring of the scheme indicates that since congestion charging was introduced, there have been no discernable significant effects – positive

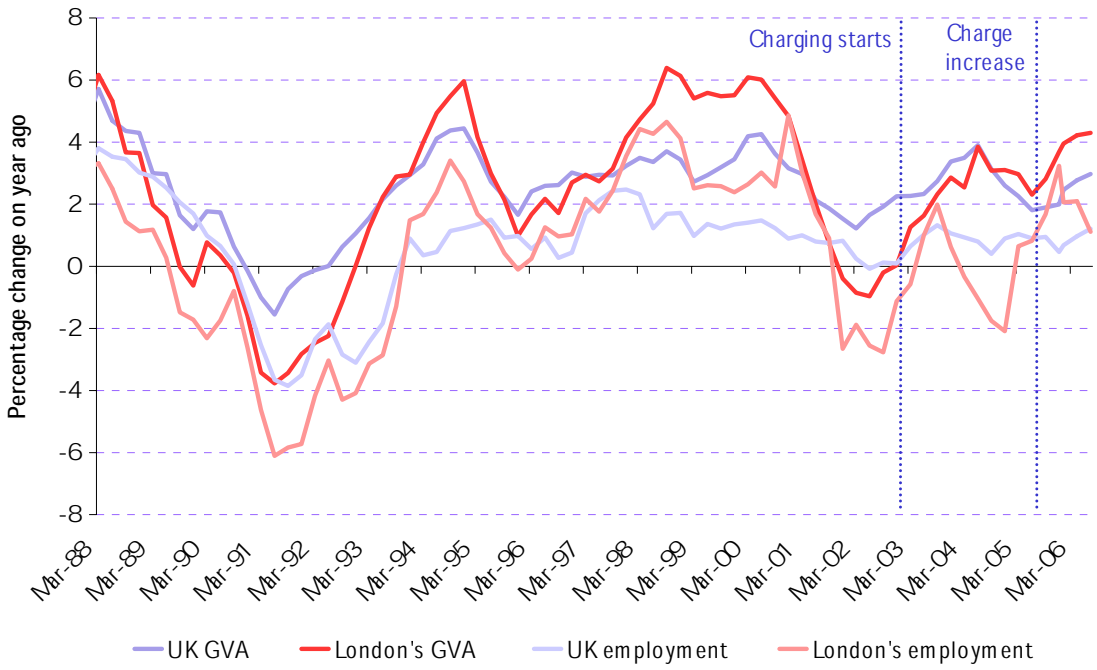
or negative – on businesses and the London economy that appear to be due to charging. The microeconomic analysis in Section 7 indicates a net positive impact from charging.

5.2 Key findings from previous reports

TfL's *Fourth Annual Impacts Monitoring Report* concluded that:

- Analysis of comparative trends in various indicators of business performance, including change in jobs, business populations and turnover, continued 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 with the £5 charge.
- An independent external audit of the TfL and GLA monitoring of the economic and business impacts of congestion charging concluded that TfL's assessment that the scheme has had a broadly neutral impact on the central London economy was reasonable.
- The growth of the London economy remained positive in 2005 despite the effects of the terrorist bombings in central London in July 2005 (Figure 5.1).
- Business performance in the charging zone was significantly better than in the rest of London, particularly in terms of profitability and productivity.

Figure 5.1 Output (Gross Value Added – GVA) and employment growth in Greater London and the UK.



Source: Experian.

5.3 Key findings for 2006

- The key business sectors – financial and business services, hotel and restaurants, and retail – in the central charging zone showed positive trends in the years following the introduction of congestion charging in comparison to pre-2003.
- Analysis of latest data continues to show no evidence of differential effects between the central London charging zone and comparator locations that might be indicative of a congestion charging effect.
- The hotel and restaurants sector and retail sector in the central London charging zone has registered stronger business performance since the introduction of charging, and has outperformed other areas of London.
- Analysis of commercial property rental values suggests that the property markets follow a cyclical pattern and are impacted by a combination of both local and London-wide factors. The commercial property market does not appear to have been impacted adversely by the charging scheme even though performance both before and after the introduction of charging has been mixed.

5.4 General economic trends

- Over the long-term, London's economy tends to move closely with the economy of the UK as a whole. This is unsurprising since London produces around 15-20 percent of total UK output. However, London tends to be a more volatile economy – as the peaks and troughs of the pink lines in Figure 5.1, compared to the blue lines, show.
- London's output (Gross Value Added) growth has recovered from the brief recession at the beginning of 2002 and is now growing well above the trend (and above the growth rate of the UK as a whole) at around 3 to 4 percent a year. London's employment growth has also picked up, but has remained volatile.
- Central London retail sales made a strong recovery from the brief dip that followed the London bombings in July 2005. Indeed, year-on-year retail sales growth in central London has significantly outperformed that of the UK since then. Similarly, overseas visitor numbers and their expenditure also recovered following a brief downturn at the end of 2005.
- In 2006, the London economy outperformed the UK as a whole. The rate of house price growth continued to rise in 2006, supporting consumer spending. The outlook for 2007 is slightly subdued with growth projected to be slower than in 2006, but still above trend. This reflects rising inflation and interest rates which are likely to start influencing consumer spending, as well as higher utility bills and a rising tax burden. For the UK as a whole, most commentators expect growth to remain around trend level (2.5 percent a year).

5.5 Assessing the business and economic impacts of congestion charging in central London

The economic impact of road user charging can be divided into supply side and demand side effects, alongside some redistribution of economic activity. The scale of these effects is determined by the actual cost of paying the charge and the impact on journey times brought about by the scheme.

Supply side effects

Supply side effects relate to the impact of the charge on the cost-effectiveness of businesses. On the positive side, productivity improvements and cost savings may be expected from lower travel times and better reliability for commuting and business journeys in the charging zone. On the negative side, the 'compliance costs' of paying the charge and some business costs will rise as suppliers and freight operators pass on charge payments to businesses.

Demand side effects

The demand side effect is a combination of 'income' and 'substitution' effects. The income effect primarily relates to the reduction in purchasing power from those who pay the charge. The substitution effect is the redistribution of economic activity as drivers potentially switch expenditure away from the charging zone in order to avoid paying the charge.

As discussed in previous reports, transport costs are typically only a small fraction of total business costs, and congestion charging would typically have only a very limited impact on these costs. It follows that the impact on most businesses will be small, albeit that some specific types of business may be affected to a greater extent.

Section 7 presents a quantitative cost and benefit microeconomic evaluation of the scheme with the £5 charge.

The main data sources used in this report for macroeconomic evaluations are:

- *The Annual Business Inquiry* – Official data from the Office for National Statistics that enables comparison of employment and business units at a relatively fine level of geographic and industrial disaggregation.
- *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.
- *Investment Property Databank* – A global information organisation providing objective measurement and analysis of property markets, through the supply of independent market indices and portfolio benchmarks for the property industry.
- *SPSL Retail Traffic Indicators* – A private company providing technology and analysis to measure retail traffic (footfall) to UK retail outlets and locations. Specific retail traffic indicators were established specifically for monitoring footfall within the congestion charging zone.

- *VAT Registrations data analysis* – spatial analysis, by business sector, based on 11 years of data from the VAT (Value Added Tax) registrations database of UK businesses registering, or deregistering for VAT.

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

The conclusion from all the studies, updated for this report, is that it remains difficult to discern any significant impact on aggregate business performance from congestion charging with a £5 charge. Given the limitations of the data, TfL conclude that businesses in totality in the charging zone have not been measurably affected in net terms, either positively or negatively, by congestion charging in central London. This does not preclude the possibility that certain businesses in specific sectors may have been differentially impacted, although past research of particular business activities using 'case studies' failed to show a clear discernable impact from charging, as described in the *Third Annual Impacts Monitoring Report*, June 2005.

As a development on previous annual impacts monitoring reports, this year TfL focus the assessment of the macroeconomic impact of charging on the main business sectors in the charging zone, highlighting performance in key business and economic indicators in relation to comparable geographic locations. Trends have mainly been analysed pre-and post-2003 as opposed to pre-and post-charging due to the limitation of the available data, which is typically annual. The following summarises the results of the updated economic studies by business sector.

5.6 Financial and business services sector

In terms of employment, the number of business units, turnover and profits, the financial and business services sector in the central zone has performed considerably better post-2003 than prior to 2003. The performance pre-2003 was adversely affected by a general downturn in financial and stock market activity due to the 'bursting of the dot.com market bubble' and the terrorist attacks on the New York financial district in September 2001, which had a contagious effect throughout global financial markets.

Post-2003, the central London congestion charging zone has performed better than inner and Greater London in terms of VAT registrations and sales, but comparatively less well in terms of employment and the number of business units. Nevertheless performance in the charging zone has clearly been better pre-2003 than post-2003, which may in part reflect charging-related changes, but TfL's assessment would be that there is no conclusive evidence that the financial and business services sector has been affected significantly by congestion charging.

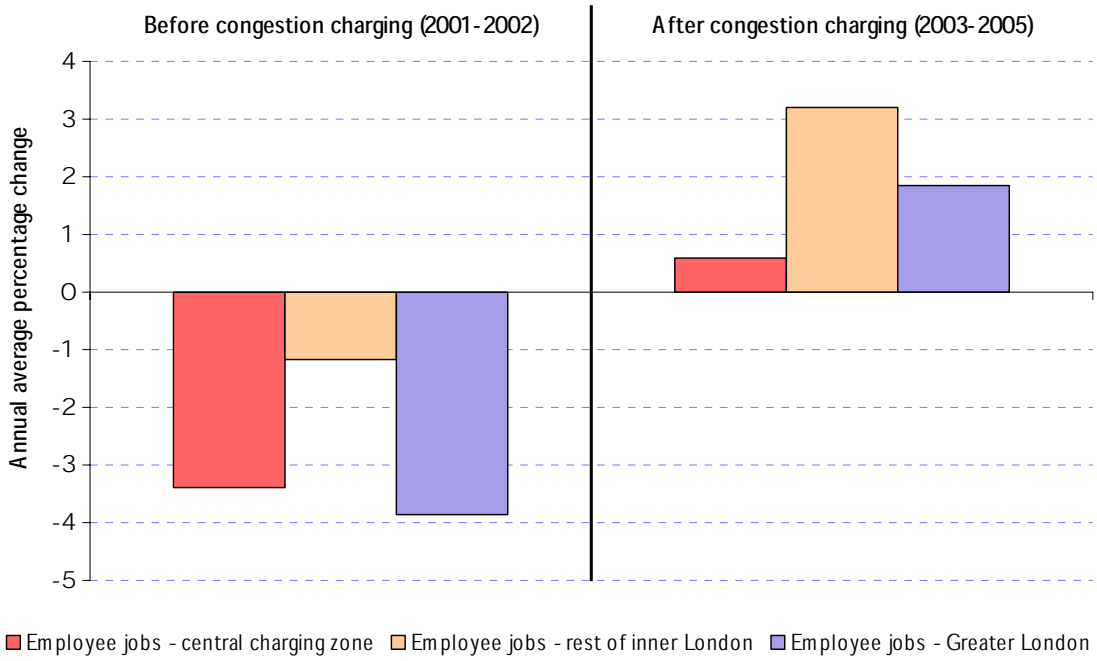
Employee jobs in the financial and business services sector

The financial and business services sector is by far the largest provider of jobs in the central zone, accounting for 50 percent of total jobs in 2005, according to the Annual

Business Inquiry, 2007. As a sector, it is incredibly diverse. For example, it comprises highly skilled financial jobs (such as derivatives trading), legal and accountancy services, and support services such as office cleaning.

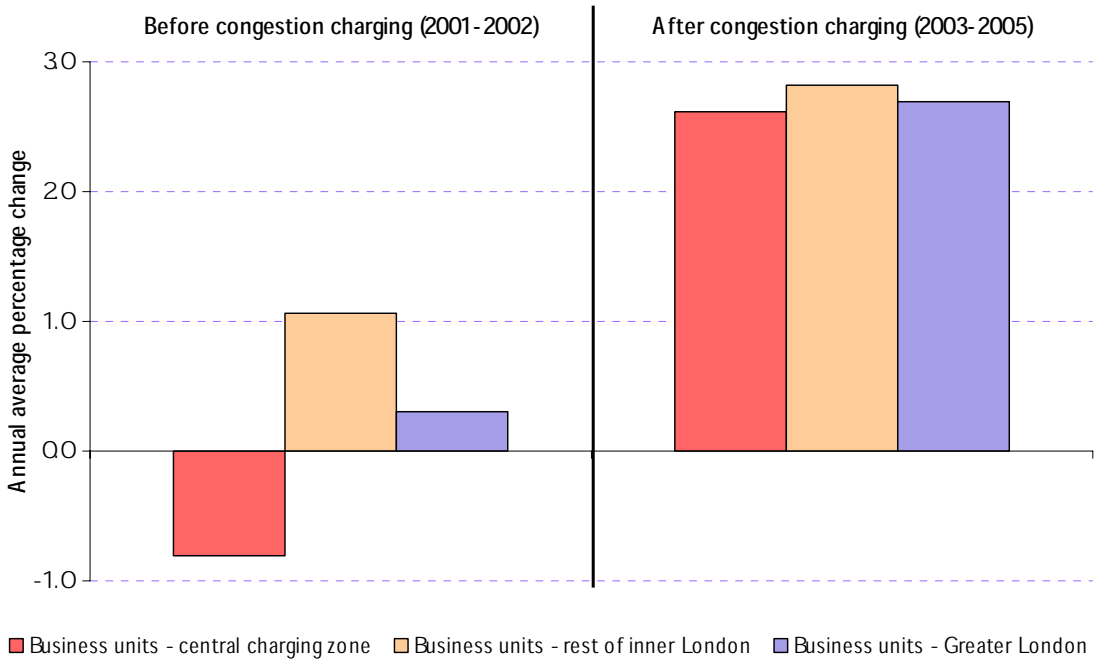
Figure 5.2 shows the growth trend, both before and after 2003, in the number of financial and business services jobs in the central zone, as well as the rest of inner London and Greater London. Figure 5.3 shows the growth trend in the number of business units, for comparison.

Figure 5.2 Employee jobs in the financial and business services sector, before and after charging.



The performance of the financial and business services sector in the central zone, the rest of inner London and Greater London has been considerably stronger in the period since 2003 than in the two years prior to 2003, both in terms of numbers of employee jobs and growth in business units. Prior to 2003, employee jobs in the financial and business services sector declined by 3 percent on average over the two years. This recovered to positive growth of nearly 1 percent on average over the three years following the introduction of congestion charging. Similarly, the number of business units in the central zone declined by on average 1 percent per annum between 2001-2002 but since 2003 have recovered strongly, growing on average by 2.5 percent per annum. The improved performance since 2003 reflects the sustained pick up in activity in this sector that followed the brief recession in London in the period at the end of 2001 and beginning of 2002.

Figure 5.3 Business units in the financial and business services sector, before and after charging.

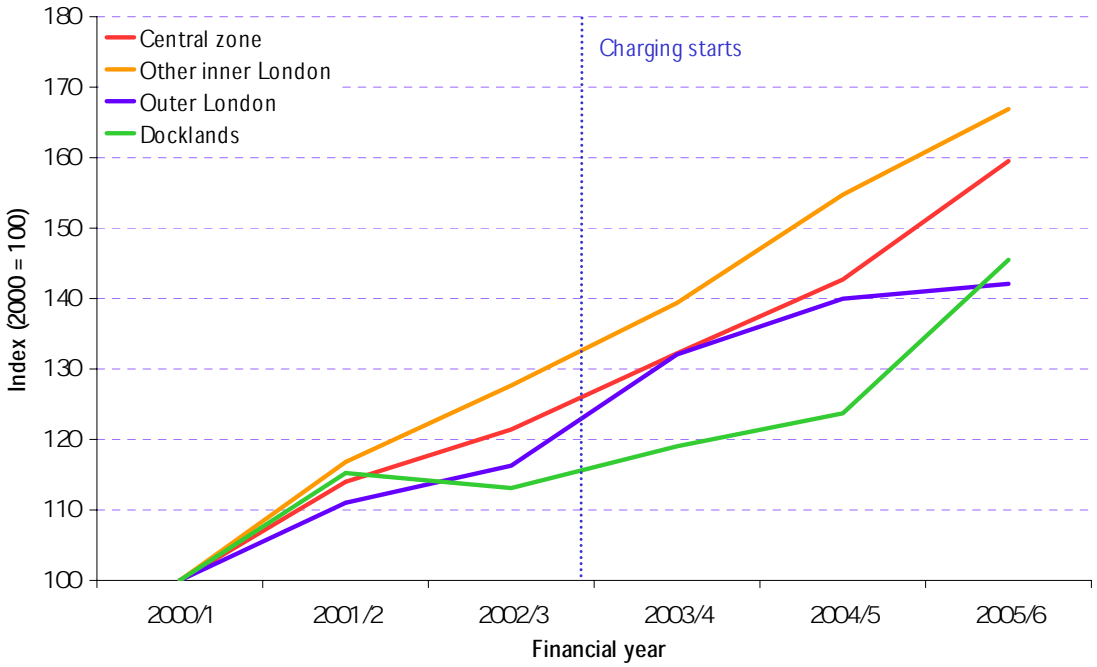


Source: Annual Business Inquiry, Office for National Statistics, January 2007.

Turnover in the financial and business services sector

In terms of turnover, the financial and business services sector has performed strongly over the last five years, increasing its turnover every year (Figure 5.4)

Figure 5.4 Dun & Bradstreet index of sales for the financial and business services sector.



Source: Dun & Bradstreet Ltd.

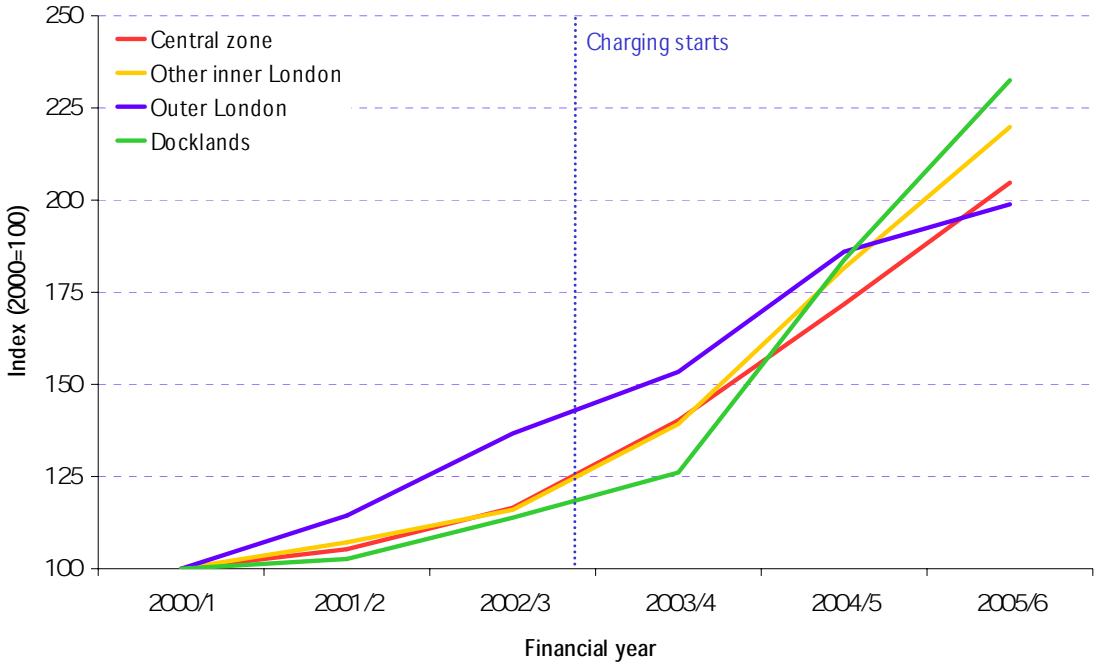
Turnover growth has been particularly strong in the central zone and in the rest of inner London, excluding the future western extension zone. Notably, the central London congestion charging zone has outperformed Docklands – with a comparable financial and business services sector profile – although Docklands sales performance picked up strongly in 2005. Businesses located in outer London have performed comparatively less well.

Profits in the financial and business services sector

The financial and business sector has generally performed in line with the average growth in profits for all businesses over the last two years.

Figure 5.5 shows the Dun & Bradstreet average index of profits for the financial and business sector, for different geographical areas pre-and post-2003. All areas have seen higher profits post-2003, with only marginal differences in growth between the various areas in London.

Figure 5.5 Dun & Bradstreet index of profits for the financial and business services sector.



Source: Dun & Bradstreet Ltd.

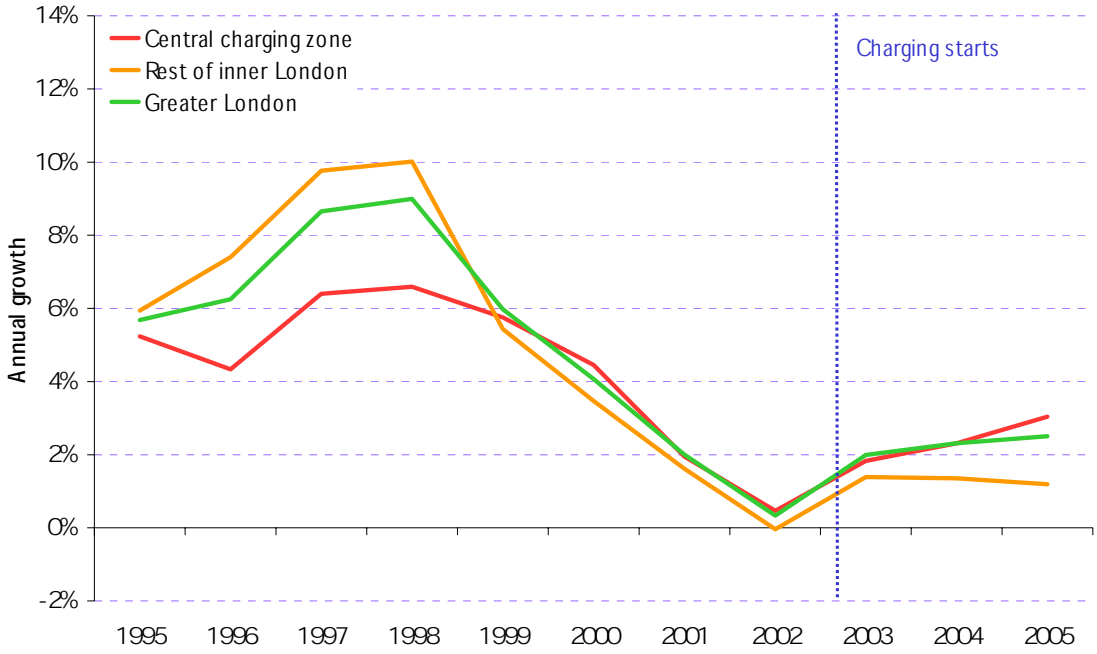
VAT registrations in the financial and business services sector

Data on VAT registrations provides a valuable gauge of new business start-ups, closures and business turnover, and are a useful indicator of the general health of business activity.

Annually, the largest number of business VAT registrations and deregistrations are in the financial and business services sector, which reflects the overwhelming dominance of this sector in the central charging zone. This sector has shown positive average annual growth in net VAT registrations both pre-and post-2003. Figure 5.6 shows that while the growth in net VAT registrations in the central London charging

zone has been lower post congestion charging, this trend is in line with lower growth rates post-2002 across London as a whole. In fact, net VAT registrations in the central London charging zone were slightly higher than the rest of inner London and Greater London as a whole.

Figure 5.6 Net change in VAT registrations for the financial services sector.

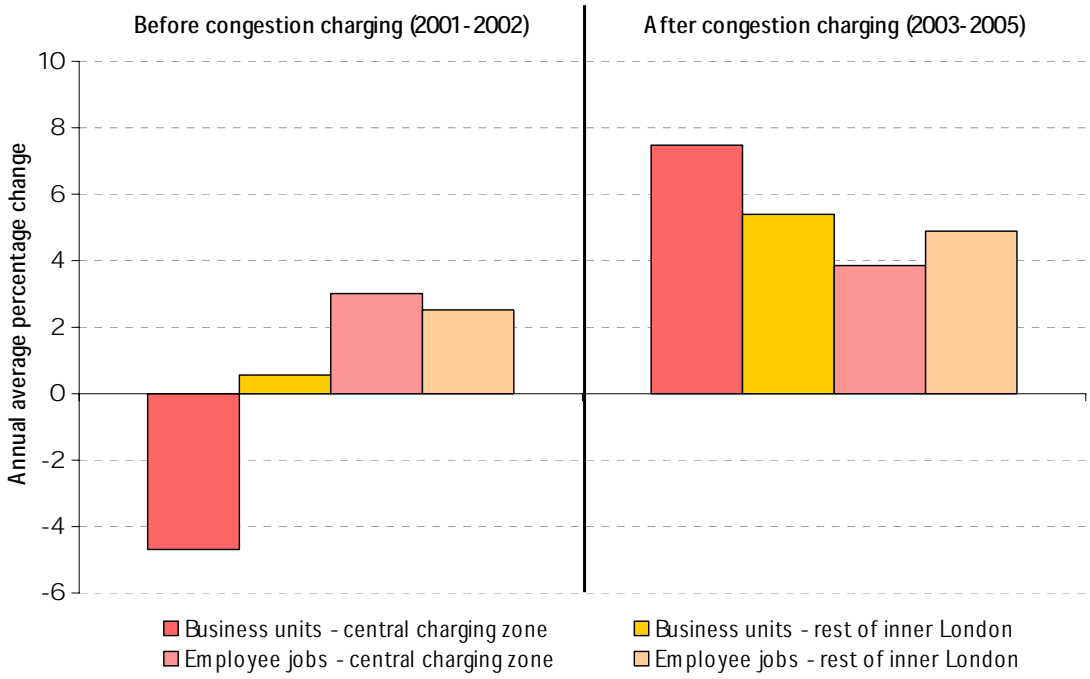


5.7 Public services: education and health sectors

Public services (defined in this analysis as the health and education sectors) are the second largest provider of jobs in the central London zone, accounting for 8 percent of jobs in 2005, according to the latest Annual Business Inquiry, 2007.

Figure 5.7 shows the growth in employment in public services in the central London zone, compared to the rest of inner London, both before and after charging. The main indicators of business performance in public services are jobs and business units. Turnover or sales provide a less relevant indicator of economic activity in the public sector. Average growth in jobs and, in particular, business units in health and education in the central London charging zone have been higher since 2003 than before, according to the Annual Business Inquiry, 2007. Post-2003, the central London charging zone has performed on par with inner London in terms of employment growth, and has considerably outperformed inner London in terms of the growth in business units. Thus, there is no discernible evidence of an aggregate congestion charging effect on these public services.

Figure 5.7 Business units in the health and education sectors, before and after charging.



Source: Annual Business Inquiry, Office for National Statistics, January 2007.

5.8 Hotels and restaurants sector

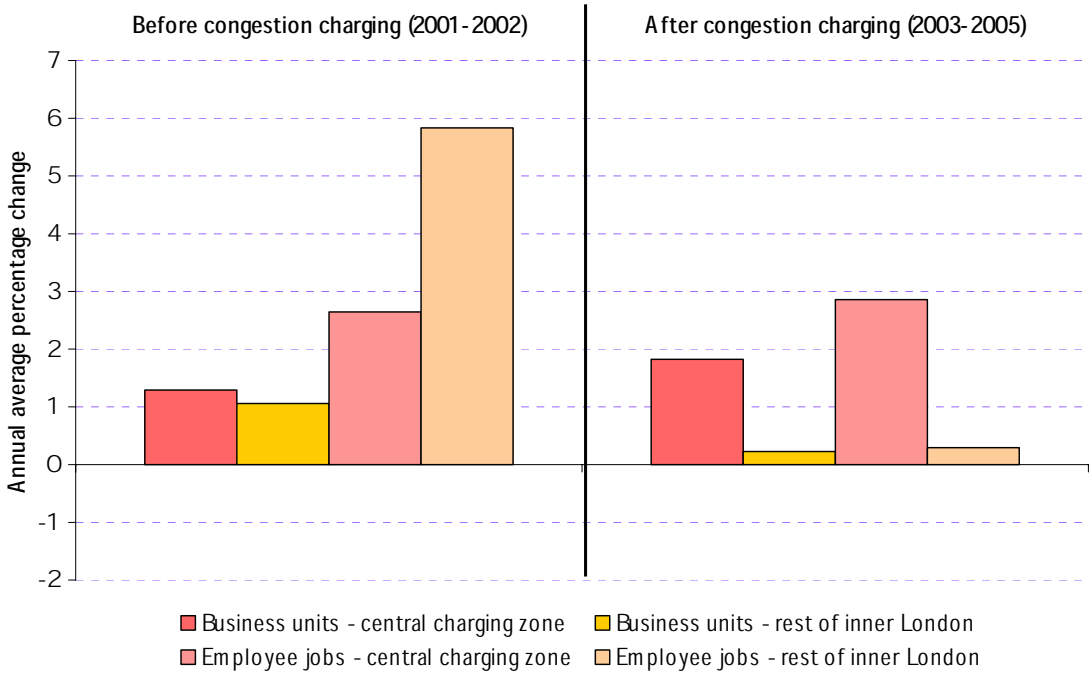
The hotels and restaurants sector is a major provider of jobs in the central London charging zone servicing both the overseas and domestic business and tourism market. Despite major terrorism incidents affecting tourism both before and after the introduction of congestion charging, growth in employment and the number of business units in the hotel and restaurants sector in the central London charging zone have been very consistent – with average growth of between 1-3 percent per annum. The central London charging zone has also generally outperformed other areas in London in terms of key performance indicators, such as profitability and turnover. Therefore, there is some evidence to suggest that the hotel and restaurants sector in the charging zone has experienced disproportionate positive growth since 2003.

Employees and business units in the hotels and restaurants sector

Closely following public services, the hotels and restaurants sector is the third largest employer in the central London congestion charging zone, accounting for almost 8 percent of total central zone employee jobs in 2005 according to the Annual Business Inquiry, 2007.

Figure 5.8 shows that the growth in employment and business units in the central London charging zone has been relatively stable pre-and post-2003 within this sector, at around 1 to 3 percent on average per annum. This performance contrasts with that of inner London over the same period, where the rate of growth in jobs and business units has declined considerably.

Figure 5.8 Business units and employee jobs in the hotels and restaurants sectors, before and after charging.

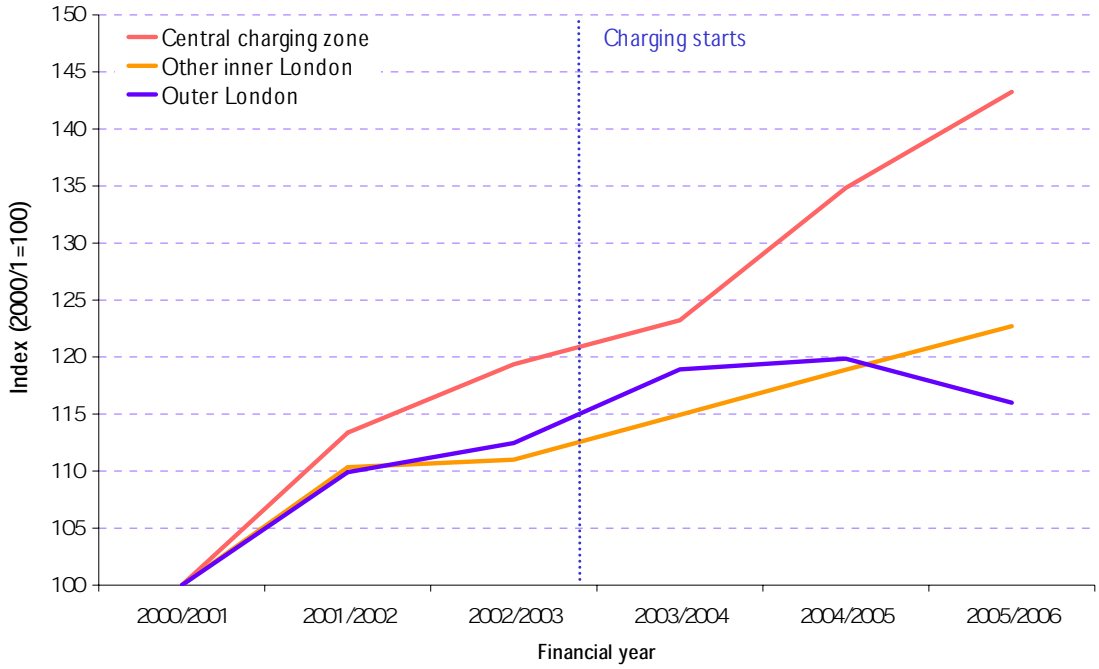


Source: Annual Business Inquiry, Office for National Statistics, January 2007.

Turnover and profitability in the hotels and restaurants sector

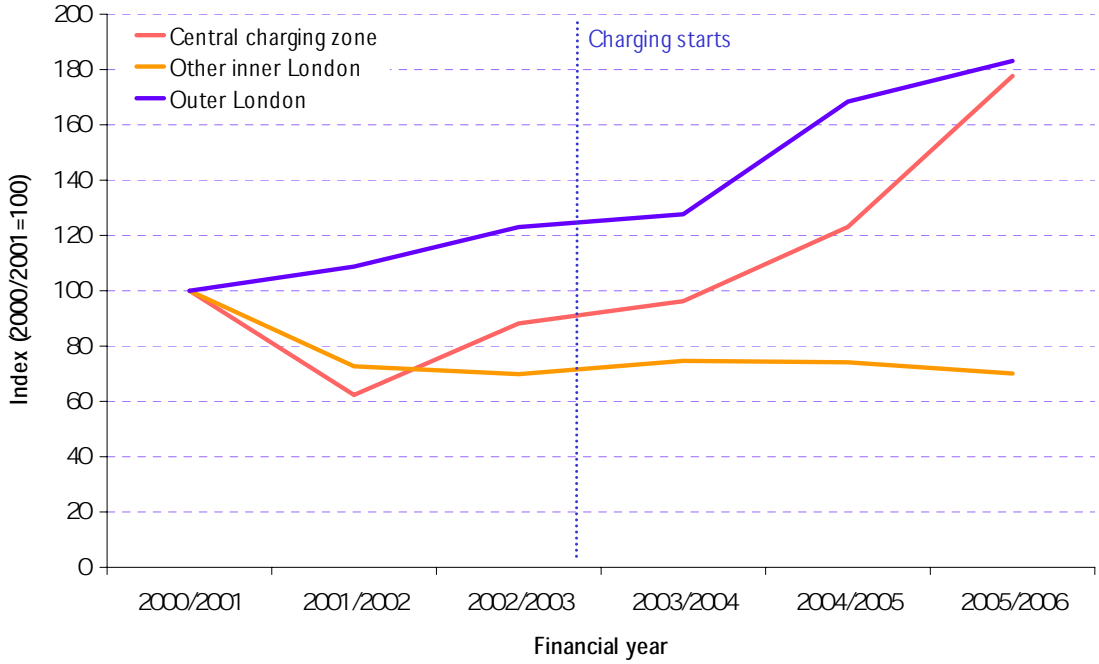
Sales growth and profitability in the hotel and restaurant sector in central London has been strong post-2003. Figure 5.9 indicates that sales growth in the central London charging zone has accelerated post-2003, rising faster than both inner and outer London. In the charging zone, profits have recovered substantially with profitability growth comparable to outer London levels in 2005/2006, despite a difficult pre-charging period in 2001-2003. In contrast, profitability in the inner London hotels and restaurants sector has declined since 2000, as shown in Figure 5.10.

Figure 5.9 Index of sales in the hotels and restaurants sector, compared to other locations in London.



Source: Dun & Bradstreet Ltd.

Figure 5.10 Index of profits in the hotels and restaurants sector, compared to other locations in London.



Source: Dun & Bradstreet Ltd.

5.9 Retail sector

Charging those who drive into the zone reduces the disposable income of those who pay the charge and encourages some drivers to avoid the charging zone. These 'income' and 'substitution' effects are likely to have the most direct effect on the retail sector. Thus, the impact on the retail sector is particularly important in assessing the impact of congestion charging.

Having said this, the retail sector itself is subject to some important external trends. These include increased weekend shopping and the increasing use of the internet for shopping and browsing – the latter possibly reducing 'window shopping' and hence shopper presence on the high street, and perhaps also sales at high street locations. Furthermore, previous annual impacts monitoring reports have shown that the proportion of shoppers who used cars to access central London has been relatively small, both before and after the introduction of charging. Therefore, the impact of any congestion charging related changes would be correspondingly small.

Growth trends in both retail employment and business units have been similar in the central London charging zone. In addition, the central London congestion charging zone has outperformed other areas in London since 2003. Retail footfall traffic in the central London charging zone has shown no noticeable effects from charging, although there appears to be greater difference between weekday and weekend trends.

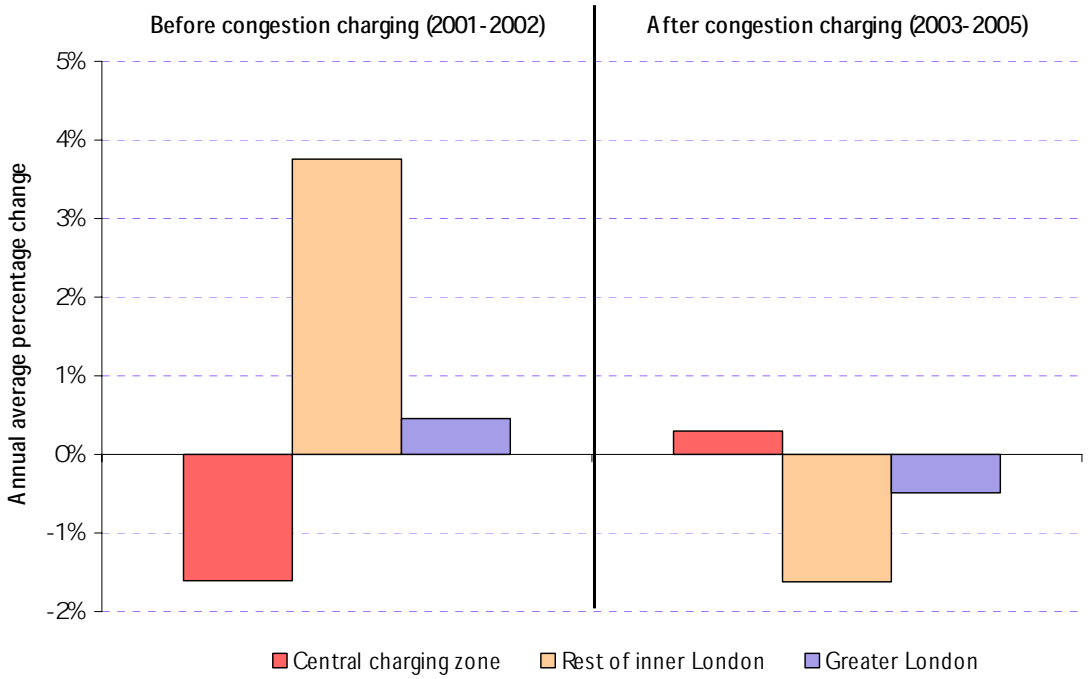
Net VAT registrations in the central London charging zone have shown slightly weaker trends post-2003 compared to elsewhere in London. However, excluding the terrorism affecting 2005, the analysis reveals that the central London congestion charging zone has in fact performed comparatively well. There is therefore no discernable effect on aggregate retail activity in central London since the start of congestion charging.

Employees and business units in the retail sector

The fourth largest employer in central London is retail, with just over 1 in 5 jobs, according to the Annual Business Inquiry, 2007.

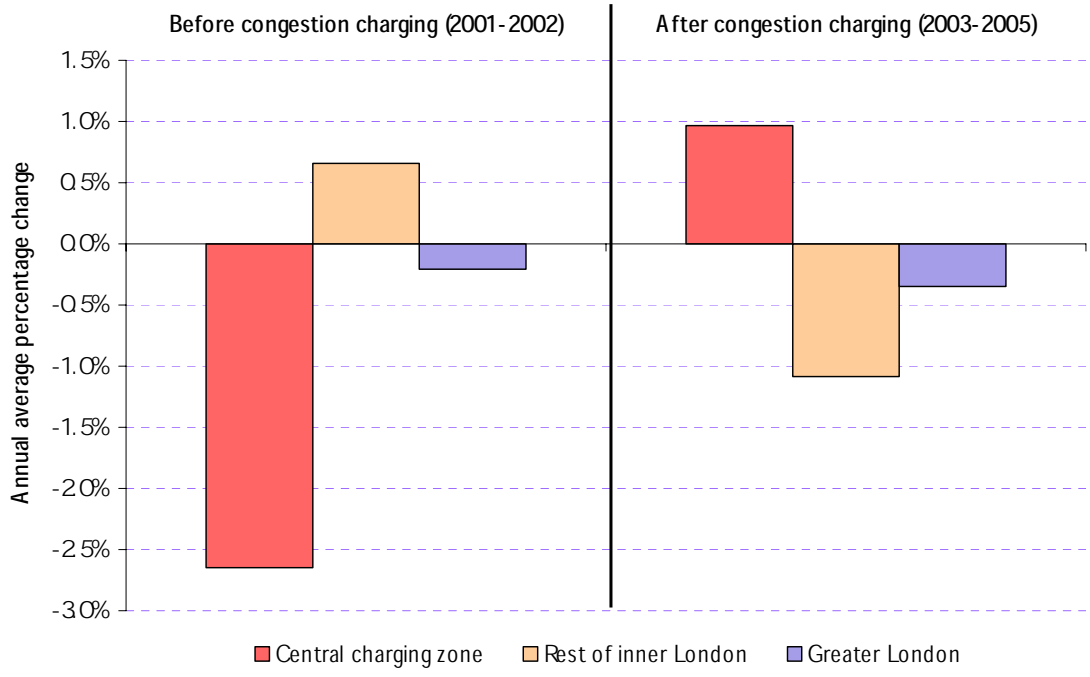
Employment in the retail sector has been volatile across London over the last five years. The central London charging zone has performed better in the period after 2003 than before 2003. Since 2003 the retail sector in the central London charging zone has outperformed both inner and Greater London, with growth in retail business units reflecting employment trends in the sector. In fact, the positive trend (3.5 percent) in the growth in business units post-2003 in the central London charging zone has been slightly greater than the 2 percent positive swing in employment (Figure 5.11). Elsewhere in London growth rates in employment and business units post-2003 have been negative, as shown in Figure 5.12

Figure 5.11 Employee jobs in the retail sector, before and after charging.



Source: Annual Business Inquiry, Office for National Statistics, January 2007.

Figure 5.12 Business units in the retail sector, before and after charging.

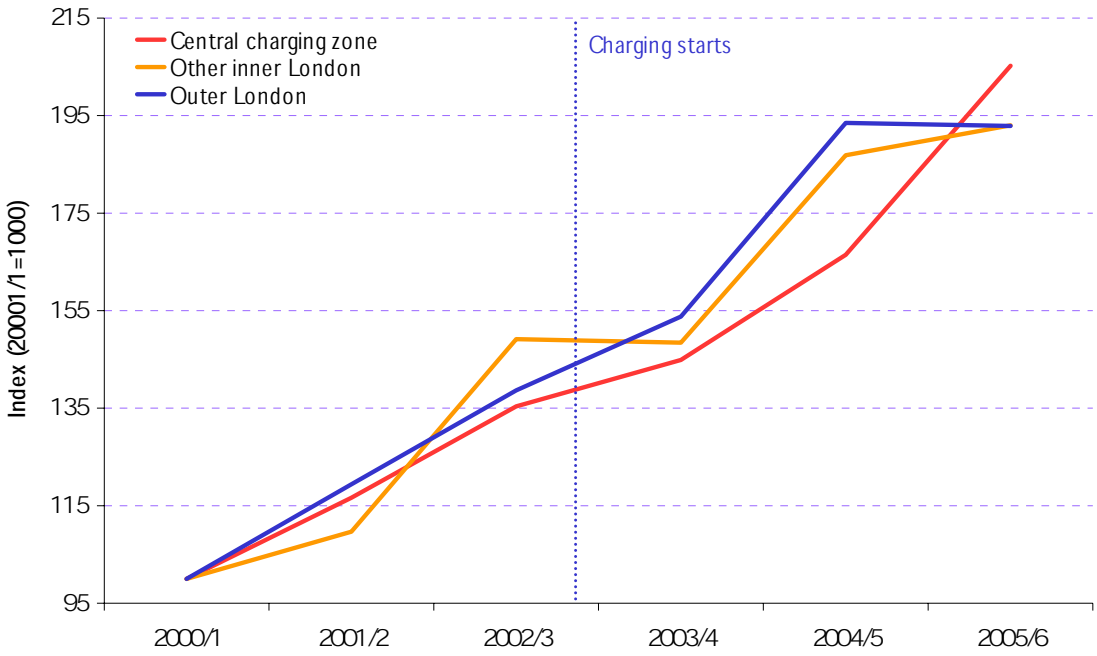


Source: Annual Business Inquiry, Office for National Statistics, January 2007.

Profits in the retail sector

Retail businesses have seen healthy profitability and steady growth across all areas of London. As Figure 5.13 shows, the central London zone retail sector has shown consistently strong profit growth during the past five years and has most recently out-performed the rest of London.

Figure 5.13 Index of profit in the retail sector.



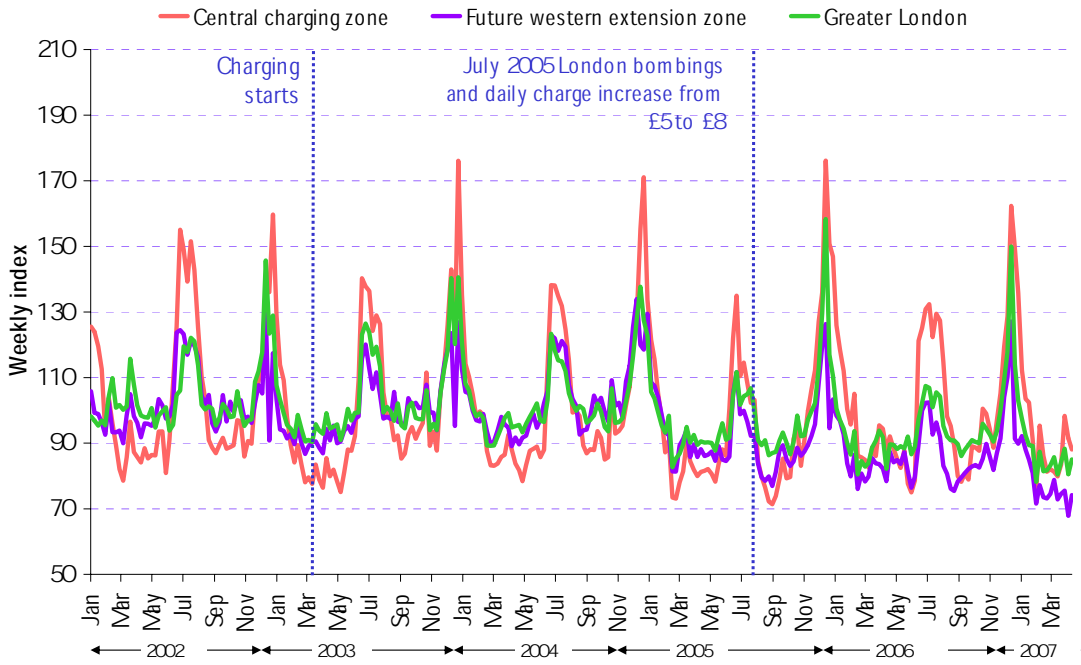
Source: Dun & Bradstreet Ltd.

Retail traffic

Retail traffic data, in comparison to other business and economic indicators presented above, is available on a weekly basis with a lag of a fortnight. This enables a more timely assessment of pre-and post-charging retail traffic (footfall) impacts than is possible with other datasets such as employment and business units. It also enables the assessment of recent scheme developments including the July 2005 Variations with the £8 charge, as shown in Figure 5.14 and 5.15.

Longer-term trends in the SPSL retail traffic index indicate that the central zone has generally outperformed the future western extension zone and Greater London as a whole. Also, there is no long-term, discernable impact following the introduction of congestion charging in February 2003, or after the July 2005 Variations. Although the retail sector in all areas within London suffered immediately following the July 2005 London bombings, retail footfall traffic indicators show swift recovery without any major lasting impact.

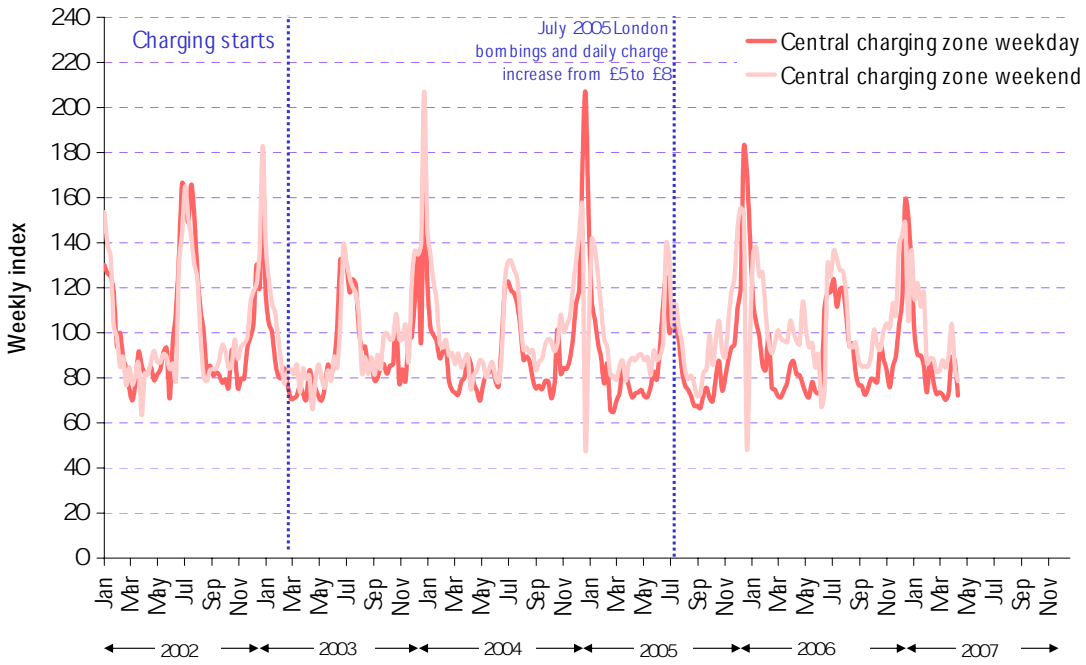
Figure 5.14 Weekly retail traffic index (footfall)



Source: SPSL Ltd.

Figure 5.15 shows the weekday and weekend split of retail footfall traffic in the central London charging zone.

Figure 5.15 Weekday and weekend split of retail traffic in the central London congestion charging zone, pre-and post-2003



Source: SPSL Ltd.

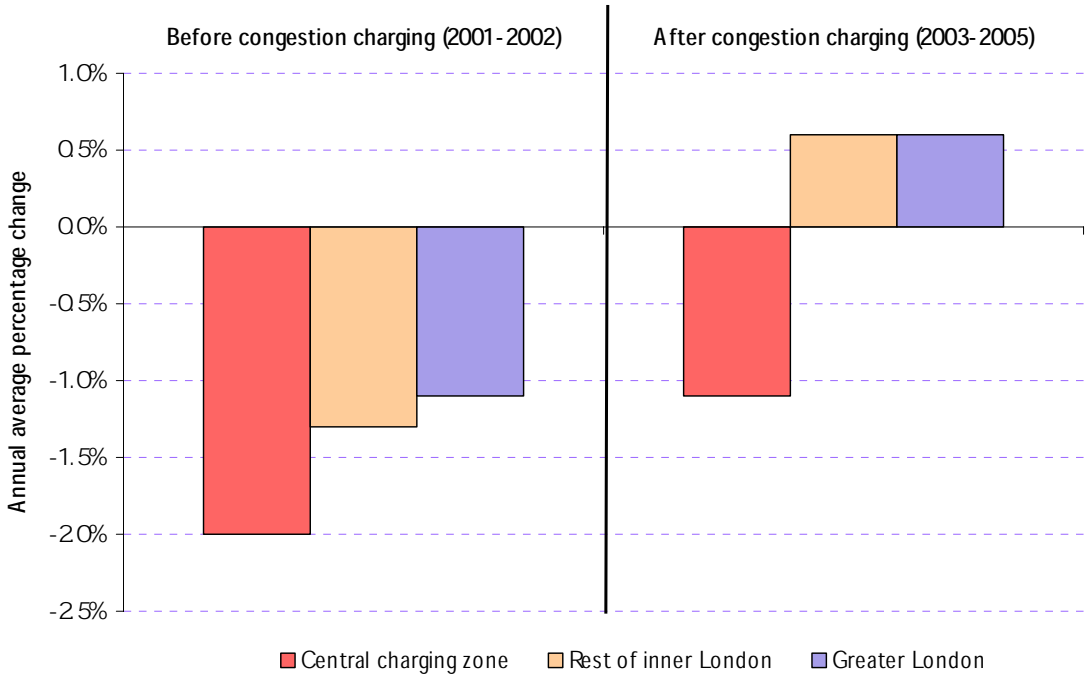
Weekday retail traffic has been relatively stable over the period since 2002, with a small upturn in 2006. The difference between weekday and weekend footfall has been increasing over the past two years. This may be due to increasing opening hours at weekends and the pick up in tourism since the end of 2004. There is no discernable impact following the introduction of congestion charging in February 2003 or after the July 2005 Variations.

VAT registrations in the retail sector

VAT registrations data currently aggregates the retail and wholesale sectors. Analysis of VAT registrations data is limited to evaluating the more immediate pre-and post-2003 periods only, due the limited availability of data following the July 2005 Variations. Collectively, the wholesale and retail sectors performed poorly in the three years prior to 2003, with the main areas in London all recording negative average annual growth of between -0.5 percent to -1.5 percent in net VAT registrations.

As Figure 5.16 shows, all areas in London have shown a pick-up in net VAT registrations since 2003, though the central London congestion charging zone is still experiencing falling numbers of registrations.

Figure 5.16 Net VAT registrations in the wholesale and retail sectors, before and after charging.

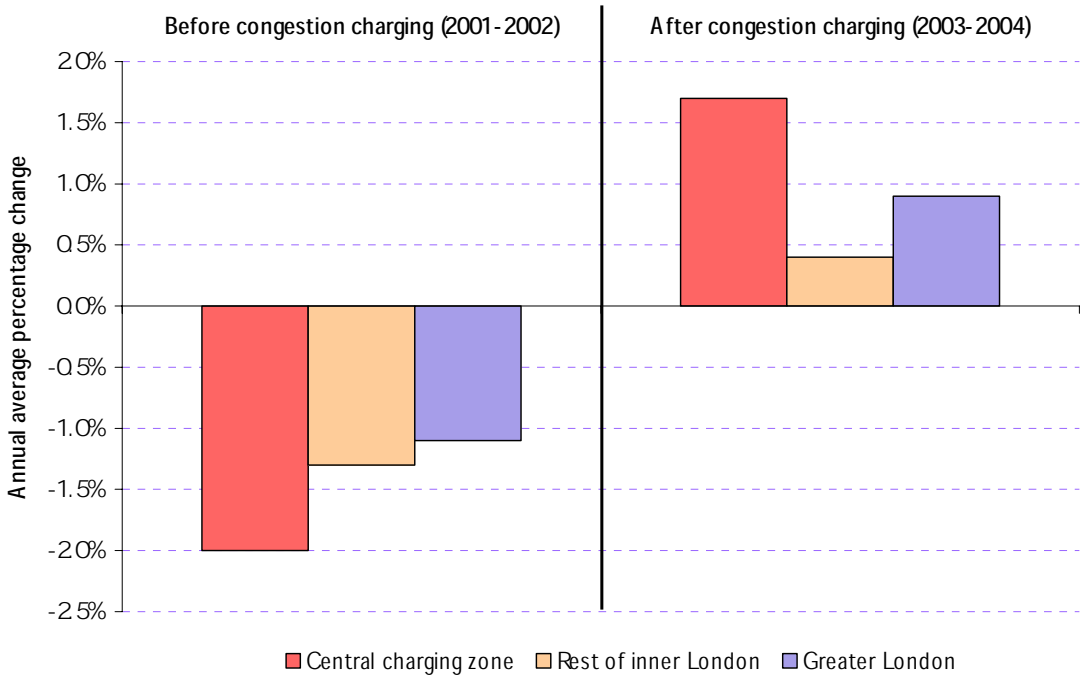


The relatively weaker net change in VAT registrations in the central London congestion charging zone was largely due to performance in 2005. In July 2005, the terrorist bombing incidents targeted central London's transport infrastructure and sharply reduced overseas visitors and consumer spending. Both factors are important business drivers for London's retail and wholesale sector. In the central London charging zone, this sector includes some of the smallest business units in the area in

terms of the number of employees and size of turnover, and these were potentially most vulnerable to sudden major economic shocks such as the July 2005 bombings.

Figure 5.17 indicates that the central London charging zone performed comparatively well post-charging when 2005 is excluded from wholesale and retail net VAT registrations calculations.

Figure 5.17 Net VAT registrations in the wholesale and retail sectors, before and after charging, excluding 2005.

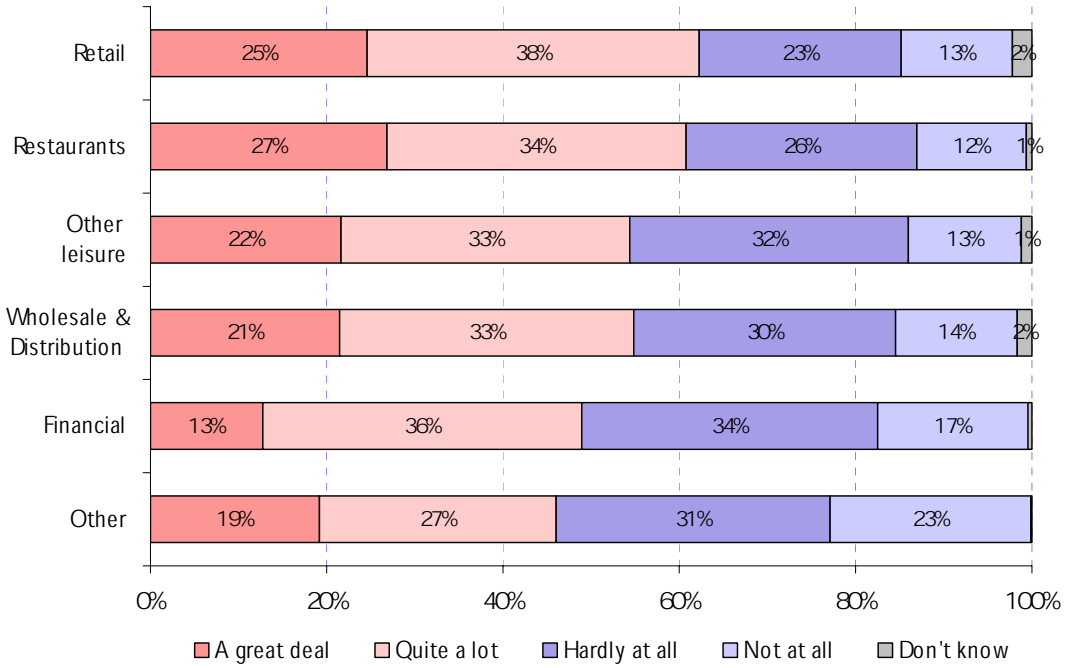


Business attitudes in the retail sector

For the last five years, TfL has conducted an annual survey of business within the central London charging zone and boundary locations to gauge business attitudes to congestion charging and its impacts on business activity. While retailers tend to be among the least supportive of the scheme, companies in retailing, more than in any other sector, agree that transport difficulties are a significant problem facing their organisation.

The most recent TfL Business Survey of Autumn 2006 suggests that nearly two-thirds of the surveyed retail sector businesses in the charging zone say that transport and travel difficulties affected their business 'a great deal' or 'quite a lot', as shown in Figure 5.18.

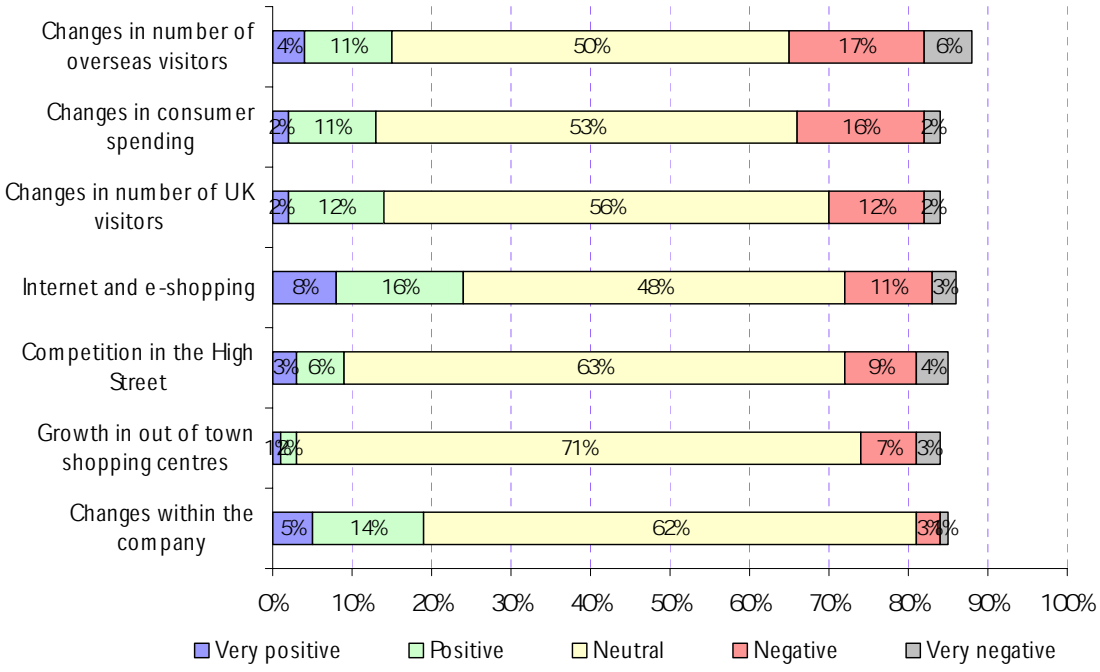
Figure 5.18 Businesses citing transport difficulties as a major problem facing the organisation, by business sector (2006)



Source: TfL Congestion Charging Business Survey: Central Zone – Wave 5.

Of the main underlying factors affecting performance in 2006, retailers in the central London charging zone identified changes in overseas visitors and consumer spending as the main negative influences on business activity (Figure 5.19).

Figure 5.19 Main factors affecting retailers in the central London congestion charging zone, 2006



Source: TfL Congestion Charging Business Survey: Central Zone – Wave 5.

The business perspective therefore lends some support to the assertion that the relatively poor retail VAT registrations performance in the central London charging zone in financial year 2005/2006 – some three years after the start of congestion charging – was due primarily to the impact of the London bombings on overseas visitors and consumer spending.

5.10 Property markets

As with other indicators used to determine possible economic impacts of congestion charging, property prices and rental yield trends result from a complex interaction of supply and demand factors within the economic cycle, rather than merely the introduction of, or increase to, the charge. Due to the commercial nature of the congestion charging zone, our analysis of trends in property markets is focused on retail and office properties.

Analysis of commercial property rental values suggests that the property markets follow a cyclical pattern and are impacted by a combination of both local and London-wide factors. Commercial property, which dominates the property market in the central London charging zone, does not appear to have been impacted differentially compared to inner London by the charging scheme. This includes the relatively short period to September 2006, over which data is available following the rise in the charge to £8 in July 2005.

Approach

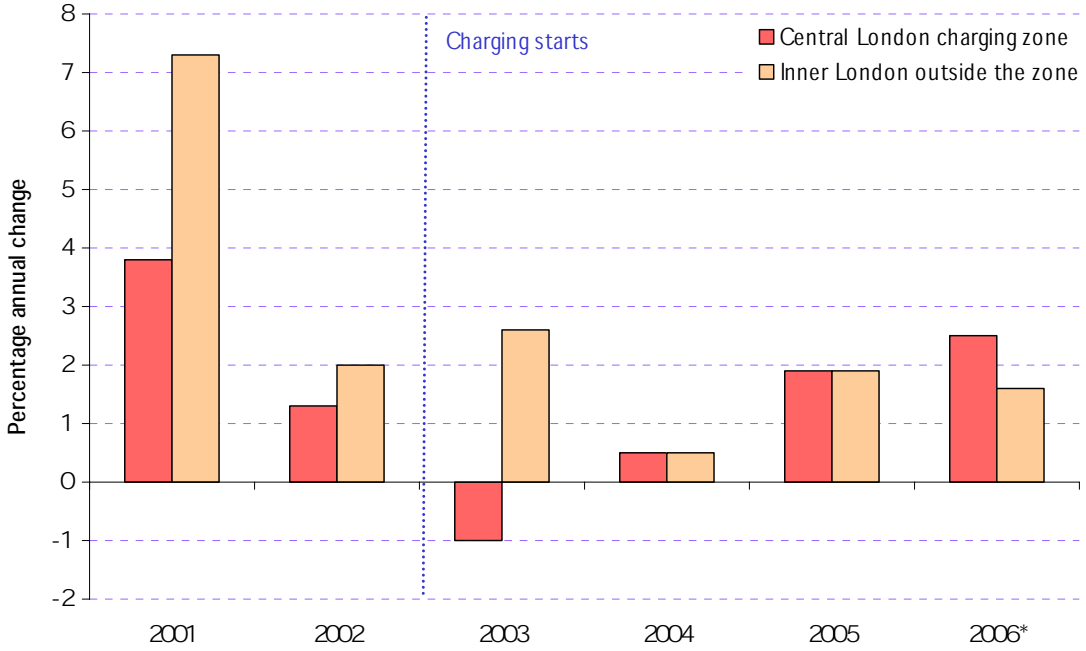
Analysis carried out by the Investment Property Databank using their quarterly databank of commercial property prices, has tracked the performance of retail and office property assets within the charging zone since 2000, using two measures:

- *rental value change* – measurement of the change in the current estimated rents of commercial properties on the open market;
- *yield impact* – measurement of the change in the value that investors place on future income streams of commercial properties.

Retail property

The central London congestion charging zone registered lower rates of growth in rental values of retail properties in comparison to inner London prior to the introduction of the charging scheme, as shown in Figure 5.20. While the poorer performance of the central London charging zone predates charging, post-2004 the rental value of retail properties in the central London charging zone has risen in line with trends in retail rental values in inner London. The positive retail property market performance reflects healthy retail performance generally.

Figure 5.20 Rental value growth of retail properties in London.



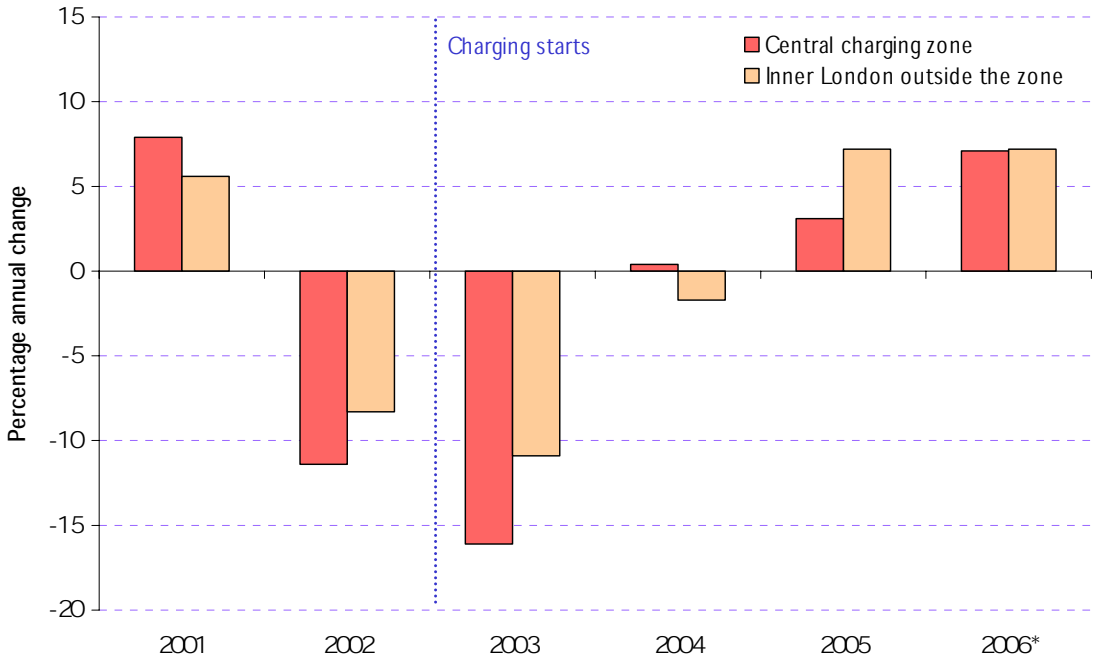
* Data for 9 months to September 2006.
Source: Investment Property Databank Ltd.

Office markets

The inner London office market is characterised by large differences in the tenant mix, type of stock and amplitude of the construction cycle. It is also affected by the cyclical pattern of office rents in the last five years, which has been influenced by such events as the start of the war in Iraq and international terrorism. In addition, the financial and business services sector and the distributive trades sector, both prominent occupiers of inner London's office space, have both experienced slowdown and growth since 2001, indicating the influence of varied trends on office rental prices.

Although growth rates differ, rental values in the London office market follow very similar trends (cyclical pattern) in both the central London charging zone and inner London. In 2001 when office rental values rose, rents in the central London charging zone outperformed inner London. However, when rental values fell in 2002, the central London charging zone performed comparatively less well. After 2003, a similar pattern has been seen with office rental values in the central London charging zone outperforming or in line with inner London rental value growth in some years, and performing comparatively less well in others, as indicated by Figure 5.21.

Figure 5.21 Rental value growth of office properties in London.



* Data for 9 months to September 2006.
Source: Investment Property Databank Ltd.

Business rates

Since 2004 the Valuation Office Agency has received over 10,000 appeals for alterations to the rateable values of commercial properties in London that cite congestion charging (among other factors). To date, the evidence presented to the Valuation Office Agency has not supported any reduction in the rateable value of properties on the grounds that the congestion charging scheme has adversely affected business activity – due to a lack of evidence.

The rateable values of commercial properties, commonly known as 'business rates' or 'non-domestic rates', are established by the Inland Revenue's Valuation Office Agency. These contribute towards the costs of local authority services.

The rateable value is based on the rental value of a commercial property at a set valuation date, called the antecedent valuation date. The most recent assessment took place in April 2003, effective from April 2005. The ratings are assessed every five years. It is then assessed by the Valuation Office Agency and used to calculate the rates payable by ratepayers.

Table 5.1 shows the outstanding commercial property appeals against rateable value evaluations for London boroughs in and around the charging zone. No new appeals citing congestion charging were received between February 2006 and February 2007, and consequently, the number of outstanding appeals has decreased significantly over this period.

Table 5.1 Outstanding appeals against the rateable value of commercial properties that cite congestion charging as a ground for appeal since 2006.

Borough	Outstanding appeals February 2006	Outstanding appeals February 2007
City of London	27	0
City of Westminster	118	44
Hackney	8	0
Islington	12	0
Tower Hamlets	0	0
TOTAL	**167**	**51**

5.11 Summary of key points

No general evidence of any clear differential impact of the central London congestion charging scheme on business activity has been found by the TfL analysis.

The dominant financial and business services sector showed positive trends in aggregate employment and business activity in the years following the start of congestion charging in comparison to the years immediately before charging in 2003. Similarly, the hotel and restaurants sector and the retail sector, both of which are important employers in the central London congestion charging zone, registered stronger business performance following the introduction of charging, and have outperformed other areas of London.

Analysis of commercial property rental values is complicated by economic cyclical patterns and by a combination of both local and London wide factors. Notwithstanding this, commercial property values do not appear to have been impacted differentially by the charging scheme based on mixed performance both before and after the introduction of charging.

The business and economic impacts monitoring of the July 2005 Variations to the scheme is currently limited due to long lags in the availability of published economic and business data. Retail traffic (footfall) data, which is one business dataset that is available to early 2007, shows no significant adverse impact that may be attributed the scheme variations in 2005.

6. Central zone: scheme operation, enforcement and revenues

6.1 Introduction

This section looks at developments to the operation and enforcement of the central London congestion charging scheme during 2006. It also reviews revenues and expenditure associated with the scheme. Developments related to the introduction of the western extension are summarised in Section 14.

The operation of the central London congestion charging scheme continued to improve throughout 2006, with the introduction of further service enhancements that have resulted in a better chargepayer experience, reflected in increased chargepayer satisfaction and increased compliance with the scheme.

Key developments during 2006

- Overall satisfaction with the quality of service provided by congestion charging reached a new high of 79 percent in 2006.
- A number of changes were introduced to the operation of the scheme during 2006, including significant improvements to the processing of residents' discounts and the launch of 'Pay Next Day', allowing chargepayers to pay the charge the day after they travelled within the charging zone.
- Total valid charge payments decreased slowly for much of 2006, reflecting the charge increase in July 2005 and the ongoing general 'background' decline to traffic referred to elsewhere in this report. However, numbers of charges paid increased towards the end of the year, probably reflecting the extension of residents' discount status to western extension zone residents from October 2006.
- Capita, the main service provider for the scheme, generally performed well and met all of its key milestones in the delivery of additional and new services required for customer improvements and preparation for the launch and operation of the Western Extension.
- The internet remains the most used channel for charge payments, accounting for 33 percent of transactions.
- Compliance with the scheme continued to improve, with the level of Penalty Charge Notices issued in 2006 about 17 percent down on 2005.
- Representations and appeals against Penalty Charge Notices continued to reduce, with 14 percent of the Penalty Charge Notices now being subject to a representation and 1 percent subject to appeal.
- Of the cases which reach the Parking and Traffic Adjudicators, TfL congestion charging has a higher level of success in winning appeals than any local Authority, with 84 percent of appeals heard being found in TfL's favour.
- Penalty payment rates remain consistent, with over 72 percent paid – the vast majority at the discounted amount.

- Significant improvements have been made to the congestion charging website to provide simple guidance and advice to vehicle keepers who receive Penalty Charge Notices.

Scheme operation

6.2 Service developments and contractor performance

Developments to the operation of the scheme during 2006 have built upon the enhancements to the service delivered in 2003, 2004 and 2005 as described in previous annual impacts monitoring reports. The result has been additional improvements to the 'chargepayer experience', increased compliance with the scheme and a further reduction in the issuing of Penalty Charge Notices that chargepayers believe are unfair.

Key developments for the scheme in 2006 were:

Residents and discounts

- The residents' discount renewal process has been greatly simplified so that each year registered residents now simply have to confirm their details rather than submit a new application. This has resulted in 95 percent of resident affirmation applications being approved and a 30 percent reduction in rejected discount renewals.
- Enhancements in the application process now allow qualifying residents to pre-register on the web or through the call centre. Completed application forms are then generated and sent to the applicant along with a letter clearly stating the proof of details that need to be returned. The applicant simply has to sign the form and return it with the required proofs. These amendments have contributed to a 50 percent reduction in rejected new discount applications.
- Improvements have also been made to the actual processing of residents discounts. A specialist team has been established to help residents who are having difficulty in setting up their discount. This includes outbound calling to new residents who have incorrectly completed the application form to ensure speedier resolution of the problem.
- TfL has aligned the dates for residents' charges with the period for which they are eligible for the residents' discounts. Residents are now no longer able to buy valid charges beyond the period for which they are eligible for a discount. This has reduced the level of confusion at discount expiry and hence decreased the number of Penalty Charge Notices issued to residents.
- A new 100 percent discount from the congestion charge, for three-wheeled vehicles that are less than 1 metre wide and 2 metres long, was successfully introduced in September 2006.

Payments

- The Pay Next Day scheme was introduced on 19 June 2006. Chargepayers can now, at a total charge of £10, pay up to midnight on the charging day following

their journey in the congestion charging zone. Previously, chargepayers had to pay in advance or on the day of travel. Pay Next Day has proven very popular and is used for over 4,000 payments per day, increasing convenience and reducing the level of Penalty Charge Notices issued by around 12 percent.

- A new call recording system was introduced that records all 'customer' calls coming into the call centre. This provides significant enhancements to training, as well as allowing faster resolution of complaints and enquiries.

Enforcement information

Additional specific enforcement-related pages have been added to the congestion charging website, www.cclondon.com, to provide detailed information regarding the entire enforcement process. These include particular advice on how to make representations, and the appeal and statutory declaration processes. By providing this information in an easy to follow format, chargepayers will have access to information that provides them with clear guidance and advice if they receive a congestion charging Penalty Charge Notice. These additional pages can be found at www.cclondon.com/Penalties-Enforcement.

Appeals

TfL successfully introduced an electronic data interface with the appeals service in November 2005, working in conjunction with the Parking and Traffic Appeals Service. This interface allows the electronic transfer of all evidence relating to appeals between Capita and the appeals service. It removes the need for paper exchange of documents, thereby reducing the likelihood of evidence going missing. TfL is still the only Authority to use such an interface and its introduction has contributed to:

- increased efficiency in submitting appeal packs and other data to Parking and Traffic Appeals from TfL;
- a significant reduction in paper and printing by TfL and Capita;
- a reduction in decisions to not contest appeals by TfL;
- a reduction in the risk of appeals packs being delayed or lost in transit.

Bailiffs

During 2006 TfL undertook a thorough review of its bailiff arrangements, contracts and bailiff monitoring programme and has made further improvements in numerous areas. These improvements include:

- The introduction of additional monitoring activities and increased frequency of monitoring with detailed monitoring reports provided to each bailiff company.
- From later in 2007, introduction of a bailiff 'Know Your Rights' leaflet to be issued with bailiff correspondence and interaction. This will provide debtors with simple information about what happens when bailiffs are engaged to discharge a debt and what a bailiff can and cannot do, as well as detailed information regarding the complaints processes.
- Formal variations to the contracts with financial penalties for: failure by the bailiff companies to issue the Know Your Rights leaflet; failure to use the correct

documentation or misleading documentation during the enforcement process; failure to provide proof of visits using Global Positioning Satellite tracker records or a suitable alternative; failure to check the references of new personnel and failure to use certificated bailiffs in the execution of congestion charging warrants.

In addition to the above, from June 2007, all four bailiff companies will be required to report on call centre answer times and availability, and to provide an additional report showing the point in the enforcement process where payment has been achieved.

Foreign vehicles

Congestion charging continues to use the services of a dedicated European debt recovery agency – Euro Parking Collections. Euro Parking Collections is now into its third full year of working on the collection of congestion charging penalties incurred by foreign registered vehicles. Where Euro Parking Collections is able to access the keeper information of foreign registered vehicles it has achieved a 38 percent collection rate, which represents a steady improvement on previous years.

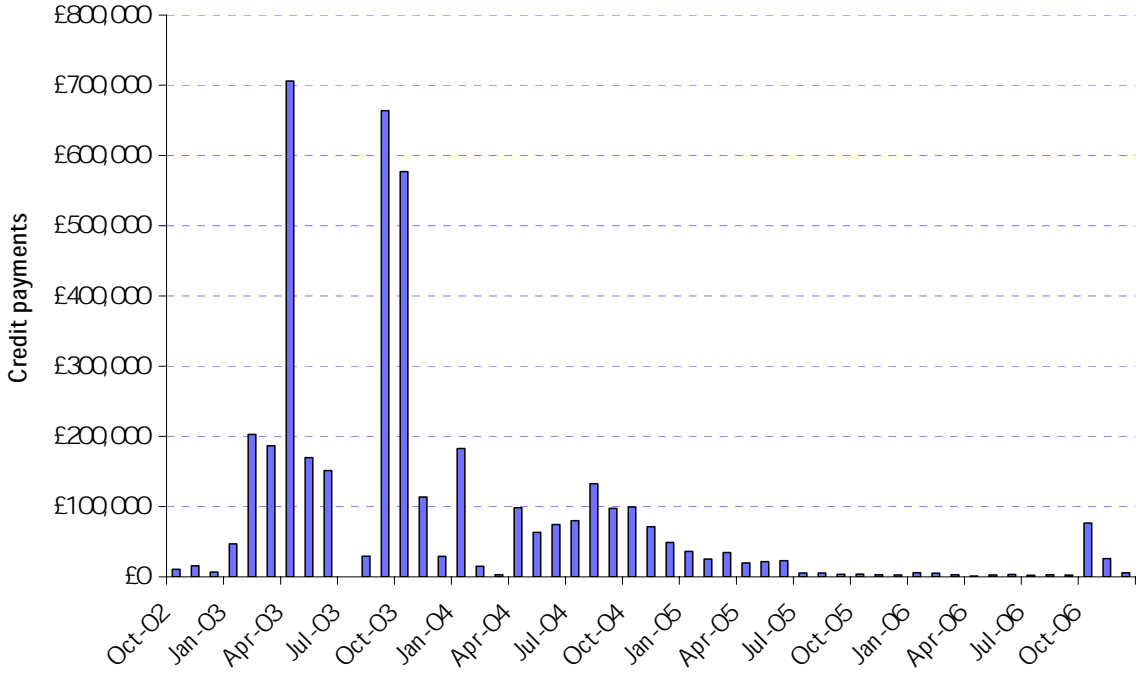
Working in partnership with TfL, Euro Parking Collections continues to widen the scope of its access to European vehicle licensing agencies and has recently gained access to the agencies of Finland and Austria, bringing the total number of countries to 16. It is hoped that access to further European countries will be achieved in the coming year with steady progress being made to access details for keepers registered in Belgium, Estonia, Hungary, Ireland, Latvia, Lithuania, Bulgaria, Czech Republic, France, Romania, Slovakia, Slovenia and the Netherlands.

6.3 Capita performance

Capita is the main service provider supporting the day to day operations of the scheme on behalf of TfL. Capita has staff in London and Coventry that manage the key functions of the service including camera maintenance, image capture, the contact 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 has 52 performance indicators within the Capita contract and Supplemental Agreement (see TfL's *Third Annual Impacts Monitoring Report*). There are seven 'super' key performance indicators, 32 key performance indicators and 13 quality performance indicators. Performance against these indicators has further improved in 2006, with the vast majority of indicators being met.

Figure 6.1 Capita performance – service credit payments from Capita to TfL.



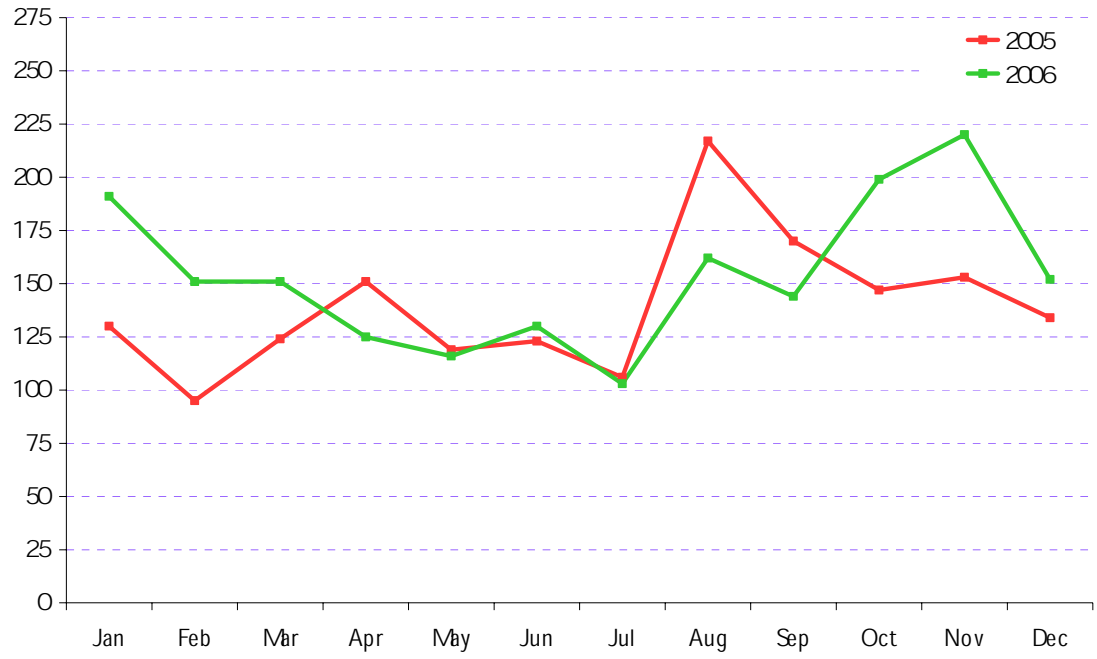
This strict performance regime, monitored by a team of TfL Policy and Monitoring Advisors based on site in Capita's main contact centre, has contributed to a significant and sustained improvement in the quality of service in key performance areas. These include reductions to Penalty Charge Notices issued as a result of an error by Capita, or the incorrect processing of representations and appeals, both of which remain within acceptable levels.

Performance from July 2005 and throughout 2006 steadily improved when compared with earlier years with the exception of some processing errors that occurred in October, as reflected in the trend of service credit payments from Capita to TfL (Figure 6.1).

NCP Services is TfL's service provider for on-street enforcement operations in respect of persistent evaders of the congestion charge. The company has continued to provide a fully satisfactory performance throughout 2006 (Figure 6.2).

Based on the successful introduction of a 'Locust' van in 2005, a second 'Locust' van which is capable of reading number plates of parked vehicles whilst travelling at the speed of general traffic was introduced in 2006. This has contributed to a more effective method of identifying and enforcing against persistent evaders of the scheme.

Figure 6.2 Number of persistent evader vehicles enforced against per month in 2005 and 2006



Planned developments

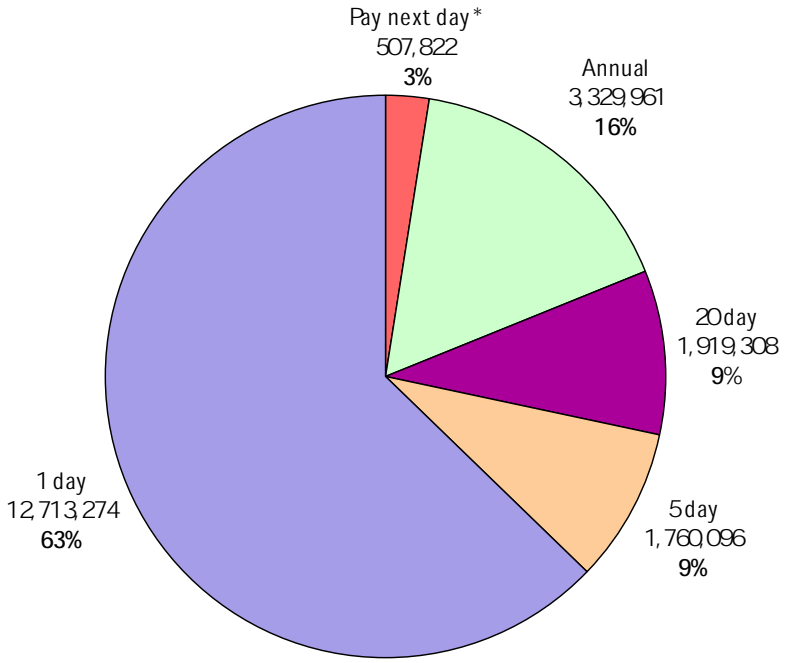
Additional developments are planned to further improve the quality of service and maintain high levels of chargepayer satisfaction in 2007. These include:

- Further improvements to the website to improve the accessibility and usability.
- The Blue Badge discount application process will be improved following the successful changes introduced to the residents' process.
- Further public information relating to how to challenge a Penalty Charge Notice and what evidence TfL requires in order to investigate a representation.
- Further consultation with the British Vehicle Rental and Leasing Association is underway to help ensure that hire companies provide the appropriate information to transfer liability to the hirer.
- Congestion charging enforcement expect to launch a system whereby members of the public intending to purchase a new vehicle, can, on provision of confirmation from the existing keeper, check with TfL to ascertain whether the vehicle has outstanding congestion charging Penalty Charge Notices.

6.4 Congestion charging payments

Figure 6.3 shows the breakdown of congestion charging payments by type. Standard daily charges were the most common payment type throughout 2006. The Pay Next Day option was only introduced in June 2006, so is not directly comparable with the percentages of other payment options.

Figure 6.3 Congestion charging payments by type, 2006



* Pay next day introduced in June 2006.
Note: payments valid for more than 1 day (eg, annual) shown multiplied by days for which they are valid.

Figure 6.4 shows the monthly average volumes of valid charges paid since the start of 2004. The general trend is slowly downwards, reflecting the ongoing 'background' declines to traffic in and around central London described elsewhere in this report. The response to the increase in the charge to £8 in July 2005 is clearly visible in this indicator, as is an upturn in the latter months of 2006, reflecting western extension residents' discount charge payments. The percentage of 'fleet scheme' vehicles increased from 16 percent to 18 percent during 2006, reflecting a number of improvements to TfL's fleet scheme arrangements as described in previous reports.

As noted in TfL's *Fourth Annual Impacts Monitoring Report*, because potentially chargeable vehicles (cars, vans and lorries) account for under half the traffic within the charging zone during charging hours, the magnitude of changes to the total number of vehicles observed would be reduced in comparison with the equivalent congestion charge payments trend. Taking this and other relevant factors such as background decline in traffic into account, the long-run effect of the July 2005 charge increase on payments is of the order of 8 percent, corresponding to an approximate reduction in total traffic in the central zone of about 3 percent (see also Section 2 of this report).

The up-turn in charge payments in late 2006 would correspond to an increase in traffic in the original central zone from trips by newly-discounted western extension residents. Western extension residents making similar trips before October 2006 would generally have been full chargepayers. However, the extension of the discount facility will have led to additional trips over and above those routinely made by these residents beforehand. Taking these factors into account, the implied corresponding increase to traffic in the central zone from additional resident's discount trips in late 2006 would be of the order of 3 percent.

Figure 6.4 Average number of valid charges on each charging day, January 2004 to December 2006

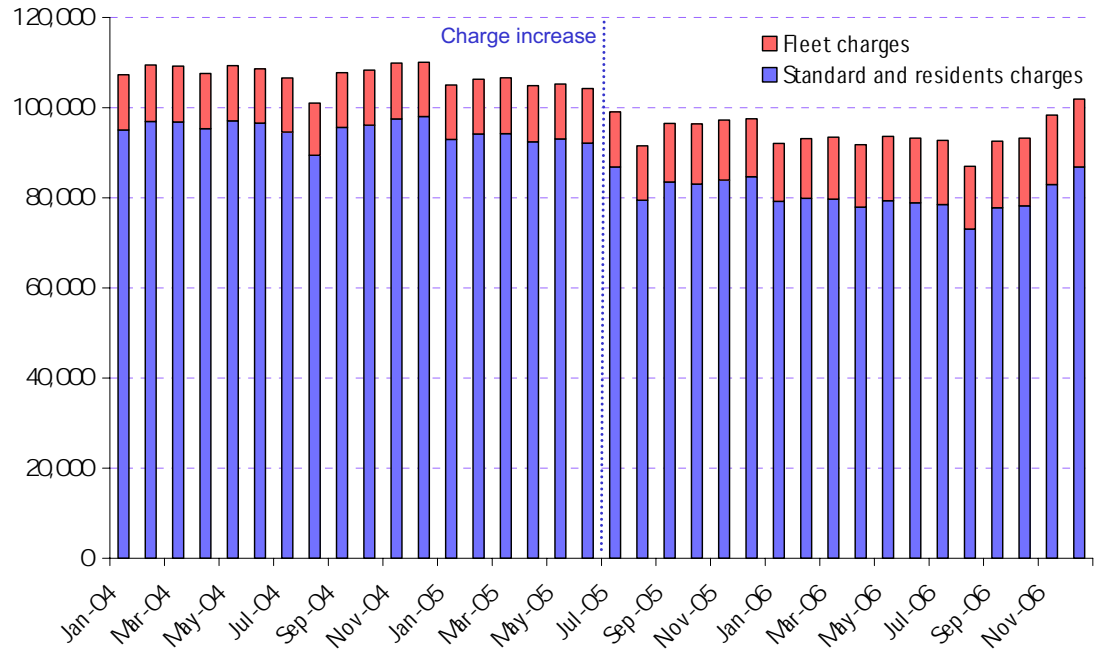


Table 6.1 illustrates the percentages of each type of payment since the start of the scheme in 2003. As can be seen, almost two-thirds of residents' charges are annual, whereas over eighty percent of standard charge payments are daily.

Table 6.1 Charges by payment type.

	Standard charges				Residents' charges		
	Daily	Weekly	Monthly	Annual	Weekly	Monthly	Annual
First year of scheme (17/02/03 - 31/12/03)	82%	9%	6%	2%	20%	24%	56%
Second year of scheme (01/01/04 - 31/12/04)	82%	9%	6%	2%	18%	22%	60%
Third year of scheme (01/01/05 - 31/12/05)	81%	9%	7%	3%	17%	18%	65%
Fourth year of scheme (01/01/06 - 31/12/06)	81%	6%	8%	4%	19%	16%	65%

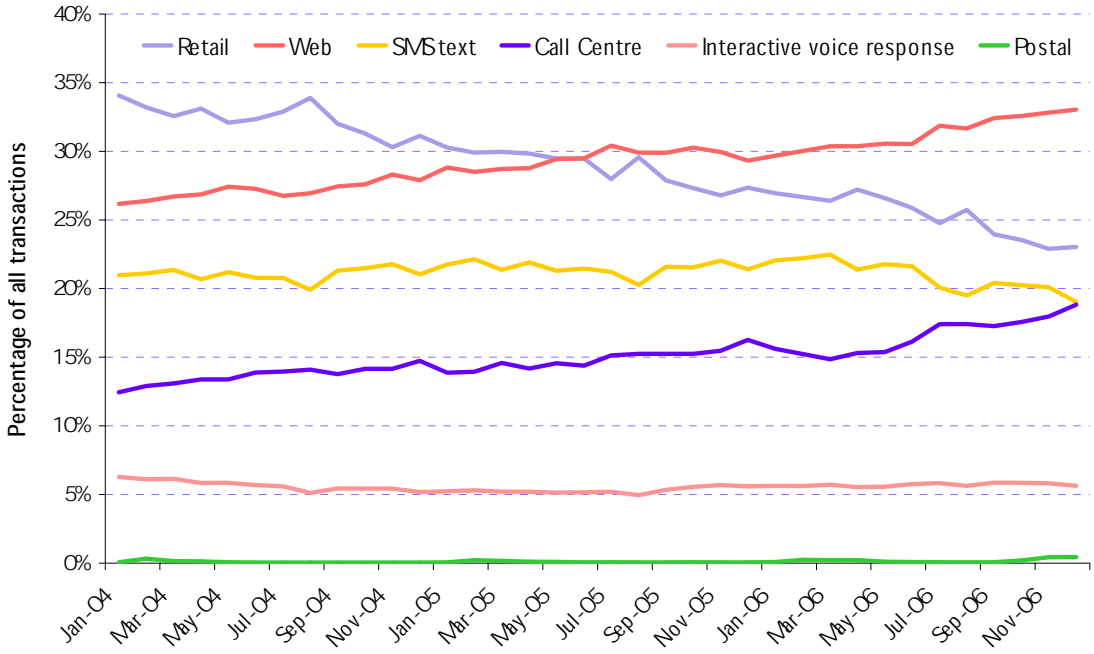
Taking all payment types into account, of the payments made for the 12 months ending December 2006, 20 percent were made in respect of vehicles registered for the 90 percent residents' discount. This was an increase from 16 percent in 2005, and primarily reflects the extension of residents' discount status to residents of the western extension zone, following registration, from late October 2006.

6.5 Payment channel split

Previous annual impacts monitoring reports have described established patterns of payment, and identified a trend towards growing use of automated payment channels.

In 2006, there has been a further increase in the usage of the web channel and a reduction in usage of the retail channel. The call centre payment channel saw growth in latter part of 2006. This was in part the result of Pay Next Day, which was introduced in June 2006 and is available through only the web and call centre channels (Figure 6.5).

Figure 6.5 Charge transactions payment by channel, January 2004 to December 2006



6.6 Quality of service

Overall satisfaction with the operation of the scheme as measured by surveys of chargepayers is now at 79 percent, up from 77 percent twelve months ago, and at its highest level since the start of the scheme. Satisfaction with the payments process rose from 82 percent in 2005 to 85 percent in 2006, again representing a new highest level.

Improvements in the monitoring regime for payments have increased the error free payment rate to 99.8 percent. These improvements include additional quality and monitoring staff employed in the contact centre to ensure that chargepayers receive a high and consistent level of service when they contact TfL.

Call centre performance improved further in 2006, with average queuing times at only 9 seconds for the year. The volume of calls has dropped slightly from 2005 figures, averaging some 230,000 calls per month. The percentage of callers abandoning calls or unable to get through to the call centre was 0.5 percent in 2006.

In reviewing the quality of service provided by TfL, the Local Government Ombudsman in the *Local Government Ombudsman Annual Letter 2005/2006* commended congestion charging on a reduction in complaints received, and the

manner in which TfL congestion charging takes a "positive and proactive approach" when handling and settling complaints.

6.7 Public information

A series of public information campaigns were run throughout 2006, 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' ad.

In March a campaign was launched to help drivers remember to pay the charge. Drivers were encouraged to visit www.cclondon.com to download a free 'desktop reminder' to run on their computer or to request a car tax disc holder. The desktop reminder allows users to select the day of the week and time of day they wish to be reminded to pay the charge, with a click-through link to www.cclondon.com to enable users to pay the charge online. As of May 2007, 13,000 potential chargepayers have downloaded the desktop reminder, and 26,000 car tax discs have been requested and issued.

The new Pay Next Day payment option was launched using radio and press in June 2006 accompanied by some direct mail to a key segment of registered chargepayers who had driven in the charging zone during the last 12 months and had received at least one Penalty Charge Notice.

July saw the launch of a new campaign targeting all Londoners as well as drivers, explaining the benefits of the scheme and how the net revenue generated was being used. Key messages focused on *'Less congestion'*, *'More people using public transport'*, *'72km of new cycle lanes'*, and *'350 more buses to catch'*. The messages ran on roadside posters, in the London-wide local press and ethnic minority press, as well as in the Londoner and the Metro.

Press advertisements in the Metro newspaper in December 2006 reminded Londoners that the charge was not in operation over the Christmas period.

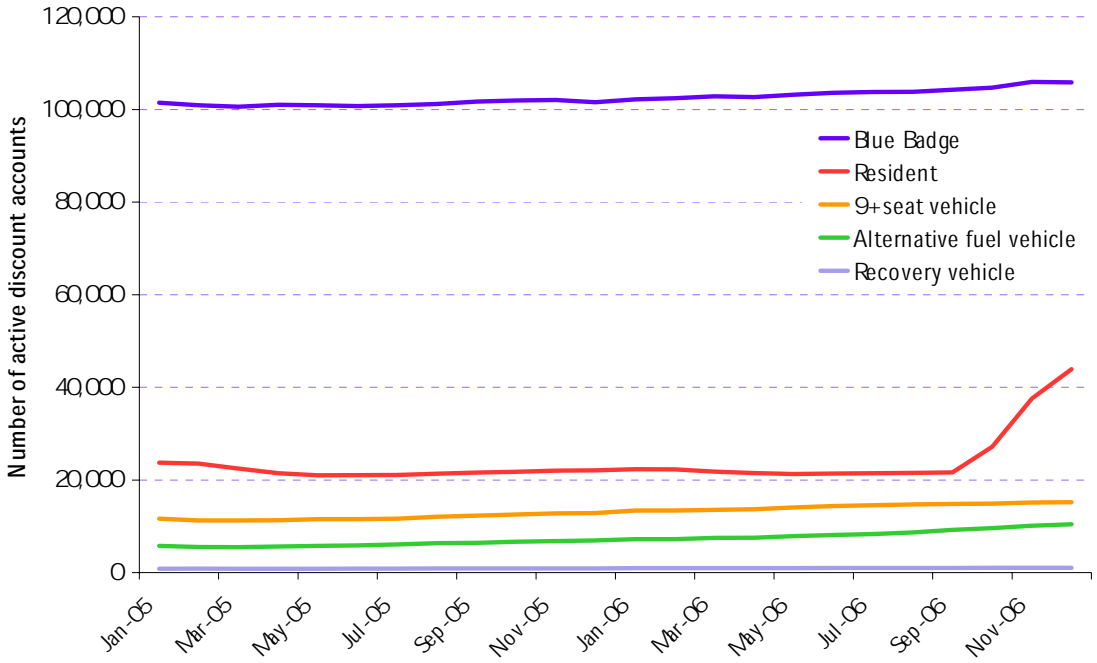
New leaflets have been developed specifically targeting newly registered residents and Blue Badge holders. The leaflets aim to help these people understand how their discount works and provide tips to help them avoid receiving any unnecessary Penalty Charge Notices.

6.8 Registrations and discounts

As expected, applications for resident discounts rose sharply from October 2006 as residents in the western extension zone took the opportunity to pre-register for the extended scheme (Figure 6.6). This conferred discounted status for trips to, from or in the original central zone (see also Section 6.4) from date of registration, leading to some increases in circulating traffic in the central London zone. Note that a proportion of these 'newly discounted' residents' trips would have been made

previously as fully-chargeable trips. However, others would have been 'new' trips, contributing to a small overall increase in traffic in the central zone.

Figure 6.6 Active discount accounts by type, January 2005 to December 2006



Scheme enforcement

6.9 Enforcement process

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 on various routes within the zone, capture images of vehicles within the charging zone during the hours of operation (07.00 to 18.30 throughout 2006). The hours of operation in both parts of the extended charging zone changed to 07.00 to 18.00 following the introduction of the western extension in February 2007. Vehicle 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 detected.

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 record on the database are then sent through to the next stage of the process.

Since the introduction of Pay Next Day in June 2006, the process for issuing Penalty Charge Notices has been extended by 24 hours. By 02.00 on the second working day following the end of the charging day on which the vehicle was detected, all the vehicle registration numbers for those vehicles where no 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 contraventions of the requirements of the scheme. 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 Charge Certificate and the amount due being increased to £150.

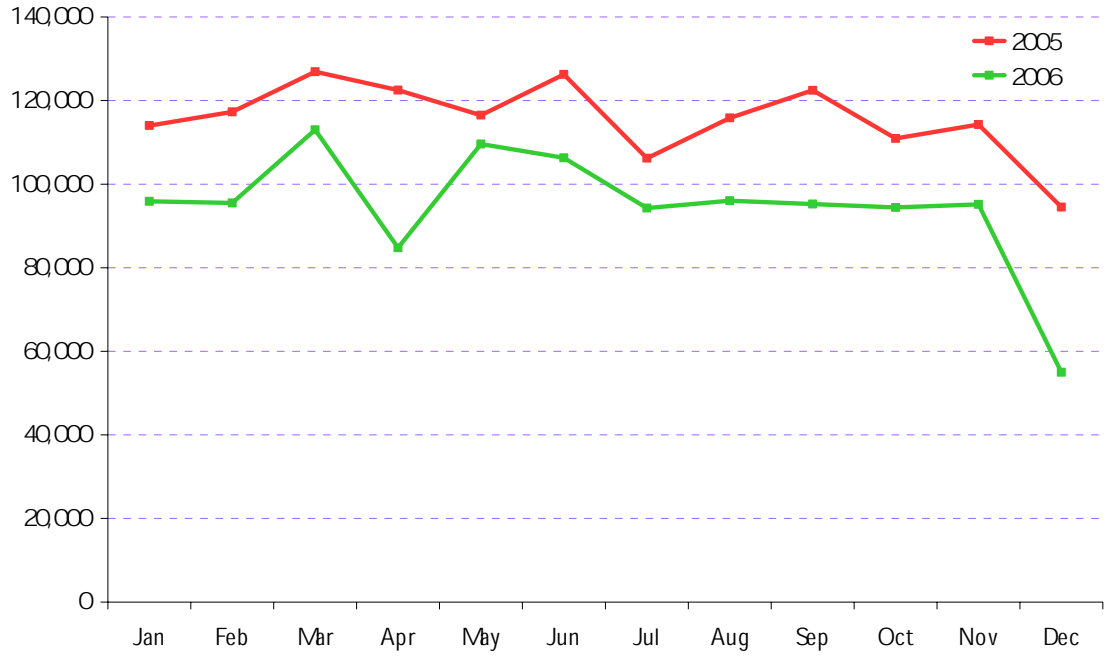
Should a chargepayer wish to challenge a Penalty Charge Notice, they are legally required to make a written representation to TfL. From the moment that a written representation is received by TfL, all enforcement action is put on hold until the matter is investigated. Should TfL reject the representation, the chargepayer is able to make an appeal against TfL to the independent Parking and Traffic Appeals Authority.

6.10 Penalty Charge Notices issued

The number of Penalty Charge Notices issued continued to reduce throughout 2006 (Figure 6.7). This continuing reduction can be attributed to greater chargepayer understanding of the operation of the scheme and implications of not paying, the introduction of Pay Next Day, reduced service provider and chargepayer errors, fewer chargeable vehicles driving in the zone and improved quality of service by Capita.

The impact of Pay Next Day, which was introduced in June 2006, has been to reduce Penalty Charge Notices from 15 percent at the point of introduction to 12 percent towards the end of the year. Overall, 17 percent fewer Penalty Charge Notices were issued in 2006 compared to 2005.

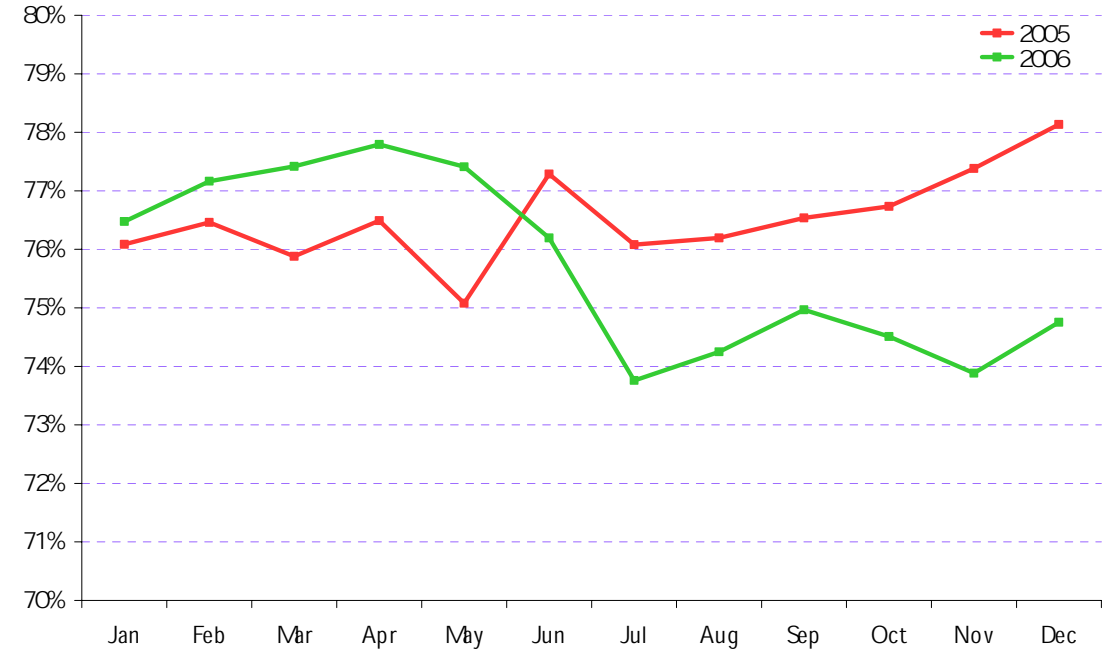
Figure 6.7 Penalty Charge Notices issued, 2005 and 2006



6.11 Penalty Charge Notices paid

Throughout 2006 the proportion of Penalty Charge Notices paid has remained consistently above 74 percent of all Penalty Charge Notices issued. Figure 6.8 is based on the 'contravention date' and therefore Penalty Charge Notices recovered in the last few months of 2006 will increase over time to an anticipated average over the year of above 74 percent.

Figure 6.8 Proportion of Penalty Charge Notices that were paid, 2005 and 2006



This recovery rate for Penalty Charge Notices compares favourably with that achieved by Local Authorities for similar civil traffic offences such as parking offences. The remaining 26 percent of Penalty Charge Notices are cancelled as a result of an accepted representation, or in the event that the debt can not be recovered as when the keeper of the vehicle cannot be traced, is bankrupt or deceased.

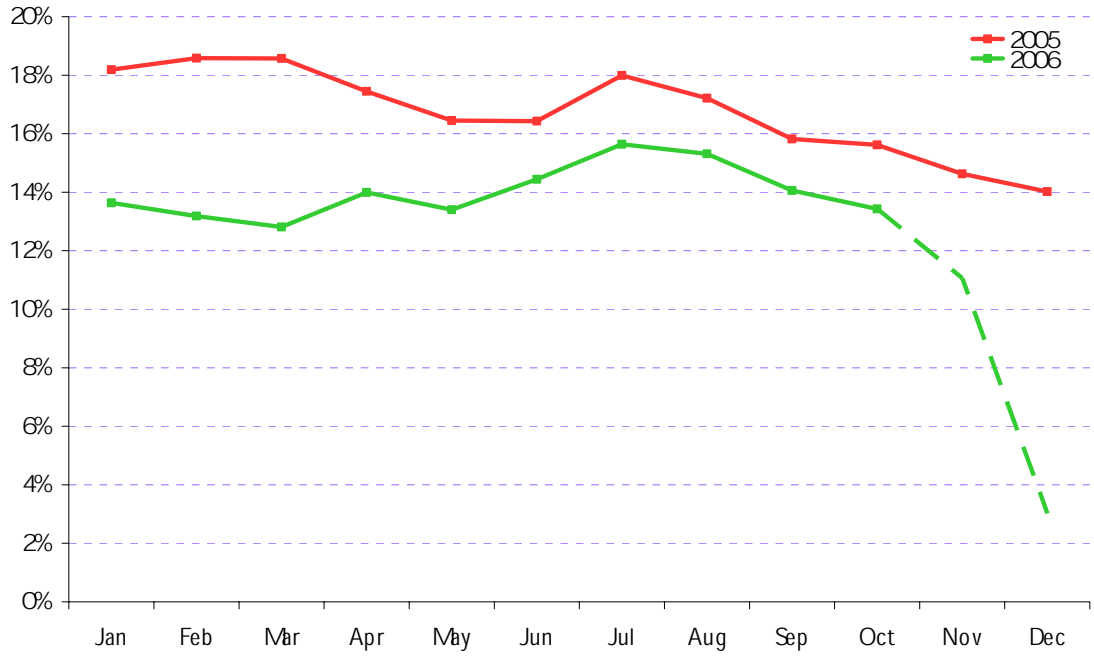
6.12 Representations made against Penalty Charge Notices

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 was consistently below 15 percent.

Figure 6.9 is based on contravention date with almost all representations received within 5 to 7 months of the date of contravention. Data up to September 2006 are considered unlikely to change, with small further increases expected for October through to December. An overall figure of 15 percent is expected for 2006. This percentage has fallen from a high of 64 percent in 2003 to 21 percent in 2004 and is consistent with an overall figure of 15 percent in 2005. This continues to reflect the improvements to, and increased understanding of, the scheme.

Figure 6.9 Representations received as a percentage of Penalty Charge Notices issued, 2005 and 2006



The main reasons for representations being accepted or rejected in 2006 are:

Representations accepted

- *Sold vehicle before the date of offence* – TfL accesses live data of the registered keeper as held by the Driver and Vehicle Licensing Agency and, as a result, Penalty Charge Notices can be issued to the old keeper whilst the Driver and Vehicle Licensing Agency 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 for chargepayers who simply forget to pay.
- *Unplanned entry in zone* – TfL will not normally accept representations from those who claim they did not intend to travel into the zone, did not see the numerous signs, road markings etc.
- *Insufficient evidence of hire* – representations are often rejected when the hire company is unable to provide sufficient evidence in the form required by the Regulations that govern the transfer of liability from hire company to hirer.

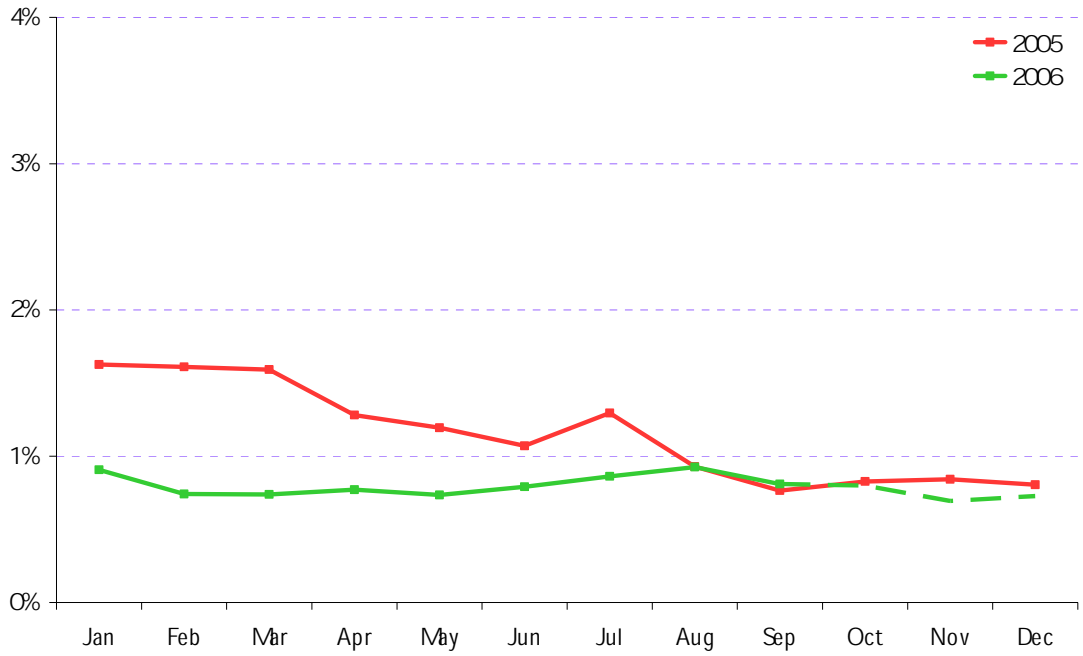
6.13 Appeals

The keeper of any vehicle that was the subject of a representation that TfL considered but rejected may appeal against this decision to the Parking and Traffic Appeals Service. All appeals are considered by independent adjudicators.

The volume of appeals received consistently reduced throughout 2003, 2004 and 2005 and a further reduction has been seen during 2006. In 2006, just over 1 percent of Penalty Charge Notices issued resulted in an appeal and an average of 84 percent of appeals were determined in favour of TfL. This is the highest success rate for traffic enforcement penalties heard by adjudicators of any Authority.

Figure 6.10 is based on contravention date with almost all appeals received within 5-8 months of the date of contravention. Figures up to August 2006 are not expected to change. Minor increases are expected for the period September to December. The annual average appeal rate for 2006 is expected to be 1.5 percent.

Figure 6.10 Appeals received as a percentage of Penalty Charge Notices issued, 2005 and 2006



6.14 Debt collection and persistent evasion

Where a Penalty Charge Notice remains unpaid and there is no outstanding representation or appeal, the debt is registered at County Court and a warrant 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 that 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 2006 some 741,016 warrants have been issued to bailiffs since the start of the scheme. The number issued in 2006 was 169,839. 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.

During 2006 TfL undertook a thorough review of its existing bailiff arrangement, contracts and bailiff monitoring programme and have made further improvements in numerous areas (see Section 6.2).

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 congestion charge. A persistent Penalty Charge Notice evader is defined as a vehicle that has three or more outstanding Penalty Charge Notices with no pending representation or appeal. The on-street enforcement service is also effective in the enforcement against vehicles that are not registered with the Driver Vehicle and Licensing Agency.

TfL's ability to effectively identify and enforce against persistent evaders improved in 2006 through the introduction of the 'Locust' van. The total number of vehicles clamped and removed during 2006 was 1,844.

6.15 Scheme costs and revenues

Since the *Fourth Annual Impacts Monitoring Report* there have been two significant developments that have affected the income and operational costs of the scheme:

- In June 2006, following feedback from chargepayers, the facility to pay the charge on the following day was added to the scheme. An additional charge of £2, making a total of £10, is now payable in these circumstances. This has given rise to some increased charge income and a reduction in Penalty Charge Notices issued.
- The second and in the longer-term more significant change has been the introduction of the Western Extension from 19 February 2007, with the associated change in scheme operational hours.

The combined effect of these changes, coupled with background trends, had little impact on net scheme revenues in 2006/2007. The extended scheme operates as a single enlarged zone, and it not possible to attribute income specifically to either the original central zone or the western extension. The figures below relate to the financial year 2006/2007 and therefore include an element of contribution from the western extension, both in terms of discounted residents' payments from October 2006 and charges from 19 February 2007. In a full financial year, the indications are that additional net revenues, after allowing for costs and when compared with the original central London scheme, will be up to £40m a year.

The costs and revenues associated with the scheme are provisionally estimated for 2006/2007 below. A provisional summary is also provided for the application of the net revenues from the scheme in 2006/2007 and their allocation to transport programmes in support of the Mayor's Transport Strategy, as required by law.

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. Operating costs also include the relevant staff and other costs of TfL in supervising, administering and monitoring the scheme. In 2006/2007 these exclude the additional costs required for the introduction of the western extension as these are provided centrally and not from the scheme income.

Table 6.2 provides provisional out-turn figures for financial year 2006/2007, comparing scheme revenues with scheme operation costs.

Table 6.2 Scheme revenues and costs, financial year 2006/2007. (£million provisional)

Revenues	
Standard daily vehicle charges (£8)	125
Fleet vehicle daily charges (£7)	27
Resident vehicles (£4 per week)	6
Enforcement income	55
Total revenues	213
Total operation and administration costs	-90
Net revenues	123

Allocation of net revenues

By law the net revenues from the scheme must be spent on measures to further the Mayor's Transport Strategy. This is 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 operation of the scheme. However, TfL have been advised by Government that a longer period of hypothecation would apply following the introduction of the western extension in February 2007. The hypothecation period will therefore extend to 2017.

Table 6.3 provides a provisional summary of the areas of expenditure of the net revenues in financial year 2006/2007.

Table 6.3 Application of congestion charging scheme revenues, financial year 2006/2007. (£million provisional)

Bus network operations: Contributions to major enhancements of London's bus garages, stations, stops and shelters; to bus priority and real-time customer information systems; and to bus operations and support activities.	101
Roads and bridges: Contributions to investing in programmes to improve the quality of street conditions, including reconstructing and resurfacing carriageways and footways and upgrading and strengthening structures.	14
Road safety: Contributions to measures to reduce road casualties, both on Tfl roads and borough roads.	5
Walking and cycling: Contributions to a programme of improvements for pedestrians, both on TfL roads and on borough roads; includes contributions to borough local transport improvements.	3
Total	123