Transport for London

# Travel in London

## Report 5


MAYOR OF LONDON

Transport for London

# Overview

## Travel in London report 5

Travel in London summarises trends and developments relating to travel and transport in Greater London. Its principal function is to provide an interpretative overview of progress towards implementing the transport and other related strategies of the Mayor of London, together with an evidence and analysis base for the general use of stakeholders whose responsibilities cover many different aspects of transport and travel in London. This fifth Travel in London report draws on the latest available data, generally reflecting the 2011 calendar year, or the 2011/12 financial year, and sets these in the longer-term context of the evolution of transport and associated trends in London.

This report also contains an extended 'spotlight' chapter focusing on the travel demand and operational performance aspects of the London 2012 Olympic and Paralympic Games.

## Progress since year 2000 for travel and transport in London

The year 2011 through to 2012 saw continued progress with the implementation of the Mayor's Transport Strategy. Many aspects of transport and travel in London have improved over the last decade and these improvements continued in the latest year. Headline developments since 2000 include:

- Development of the public transport system in order to support population and economic growth. 34 per cent more bus kilometres and 13 per cent more Underground kilometres were operated in 2011/12 compared to 2000/01.
- Alongside this growth in public transport there has been a reduction in the volume of road traffic in London. Ten per cent fewer vehicle kilometres were driven in 2011 than in 2000, partly reflecting increased public transport provision, and partly reflecting reductions in the capacity of the road network and congestion charging in Central London.
- These two trends have taken place in the context of a substantial growth in demand for travel, with a 13 per cent increase in population and a 7 per cent increase in jobs since 2000. London's population is now at its highest levels since the late 1930s.
- Thirteen per cent more trips were made on an average day in 2011 compared to 2000, with 18 per cent more journey stages. The main factors explaining the difference against the previous population estimates are likely to be an underestimate of the 2001 base population that would have carried through into subsequent mid-year estimates, and an underestimation of international in-migrants for London as a whole.
- London has achieved an unprecedented shift in mode shares for travel away from the private car towards public transport, walking and cycling. There was a 9 percentage point net shift in journey stage based mode share between 2000 and 2011 towards public transport, walking and cycling. In 2011, 43 per cent of journey stages in London were made by public transport, compared with 34 per cent by private transport. Had the mode shares not changed in this way, and all other things remained equal, there would have been more than 1.5 million additional car driver trips a day in 2011 than there actually were.

- There have been sustained improvements to the quality and reliability of public transport services. Service reliability indicators in 2011/12 for bus, Underground, Docklands Light Railway (DLR), Tramlink and National Rail in London all show improvements on 2000, and were either at – or close to – all-time highs, as they had been for most of the preceding six years. In 2011/12, 97 per cent of scheduled Underground train kilometres, 98 per cent of scheduled bus kilometres, 98 per cent of DLR kilometres and 99 per cent of Tramlink kilometres were operated.

Alongside these overall strategic travel and transport trends there have been a range of other notable achievements over the decade. These included:

- Large-scale additions to London's transport infrastructure, including several extensions to the DLR, and the development of the London Overground rail network. This has rapidly established itself as a high-quality metro-style rail network offering new orbital connections for many of London's more deprived communities. Also a range of benefits have emerged from the Tube Upgrade programme.
- Substantial improvements to the safety of London's travel environment, with 58 per cent fewer people being killed or seriously injured on London's roads in 2011 compared to the average between 1994 and 1998.
- Public transport travel in London has also got safer. Reported crimes on or near the bus network reduced by 57 per cent since comparable records began in 2005/06, while those on the Underground and DLR have reduced by 48 per cent over the same period.
- Good progress has been made with reducing transport emissions of local air quality pollutants and greenhouse gases. These are (nitrogen oxides ($NO_x$), particulate matter ($PM_{10}$) and carbon dioxide – $CO_2$). However, levels of all three pollutants continue to pose a significant challenge in absolute terms.
- The Mayor's 'cycling revolution' for London has continued to take shape. The successful Barclays Cycle Hire scheme in central London has grown over the last year to include over 9,000 bicycles, increasing from 6,000 in July 2010 when the scheme launched. Barclays Cycle Superhighways are also continuing to develop, and London is broadly on target to achieve the Mayor's aim of a 400 per cent increase in cycling by 2026.

## Overall trends in travel demand and the factors affecting it

- In mid-2012 new direct estimates of London's population became available as initial figures from the 2011 Census of population were released. These new numbers showed London's population to be 8.2 million, which is significantly higher than previously understood. This new estimate is up 12 per cent from the previous Census estimate in 2001 and is approaching the previous peak of 8.6 million in the late 1930s. If London residents trip rates do not change then levels of future travel demand will be higher than previously estimated in the MTS.
- The UK economy emerged from recession in Quarter 1 2010, following six consecutive quarterly falls in Gross Value Added (GVA) – a basic measure of economic output. Economic growth remained uncertain and the UK returned to recession in Quarter 1 2012. UK output remained just under 4 per cent below pre-recessionary levels at Quarter 4 2011, and continuing uncertainty remains a

major factor acting against economic growth. Although employment in London fell by 4.5 per cent it has since recovered to above pre-recessionary levels, with 5.03 million jobs in Quarter 2 2012, although in the context of a higher resident population.

- 25.5 million trips were made to, from or within London on an average day in 2011 – an increase of 1 per cent over the previous year. The recent increase, although largely reflecting population growth rather than a more fundamental change in travel behaviour, is comparable to the historic 1.1 per cent average annual growth rate in this measure before 2007. There was also a 1.9 per cent increase in journey stages – up to 29.9 million on an average day.
- The established pattern of a change in mode share away from private transport towards public transport, walking and cycling has continued over the last decade. In 2011, public transport had a mode share of 43 per cent, compared to 42 per cent in 2010 and 34 per cent in 2000.

## Travel demand trends by mode of transport

- Public transport patronage grew strongly in 2011/12. There was a 4.8 per cent increase in the annual number of journey stages and a 4.8 per cent increase in passenger kilometres on public transport between 2010/11 and 2011/12.
- Patronage on the Underground grew particularly strongly, with 7.3 per cent more passenger kilometres travelled and 5.7 per cent more journey stages compared with 2010/11.
- Bus passenger kilometres increased by 1.7 per cent, with a corresponding increase of 2.4 per cent in bus journey stages.
- There were 9.8 per cent more journey stages on the DLR (10.0 per cent more passenger kilometres) in 2011/12, partly reflective of continuing growth of the network, including the latest extension to Stratford International and introduction of three-car trains.
- London Overground passenger kilometres increased by 6.4 per cent between 2010/11 and 2011/12. Passenger kilometres travelled on National Rail in London and the South East increased by 5.7 per cent, and journey stages increased by 8.3 per cent.
- Road traffic in London continued to fall, with 2.0 per cent fewer motor vehicle kilometres in 2011 compared with 2010. This follows a 1.2 per cent fall the previous year.
- Cycling levels continued to increase. There was a 9 per cent increase in cycle flows on the TLRN major road network. This follows increases of 5 per cent and 15 per cent in 2009/10 and 2010/11 respectively.

## Performance of the transport networks

Public transport in London has, over recent years, benefited from the longest run of sustained high operational performance and service provision ever recorded. All key indicators of service provision have shown a marked trend of improvement over the last decade, and this improved still further in the latest year.

- A total of 72 million train kilometres were operated on the Underground in 2011/12, up from 69 million in 2010/11 and above the previous high of 71 million in 2008/09. Levels of service reliability reached new highs in 2011/12 and excess waiting times were 5.8 minutes, down from 6.5 minutes in 2010/11.

- A record high of 490 million kilometres were operated on the bus network in 2011/12, up 1 per cent from 486 million in 2010/11. Levels of service provision reached new levels in 2011/12 and excess waiting times match the 'best ever' minimum of 1.0 minute first achieved in 2010/11.
- Reliability continued to increase on the DLR, with the percentage of scheduled services operated increasing from 97.5 per cent in 2010/11 to 97.7 per cent in 2011/12. Further capacity has been created on the DLR with the introduction of three-car trains throughout the network.
- Tramlink returned a reliability value of 98.9 per cent of scheduled services operated - slightly down from the previous two years.
- The overall performance of National Rail services in London improved in 2011/12, with the public performance measure for all but two train operating companies (TOCs) improving.
- London Overground achieved a public performance measure of 97 per cent, increasing to its highest ever level.
- Journey time reliability on London's road network has remained fairly constant, averaging between 89 and 90 per cent for the past three years, although it is not yet possible to discern a clear directional trend for this indicator. Average vehicle delay in the central London morning peak increased slightly in 2011, up from 1.3 minutes per kilometre in both 2009 and 2010 to 1.4 minutes per kilometre.

## Safety and security on the transport system

Recent years have seen strong improvements to the principal indicators of safety and security on London's transport networks. These positive trends continued in 2011, with further substantial reductions to the most serious categories of casualty arising from collisions on the roads, alongside continued reductions to levels of reported crime and customer injury on the public transport networks.

- Following successive year-on-year falls over the last decade, the number of people killed or seriously injured (KSI) on London's roads during 2011 was the lowest since records began in the mid 1980s. In 2011, all KSI casualties were 23 per cent below the 2005-09 average – the new baseline to be used for assessing progress. There was a 30 per cent decrease in child KSIs, and a 19 per cent decrease in pedestrian KSIs.
- Despite this good progress overall the increasing number of cyclist casualties is an adverse trend. Sixteen cyclists tragically lost their lives in 2011, and 555 cyclists were seriously injured – an increase over 2010. While, this partly reflects the strong growth of cycling in London, it is an area of concern for the Mayor and TfL. Work is underway to tackle cycle safety issues as a matter of priority.
- On the Underground in 2011 there were three fatalities and 129 other injuries - a similar level to recent years. On the bus network, there were 85 serious injuries and one fatality, which continue a trend of a reducing risk rate despite an increase in bus passenger kilometres.
- Crime also fell on the bus, Tramlink, London Overground and Underground and DLR networks, as has been the case for the last six years. There were 9.3 reported crimes per million customer journeys on the bus and coach network in 2011/12, representing an 11.4 per cent reduction on 2010/11.

## Transport, air quality and greenhouse gas emissions

- London's air quality has improved in recent years, although emissions of two local air quality pollutants continue to pose a challenge. On an equivalent basis emissions of particulate matter ($PM_{10}$) from ground-based transport in London (vehicle exhaust sources only) fell by 12.4 per cent between 2008 and 2010, with London now generally meeting air quality limit values for this pollutant. Emissions of oxides of nitrogen ($NO_x$) from ground-based transport fell by 16.4 per cent, although further significant reductions are necessary to enable London to comply with limit values for this pollutant. Emissions of carbon dioxide ($CO_2$) from ground-based transport fell by 4.2 per cent between 2008 and 2010.

## The journey experience

- Improving the quality of Londoners' overall travel experience is a priority for the Mayor. There has been a small but consistent increase in customer satisfaction each year between 2009 and 2012. In 2012, the mean score for satisfaction with overall journey experience was 67 out of 100 compared to 64 in 2009 – regarded as 'fair' according to TfL's assessment criteria.
- Trends in perception-based Mayor's Transport Strategy (MTS) Strategic Outcome Indicators have remained fairly constant in recent years. Public transport customer satisfaction for 2011/12 scored 80, a level regarded as 'good' under TfL norms and the same level as the previous year. Road User satisfaction increased from 72 out of 100 in 2010/11 to 75 in 2011/12, which is considered 'fairly good' based on TfL's assessment criteria.
- The perception of journey experience increased from 66 out of 100 in 2010/11 to 67 out of 100 in 2011/12, which is considered 'fair', while perception of the urban realm dropped slightly from 66 out of 100 to 65 out of 100, also considered 'fair'.

## Summary of progress towards MTS Strategic Transport Goals

The overall assessment is that good progress has been made with the implementation of the Mayor's Transport Strategy, and that this has continued over the most recent year. Trends in key indicators reflect a fast growing city, with commensurate increases in travel demand. London's public transport networks have also grown, and in recent years have offered more services, and operated with higher levels of reliability, than ever before. Londoners have responded by using public transport in ever-increasing numbers, with the change in mode share away from private to public transport continuing for the 17th successive year. Indicators of safety and security, customer experience and satisfaction and transport emissions to the atmosphere are all heading in the right direction, even if there remain specific points of concern yet to be fully addressed. In the most recent year the 2012 London Olympic and Paralympic Games were successfully delivered, with transport making a fundamental and highly-regarded contribution.

Looking across the information in this report, three developments in particular warrant enhanced attention going forward. The first of these is the realisation, following publication of the 2011 Census of Population, that there are more people living in London than previously recognised. More people means greater demand on the transport networks and, in the context of these new figures, it is likely that the population projections, and hence transport demand projections to 2031 in the

MTS, will be reached long before that. The second area of concern is the increase in cyclist casualties on the roads, reflecting increased cycling levels. A range of initiatives to tackle this are already in progress and the results of these will need to be closely monitored. Finally, although much progress has been made with reducing the emissions of key atmospheric and greenhouse gas pollutants from transport, the reductions achieved so far fall short of those required if targets are to be met. This particularly applies to nitrogen oxides, where concentrations of nitrogen dioxide ($NO_2$) in London's air continue to exceed limit values, and carbon dioxide ($CO_2$) where the rate of progress towards greenhouse gas reduction targets in respect of transport remain less than that required.

## Spotlight on the London 2012 Olympic and Paralympic Games

The remainder of this Overview draws out key highlights from the review of Games time travel demand and transport network operational performance.

The London 2012 Olympic and Paralympic Games were major successes – both as sporting events and in the way the transport networks operated to support them. TfL and its transport delivery partners rose to the challenges presented by the Games, and London's travellers co-operated to ease the pressure on critical parts of the transport networks to help accommodate the extraordinary demands of the Games.

TfL, London 2012 and all transport delivery partners always had the twin objectives of delivering a great Games and keeping London moving and open for business. All of the available indicators show that these aims were comprehensively achieved.

## Preparing London's transport networks for the challenge of the Games

Hosting the Olympic and Paralympic Games is the largest peace-time logistical exercise that a city can undertake. The travel of over 6.2 million Olympic spectators over 17 days, and 2.7 million Paralympic spectators over 11 days, together with the Games workforce and the Games Family, had to be provided for - alongside the trips made for all other purposes in London.

This meant providing an enhanced level of service on routes to and from Games venues, but also taking steps to manage demand arising from regular travellers, at particular places and at particular times, so that the exceptional numbers making their way to and from events could be accommodated.

Transport arrangements for the Games were based on the expectation that 100 per cent of Games spectators in London would use public transport to reach competition venues – the 'Public Transport Games'. To help achieve this aim, £6.5 billion was invested in new transport infrastructure in the run up to the Games – all delivered within budget and well before the Games began. Ticketed spectators were also issued with a special Games Travelcard – which offered free public transport on the day of their event.

TfL and partners undertook detailed planning to ensure that the right level of service was provided at Games time. Tube, DLR and London Overground operated around one hour later each evening, and on many rail lines a more frequent service was provided during normal service hours. Additional steps were taken to ensure the reliability of the public transport networks, including enhanced preventative maintenance, the suspension of planned engineering works, and the deployment of rapid response teams to deal quickly with any incidents.

On the roads, TfL designed, implemented and operated the Olympic and Paralympic Route Networks, to expedite Games Family traffic and meet London's contractual commitments to the International Olympic Committee (IOC) in respect of journey times. This followed extensive preparation and investment, including improved traffic signalling, computer modelling and measures to strictly limit road works during Games time.

## The principal transport challenge of the Games

TfL recognised that enhanced services and operational performance would be insufficient on their own to deliver a successful Games. A significant change in travel behaviour by businesses and regular travellers, to encourage avoidance of the busiest times and places on the transport networks, was also needed. To deliver this behavioural change a major programme of Travel Demand Management (TDM) was put in place. TfL engaged with businesses, regular travellers and spectators to advise them of the busiest times and places on the roads and public transport networks and the options available for changing their travel behaviour. This was supported by the high profile 'Get Ahead of the Games' media campaign, involving widespread publicity across the networks and engagement through many different channels, such as the internet. Importantly, the scale and content of this advice was varied as the Games progressed, reflecting actual conditions on the networks, and optimising the successful balance that was, in the event, achieved.

## Games travel – setting new records

During the Games the public transport networks carried record numbers of people. On the roads, while traffic was reduced in central and Inner London around the crucial Olympic and Paralympic Route Networks (the ORN and PRN), traffic in Outer London was comparable to that normally expected. Cycling was at record levels, and more pedestrians took to the streets.

- During the Olympics, more than 62 million journeys were made on London Underground – up 35 per cent on normal summer levels. Tuesday 7 August was the busiest day in the history of the Underground – with 4.7 million passengers carried. The Paralympics saw 39 million Tube journeys, up 18 per cent on the same period in 2011.
- The DLR carried up to twice as many passengers as normal – almost 6.9 million journeys being made over the Olympic Games and 4 million journeys during the Paralympic Games. More than 500,000 DLR journeys on a single day were made for the first time on Friday 3 August.
- London Overground saw around 6.4 million journeys during the Olympic Games – up 26 per cent on expected summer levels. During the Paralympics 4.1 million London Overground journeys were made, up by 17 per cent.
- London Buses carried around 6.5 million passengers each weekday during the Olympics, and about 7.5 million during the Paralympics, while London River Services saw 44 per cent more passengers than normal.
- On the roads, traffic levels in central London and other areas directly affected by the ORN and PRN were down, by up to 10 per cent in central London against normal levels for the time of year and by up to 15 per cent against 'typical' (non summer holiday) levels.
- Traffic in Outer London, which accounts for over two-thirds of London's traffic, was actually up slightly against normal summer levels – a pattern that suggests

highly effective 'targeting' of travel behaviour change by motorists and businesses in London.

- Barclays Cycle Hire had 642,000 hires during the Olympic Games, and 442,000 hires during the Paralympics, 43 and 30 per cent up respectively on levels that would otherwise be expected. The number of cyclists on major roads was between 22 and 23 per cent higher than would otherwise be expected for both the Olympics and Paralympics. In central London, increases of 7 per cent (Olympics) and 17 per cent (Paralympics) in pedestrian numbers were recorded.

## A 'Gold medal' for transport operational performance

In addition to running more services for longer each day and with record numbers of passengers, public transport operated reliably during the Games, continuing and in some respects surpassing the trend of improving performance in recent years.

- London fulfilled its promise as a host city to get athletes to where they needed to be, on time and in safety during the Games. A 95.6 per cent level of journey time reliability for Games Family journeys was achieved for the Olympics and 97.8 per cent for the Paralympics - against a target of 95 per cent.
- The rest of the road network also kept moving. The key measure of road journey time reliability was 91.1 per cent (Olympics) and 89.5 per cent (Paralympics) – very similar to those usually achieved in London.
- London Underground operated 11 per cent more train kilometres during the Olympics, and 10 per cent more during the Paralympics. It ran 98 per cent of scheduled kilometres during the Olympic Games, and 99 per cent during the Paralympics – higher than the more typical (but still excellent) performance of 97 per cent, despite the increased demands on the network.
- During both the Olympic and Paralympic Games, reliability on the DLR was 99 per cent, and on London Overground it was 98 per cent – both networks served the Olympic Park, with the Underground and National Rail.
- During the Olympics 98 per cent of scheduled bus services operated (97.8 per cent during the Paralympics), while measures of service reliability during the Olympics bettered those more routinely achieved – despite the temporary diversions applied to many routes to support the ORN and PRN.

## How travellers successfully adapted their travel behaviour to support a successful Games and keep the rest of London moving

Despite the scale of the Games, TfL forecast that around 65 per cent of the public transport networks, and about 70 per cent of road traffic, would be substantially unaffected. TfL's travel advice was therefore targeted – emphasising avoidance of the busiest times and places on the networks while anticipating and providing for the bulk of non-Games travel in London to continue unaffected.

Travellers in London were encouraged, through the 'Get Ahead of the Games' campaign, to adapt their travel so as to reduce pressure on travel hot-spots by **reducing** the amount they travelled, by **re-timing** journeys so as to avoid the busiest times on the networks, by **re-moding** to other less-busy modes of transport and by **re-routing**, to avoid the busiest locations (known as the **'four Rs'**).

The evidence suggests that this travel demand management campaign was a major and unprecedented success. London's travellers and businesses adapted their travel to an almost optimal degree. Reports of severe overcrowding were few and

far between, identified potential travel 'hot-spots' were largely trouble-free, and non-Games travel – on the roads and public transport – largely continued as would be expected for the school summer holidays. In this way, the Games was successfully accommodated and the rest of London was kept moving and open for business.

TfL estimates that 31.6 million journey-stages were made across the transport networks on an average day during the Olympics. This is 5.5 per cent higher than would otherwise be 'expected' at the time of year. During the Paralympics, 31.4 million journey-stages were made on an average day. This is 3.9 per cent higher than would otherwise be 'expected' at the time of year. These are relatively small numbers when set against normal travel demand (29.9 million stages a day in 2011), but do reflect the normal seasonal reductions associated with the school summer holidays.

By making estimates of travel that were directly related to the Games (spectators, workers and Games Family), it is possible to estimate the extent to which 'background' (that is, non-Games) travel reduced (one of the 'four Rs') during the Games. It is estimated that this background travel reduced by about 5 per cent (1.5 million fewer journey-stages) during the Olympics, and by about 3 per cent (around 1 million fewer journey-stages) during the Paralympics. These numbers are compatible with survey-based evidence, and suggest a relatively small degree of adaptation by a large number of people – an outcome that is entirely consistent with small, sensible adaptations making all the difference, rather than significant disruption or hardship to individuals.

There is also clear evidence that people's travel adaptations were highly and effectively targeted by location. Aggregate demand at 'hot spot' locations on the public transport networks, such as central London Tube interchanges, was usually at manageable levels – reflecting a satisfactory balance between less 'background' travel and Games-related travel. Most Games venue stations coped with extraordinary levels of demand, in some cases (eg on the DLR) increasing by 20-fold above normal levels. The aggregate pattern of demand on the road network also suggests highly specific targeting by motorists and businesses.

Re-timing of journeys was also much in evidence – again relatively small adaptations by many individuals and businesses making all the difference and freeing vital capacity at key times. For example, during the Olympics in central London, there was 13 per cent more road traffic in the overnight period than normal, 13 per cent less in the morning peak, 12 per cent less during the daytime inter-peak and 11 per cent less in the afternoon peak. This was seen to greatest effect for freight and servicing vehicles.

It is estimated that between 95 and 100 per cent of Games related trips used public transport – fulfilling the 'Public Transport Games' pledge. Indeed, there were high-profile reports of athletes abandoning their Games Family vehicles and using London's efficient public transport to get to and from Games venues. The extent to which this happened was both unprecedented and highly commended by the International Olympic Committee.

## Key elements that made the Games a transport success

A combination of several factors made the Games a transport success. Among the most significant were:

- **An integrated transport system** - TfL's unique breadth of responsibilities, unique for a host city, plus measures such as the London spectator Travelcard, multi-agency co-ordinated operations and customer communications all helped to greatly improve traveller experience.
- **Outstanding levels of operational performance** - transport reliability during the Games was strong, at 98 per cent or over on the Tube, DLR and London Overground, continuing the improving performance of recent periods, and reflecting enhanced maintenance and other measures for Games time,
- **Exceptional customer experience** - with extra staff and volunteers, eye-catching magenta signage, and integrated real time customer information, transport operators provided an exceptional customer experience for spectators, Games Family and regular travellers over the summer.
- **Effective management of the road network** - TfL balanced the needs of Games Family and regular road users effectively, through active traffic management, the design of robust Olympic and Paralympic Route Networks, and by opening Games Lanes (for Games Family vehicles only) to normal traffic when they were not needed.
- **Successful communication strategy and Travel Demand Management** - with an integrated communications and travel demand management strategy, travellers were informed in real time about the best ways to use the transport system, and by following advice to avoid the busiest times and places, kept the transport system moving despite record passenger numbers.
- **Effective freight planning and operations** - following a comprehensive engagement programme, advice and support from the Traffic Commissioners and the development of tools such as the Freight Journey Planner, freight operators and businesses adapted during the Games, keeping London stocked and serviced and demonstrating innovative practices such as quieter out-of-hours deliveries.
- **More walking and cycling across London** - efforts to encourage people to walk and cycle during the Games were successful. Pedestrian counts across London showed walking was up by seven per cent during the Olympic Games and by 18 per cent during the Paralympic Games, while counts of cyclists crossing the Thames were up by 20 per during the Olympic Games and Barclays Cycle Hire saw record usage.
- **A more accessible transport system** - efforts were made to make the transport network as accessible as possible, including major alterations at Green Park and Southfields stations. New lifts were installed, accessible shuttle services were provided, manual boarding ramps were used and new audio/ visual displays were provided. This was in addition to an already fully accessible DLR, bus network and taxis.

## Key elements of the Games Transport Legacy

As London looks back on a very successful Games, attention now turns to securing their Legacy. The principal transport aspects of this legacy will be:

- Improved transport capacity and reliability – Games related new infrastructure providing transport services in East London for many years to come.
- Better public transport and road network operations – including continuing use of 'rapid response' arrangements on the Tube.
- A more accessible transport system – with both specific and general improvements either put in place for, or piloted during, the Games.
- Better partnership working among transport providers – using Games-time arrangements such as the Transport Co-ordination Centre for future major events and incidents.
- Harnessing the opportunities and lessons learned from Games time travel demand management initiatives – encouraging better journey planning to avoid travel hot-spots and more effectively use the full capacity provided by the transport networks.
- Building on the success of the Travel Ambassador and Incident Customer Service Assistant volunteering programmes during the Games - a volunteering strategy is currently being developed by TfL.
- Continued engagement with freight operators and businesses, including maintaining the Freight Forum, to build on innovative and flexible freight practices employed during the Games. Twice as many freight operators as usual undertook out of hours deliveries during the Games, and a quarter of those who introduced or increased out of hours deliveries intend to continue this in the future.
- A comprehensive review of signage on the TfL network in light of the success of the integrated magenta signage scheme used during the Games. The review is considering the end-to-end customer experience of signage in key interchange locations, the quality of accessibility signage across the network, and the possibility for temporary or permanent Games-style signs to improve way-finding.

Travel in London and related reports will continue to explore lessons from the London 2012 transport experience, and TfL will continue to develop and embed beneficial transport policy and operational initiatives based on these for the future.

# 1. Introduction

## 1.1 The Travel in London 5 report

Travel in London is TfL's annual publication that examines and summarises trends and developments relating to travel and transport in London. It provides an authoritative source of key transport statistics as well as topical evidence-based analysis, and tracks trends and progress in relation to the Transport and other strategies of the Mayor of London. It provides an interpretative overview and commentary that looks across the immediate impacts of TfL and its delivery partners, as well as external influences and trends, in shaping the contribution of transport to the daily lives of Londoners and the economic vitality of the Capital.

## 1.2 Monitoring the implementation of the Mayor's Transport Strategy

Travel in London reports aim to provide a comprehensive and objective evidence base for the formulation of transport policy. The Mayor of London published his Transport Strategy (MTS) in May 2010. Alongside his draft London Plan, Economic Development Strategy and Air Quality Strategy also published during 2010, these strategies map out the transport policy framework for London over the next few years. The MTS is built around six transport goals:

- Supporting economic development and population growth.
- Enhancing the quality of life for all Londoners.
- Improving the safety and security of all Londoners.
- Improving transport opportunities for all Londoners.
- Reducing the contribution of transport to climate change and improving its resilience to the impacts of climate change.
- Supporting the delivery of the London 2012 Olympic and Paralympic Games and their Legacy.

At the top level, the long-term outcomes sought by the MTS are monitored through a set of 23 quantitative 'Strategic Outcome Indicators', plus a specific 24th indicator relating to the 2012 London Olympic and Paralympic Games. These indicators are 'outcome-based', reflecting changes in conditions experienced by Londoners. They provide a manageable means of assessing the overall direction and pace of change in relation to MTS goals. Updated indicators can be found in chapter 9 of this report.

However, these indicators do not cover all aspects of transport that will be of interest and do not, of themselves, facilitate the more detailed understanding of topical transport issues. It is therefore necessary to take a broader and deeper view of transport trends and the factors affecting them. Collectively they lead to relevant policy insights and an 'evidence base' to support the formulation of future transport policies. Providing these insights and evidence base is the core role for Travel in London reports.

## 1.3 Developments for this Travel in London report 5

This fifth Travel in London report features a number of structural changes from previous editions. These reflect user feedback and have the effect of grouping information into clearer 'topic areas', as well as improving the accessibility and 'signposting' of key data and analysis. They include dividing the report into three sub-sections, allowing a more natural grouping of material more closely along topic lines. The three sub-sections focus on:

- **Travel demand and transport network performance.** This section assembles and summarises trends and developments in travel demand and transport network operational performance by mode of transport, including the underlying factors which influence these, such as population and economic growth. This sub-section focuses on the first of the Mayor's six transport priorities and also provides essential contextual information.
- **Progress with MTS transport goals – developments and case studies.** This section is framed around assessing progress towards MTS transport goals relating to quality of life, transport opportunities, improved safety and security and climate change. However, it also considers other topics closely related to MTS or other Mayoral strategies, such as local air quality and aspects of customer satisfaction with the transport system. It is intended that the emphasis and coverage given to specific topics in this section will vary from year to year, reflecting contemporary issues and interests.
- **Spotlight chapters** continue the established role of providing an extended analytical focus on specific topical transport-related themes from year to year. As explained more fully below, the spotlight section of this report is devoted entirely to an analysis of the transport demand and operational performance outcomes for the 2012 London Olympic and Paralympic Games. In this way it addresses part of the sixth MTS goal - supporting the delivery of the London 2012 Olympic and Paralympic Games and their legacy.

Changes have also been made to the arrangement of data and indicators throughout this report. The 23 MTS Strategic Outcome Indicators have been consolidated into one chapter, with summary commentary on the trends in these indicators and their implications for the assessment of performance against delivering MTS goals. Other numeric indicators of transport demand, operational performance and related aspects have also been consolidated into summary tables within the relevant chapter, grouping together into 'ready reference' sections the numbers that are considered and interpreted elsewhere within the report.

## 1.4 Summary of contents

This fifth Travel in London report is organised into the following chapters:

For travel demand and transport network performance:

- **Chapter 2** looks at trends for overall travel demand and mode shares in London. This includes aggregate volumes of travel and their relationship to demographic and economic factors.
- **Chapter 3** looks in more detail at these trends as they have affected the individual transport modes in London.
- **Chapter 4** considers the operational performance of the public transport and road networks in London.

Moving to other MTS goals:

- **Chapter 5** looks at aspects of safety and security, covering the important areas of road safety and safety and crime on the public transport networks.
- **Chapter 6** looks at aspects of transport and the environment, this year providing new estimates of emissions of local air quality pollutants and carbon dioxide from the updated London atmospheric emissions inventories.
- **Chapter 7** deals with aspects of physical accessibility to the transport system, with a particular focus this year on the transport accessibility arrangements for the London 2012 Olympic and Paralympic Games.
- **Chapter 8** picks up the theme of how customers perceive the journey experience, focusing for this year on what drives customer perception and their choice of transport mode.
- **Chapter 9** updates the MTS strategic outcome indicators for 2011 or the 2011/12 financial year, and summarises what they tell us about progress towards MTS transport goals and emerging policy priorities.
- **Chapter 10** is the sole spotlight chapter this year, occupying about one-half of this report. It presents a full and definitive analytical overview of the transport outcomes for the 2012 London Olympic and Paralympic Games, focusing on patterns of travel demand and the operational performance of the transport networks during summer 2012.

## 1.5 The Travel in London internet resource

An important part of the long-term development of Travel in London reports is extending the scope of coverage in a virtual way through a companion internet resource. TfL will publish a range of supporting material on the Internet over the coming year to complement this annual report. This includes summary update reports on two continuing annual monitoring surveys – the Central London Area Peak Count (CAPC) and the related Isle of Dogs cordon survey. Also to be published are several specific technical reports and updates to the Local Implementation Plan (LIPs) indicators.

## 1.6 Further information

For specific technical queries on the contents of this report, readers should contact **TILenquiries@tfl.gov.uk**.

# Travel demand and the performance of the transport networks

# 2. Travel in London

## 2.1 Introduction and content

This chapter looks at overall travel demand trends in Greater London, in terms of the overall number of trips made and the mode shares for the different forms of transport. Sections 2.5 to 2.7 provide consolidated estimates and trends for all people travelling in Greater London, including both residents and visitors, covering all of the main transport modes. Section 2.8 looks specifically at travel trends for London residents, drawing on TfL's annual London Travel Demand Survey (LTDS). Sections 2.9 and 2.10 look more widely at trends in factors that constitute the underlying drivers of travel demand change – London's population and economy, focusing in particular this year on emerging new data on London's population from the 2011 Census.

Overall travel demand trends and mode shares provide the basic backdrop against which to assess the outcomes of existing transport policies, and to frame new ones in the context of changing demand patterns. Information provided by the LTDS survey on the travel behaviour of London residents provides an essential resource to better understand the nature of transport problems and issues in their wider socio-demographic context and to assess the impacts of potential new policies, while data on London's population and economy provide insights into the main factors driving changing travel demand patterns.

## 2.2 Summary of recent developments in travel demand and mode shares in London – decade to 2010/11

Previous Travel in London reports consolidated historic information on travel trends in London over the last decade or more. Key features of these trends have been:

- Sustained growth in demand for travel, reflecting population and employment growth but also wider social and economic factors, alongside a substantial increase to the supply of public transport in London.
- A sustained shift in mode share away from private car and towards public transport.
- Substantial growth in demand on the principal public transport networks, reflecting population growth and corresponding substantial increases to the supply of public transport, alongside progressively declining volumes of road traffic.

## 2.3 Key concepts for estimating travel demand in London

This section briefly explains basic concepts and definitions underpinning the analysis of travel trends in this chapter.

Travel can be measured in several different ways. The most commonly-used measures are **trips** and **journey stages**.

A **trip** is a one-way movement from one place to another to achieve a specific purpose, for example to go to from home to work. Trips are the units of travel that best correspond to the movements of people. Travel demand may be thought of as being built up from a large number of individual people's intentions and choices – to move from one place to another as they seek to satisfy various needs. Each trip has an origin, a destination, and a single main purpose – which is the reason for

making the trip. A trip also has a single 'main mode', conventionally defined as the mode on which the longest distance is travelled for a multi-mode trip.

**Journey stages** are sub-divisions of an individual trip reflecting the successive use of different transport modes during the course of the trip. For example, a trip from home to work may involve a walk from home to a station, a train trip into town, perhaps followed by a short bus journey to the final destination (three journey stages in total). A journey stage is therefore a component of a trip that uses a single mode of transport from either the trip origin or intermediate interchange to either another interchange or the trip destination. Journey stages divide up travel into components that correspond to the way services are provided by transport operators. They therefore provide a natural way of describing the contribution of each mode of transport to total travel and thereby enable the measurement of mode shares for each of the different forms of transport.

## 2.4 Changes to the methodology for estimating total travel demand in London

It has become necessary this year to revise the methodology used for estimating annual travel and mode shares in London. There are three reasons for this:

- Firstly, the release of the Census data for 2011 (see Section 2.9) has uplifted the population estimates between 2001 and 2010, which has had the effect of increasing the number of (resident) walk stages in the calculations. For 2010, this increased estimated walks from 5.9 million to 6.1 million on an average day.
- Secondly, the car traffic series has been revised (see Section 3.10), which has affected both the car driver and passenger estimates. In 2010, car stages decreased from 10.2 million to 10.0 million because of this change.
- The final revision has been to the bus series, where a new (since 2007), more accurate estimate of bus stages using Oyster card data have been used. This means the bus series has been revised back to 2007, so in 2010 the estimated number of bus stages increased from 5.8 million to 6.3 million because of this change.

These revisions have resulted in increasing the estimate of journey stages in 2010 from the 28.7 million, published in Travel in London report 4, to 29.3 million. The effect of these revisions on the 2010 mode share has been a 0.8 percentage point increase in the public transport mode share and a 1 percentage point decrease in private transport mode share, compared with previously published data for 2010. Cycling and walking are relatively unchanged.

In Travel in London 4 it was reported that, between 2000 and 2010, public transport mode share increased by 7.5 percentage points, while private transport mode share decreased by 7.3 percentage points. In this publication, we report that between 2001 and 2011, public transport mode share increased by 8.7 percentage points, with private transport decreasing by 8.5 percentage points. The revisions described above account for 0.9 percentage points of the public transport increase, and 0.6 percentage points of the private transport decrease.

These new baselines for 2010 are used in this report. Using the new series, ie on a consistent basis, between 2010 and 2011 public transport mode share increased by 1 percentage point (driven by increases in rail and Underground), while private transport mode shares fell by 0.9 percentage points.

## 2.5 Trips in London

In 2011 25.5 million trips were made on an average day in London – an increase of 1 per cent on the previous year. Over the ten year period since 2001, total trips increased by 11.3 per cent, with particularly notable increases of 41.9 per cent in rail trips, 59.7 per cent in bus trips, and 66.6 per cent in cycle trips. Car driver trips decreased by 13.0 per cent over the same period. This continuing growth in travel demand in London mainly reflects population growth, with 8.2 million people living in London in 2011 – the highest number since the 1960s, an 11.8 per cent increase on 2001 and a 1.2 per cent increase on 2010.

### Total number of trips

Table 2.1 Aggregate travel volumes in Greater London. Estimated daily average number of trips by main mode of travel, 1993 to 2011. Seven day week.

| | Millions of trips | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Rail | Under-ground /DLR | Bus (including tram) | Taxi/ PHV | Car driver | Car passenger | Motor cycle | Cycle | Walk | All modes |
| 1993 | 1.3 | 1.4 | 2.1 | 0.3 | 6.6 | 3.6 | 0.2 | 0.3 | 5.2 | 20.8 |
| 1994 | 1.3 | 1.5 | 2.1 | 0.3 | 6.7 | 3.6 | 0.2 | 0.3 | 5.2 | 21.1 |
| 1995 | 1.3 | 1.6 | 2.2 | 0.3 | 6.6 | 3.6 | 0.2 | 0.3 | 5.2 | 21.2 |
| 1996 | 1.4 | 1.5 | 2.3 | 0.3 | 6.7 | 3.6 | 0.2 | 0.3 | 5.2 | 21.5 |
| 1997 | 1.5 | 1.6 | 2.3 | 0.3 | 6.7 | 3.6 | 0.2 | 0.3 | 5.3 | 21.7 |
| 1998 | 1.5 | 1.7 | 2.3 | 0.3 | 6.7 | 3.6 | 0.2 | 0.3 | 5.3 | 21.9 |
| 1999 | 1.6 | 1.8 | 2.3 | 0.3 | 6.9 | 3.6 | 0.2 | 0.3 | 5.4 | 22.4 |
| 2000 | 1.7 | 2.0 | 2.4 | 0.3 | 6.8 | 3.6 | 0.2 | 0.3 | 5.4 | 22.6 |
| 2001 | 1.7 | 1.9 | 2.6 | 0.3 | 6.8 | 3.6 | 0.2 | 0.3 | 5.5 | 22.9 |
| 2002 | 1.7 | 1.9 | 2.8 | 0.3 | 6.8 | 3.5 | 0.2 | 0.3 | 5.5 | 23.1 |
| 2003 | 1.8 | 1.9 | 3.2 | 0.3 | 6.7 | 3.5 | 0.2 | 0.3 | 5.6 | 23.4 |
| 2004 | 1.8 | 2.0 | 3.3 | 0.3 | 6.6 | 3.4 | 0.2 | 0.3 | 5.7 | 23.6 |
| 2005 | 1.8 | 1.9 | 3.2 | 0.3 | 6.5 | 3.4 | 0.2 | 0.4 | 5.7 | 23.4 |
| 2006 | 1.9 | 2.0 | 3.1 | 0.3 | 6.5 | 3.6 | 0.2 | 0.4 | 5.8 | 23.7 |
| 2007 | 2.1 | 2.1 | 3.3 | 0.4 | 6.5 | 3.8 | 0.2 | 0.4 | 5.8 | 24.5 |
| 2008 | 2.2 | 2.1 | 3.8 | 0.3 | 6.1 | 3.4 | 0.2 | 0.4 | 5.9 | 24.6 |
| 2009 | 2.1 | 2.2 | 3.9 | 0.3 | 6.2 | 3.5 | 0.2 | 0.5 | 6.0 | 24.8 |
| 2010 | 2.3 | 2.1 | 4.0 | 0.3 | 6.1 | 3.7 | 0.2 | 0.5 | 6.1 | 25.3 |
| 2011 | 2.4 | 2.2 | 4.1 | 0.3 | 5.9 | 3.7 | 0.2 | 0.5 | 6.2 | 25.5 |
| *Percentage change* | | | | | | | | | | |
| 2010 to 2011 | *6.3* | *4.9* | *2.5* | *1.1* | *-3.1* | *0.3* | *0.3* | *0.7* | *1.2* | *1.0* |
| 2001 to 2011 | *41.9* | *13.5* | *59.7* | *3.4* | *-13.0* | *3.9* | *-18.3* | *66.6* | *11.8* | *11.3* |

*Source: TfL Group Planning, Strategic Analysis.*
*1. Trips are complete one-way movements from one place to another.*
*2. Trips may include use of several modes of transport and hence be made up of more than one journey stage.*
*3. In tables 2.1 and 2.4 trips are classified by the mode that is typically used for the longest distance within the trip.*
*4. Round trips are counted as two trips, an outward and an inward leg.*
*5. Values for 'Rail' include London Overground.*

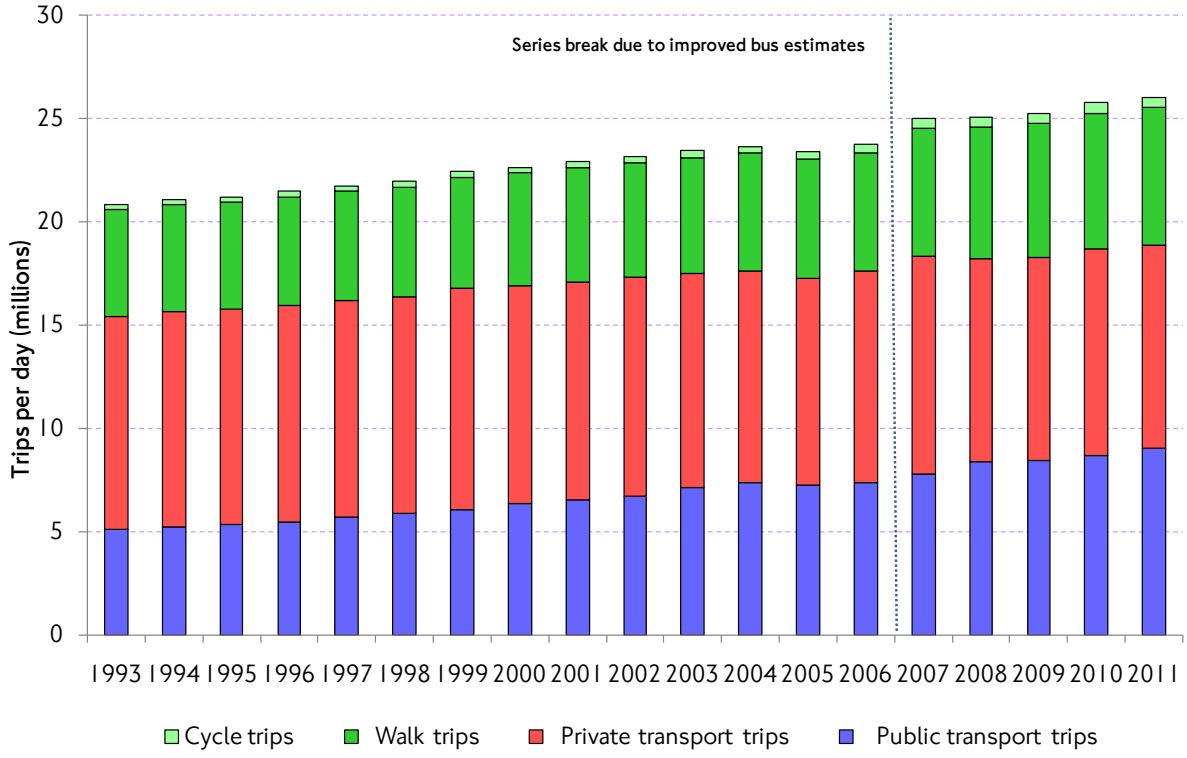
The total number of trips in London in 2011 was 25.5 million per day, an increase of 1 per cent over the previous year. Included in these totals are all trips with origin, destination or both in Greater London by London residents and by non-residents, including commuters and day visitors from outside London as well as overnight

visitors and tourists. The London resident population in 2011 was 8.2 million, 1.2 per cent higher than in 2010, and 11.8 per cent higher than in 2001. The larger 'daytime population' of Greater London, including non-resident visitors, was estimated at 9.2 million in 2011, 1 per cent higher than the previous year.

Over the ten-year period from 2001, total trips have increased by 11.3 per cent, with particularly notable increases of 41.9 per cent in rail trips, 59.7 per cent in bus trips, and a 66.6 per cent increase in cycle trips (as main mode). Car driver trips decreased by 13 per cent over the same period.

Over the most recent year there were again noticeable increases in patronage across all of the public transport modes, particularly rail and Underground (table 2.1 and figure 2.1).

Figure 2.1 Trips in London – trend in total travel demand by principal mode. Estimated daily average number of trips by main mode of travel, 1993 to 2011. Seven day week.




*Source: TfL Group Planning, Strategy Analysis.*

### Trip rates

Trip rates (the average number of trips per person per day) have been noticeably stable over the whole period covered by table 2.1, varying between 2.7 and 2.8 trips per person per day. These rates are calculated for the average daily population, which makes allowance for overnight visitors and commuters from outside London making trips in the Capital. Trip rates over the last five years have been remarkably stable, suggesting that the increase in stages and trips in London is driven by increases in population, both of London residents and visitors to the Capital, rather than individuals making more trips.

Looking specifically at London residents (see section 2.8), average trip rates in 2011/12 were 2.55 per person per day, lower than the average of 2.77 for all travellers in London. This is to be expected, given that the large majority of non-resident day visitors are already (by definition) in the course of making at least one trip on the day in question.

## 2.6 Journey stages in London

Daily journey stages in London in 2011 were 29.9 million, up from 29.3 million in 2010 and 28.8 million in 2009. This is a 1.9 per cent increase in journey stages in the latest year, reflecting both an increase in travel demand, with London continuing to emerge from the 2008-09 recession, as well as the increase in population. In 2011 there were 16.8 per cent more journey stages per day in London than in 2001.

Table 2.2 Aggregate travel volumes in Greater London. Estimated daily average number of journey stages by mode, 1993 to 2011. Seven day week.

Millions of journey stages

| Year | Rail | Under-ground | DLR | Bus (incl tram) | Taxi /PHV | Car driver | Car passenger | Motor cycle | Cycle | Walk | All modes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993 | 1.4 | 2.0 | 0.0 | 3.1 | 0.3 | 6.8 | 3.7 | 0.2 | 0.3 | 5.2 | 23.0 |
| 1994 | 1.4 | 2.1 | 0.0 | 3.1 | 0.3 | 6.8 | 3.8 | 0.2 | 0.3 | 5.2 | 23.2 |
| 1995 | 1.5 | 2.1 | 0.0 | 3.3 | 0.3 | 6.8 | 3.7 | 0.2 | 0.3 | 5.2 | 23.4 |
| 1996 | 1.5 | 2.1 | 0.0 | 3.4 | 0.3 | 6.9 | 3.8 | 0.2 | 0.3 | 5.2 | 23.7 |
| 1997 | 1.6 | 2.2 | 0.1 | 3.5 | 0.3 | 6.9 | 3.8 | 0.2 | 0.3 | 5.3 | 24.1 |
| 1998 | 1.7 | 2.4 | 0.1 | 3.5 | 0.4 | 6.9 | 3.8 | 0.2 | 0.3 | 5.3 | 24.4 |
| 1999 | 1.8 | 2.5 | 0.1 | 3.5 | 0.4 | 7.1 | 3.8 | 0.2 | 0.3 | 5.4 | 25.0 |
| 2000 | 1.8 | 2.6 | 0.1 | 3.7 | 0.4 | 7.0 | 3.8 | 0.2 | 0.3 | 5.4 | 25.3 |
| 2001 | 1.8 | 2.6 | 0.1 | 3.9 | 0.4 | 6.9 | 3.7 | 0.2 | 0.3 | 5.5 | 25.6 |
| 2002 | 1.9 | 2.6 | 0.1 | 4.2 | 0.4 | 6.9 | 3.7 | 0.2 | 0.3 | 5.5 | 25.9 |
| 2003 | 1.9 | 2.6 | 0.1 | 4.6 | 0.4 | 6.8 | 3.6 | 0.2 | 0.4 | 5.6 | 26.2 |
| 2004 | 2.0 | 2.7 | 0.1 | 5.0 | 0.4 | 6.7 | 3.6 | 0.2 | 0.4 | 5.7 | 26.7 |
| 2005 | 2.0 | 2.6 | 0.1 | 5.0 | 0.4 | 6.6 | 3.5 | 0.2 | 0.4 | 5.7 | 26.7 |
| 2006 | 2.1 | 2.7 | 0.2 | 5.2 | 0.4 | 6.6 | 3.7 | 0.2 | 0.5 | 5.8 | 27.3 |
| 2007 | 2.3 | 2.9 | 0.2 | 5.9 | 0.4 | 6.4 | 3.9 | 0.2 | 0.5 | 5.8 | 28.5 |
| 2008 | 2.4 | 3.0 | 0.2 | 6.2 | 0.4 | 6.3 | 3.6 | 0.2 | 0.5 | 5.9 | 28.7 |
| 2009 | 2.3 | 2.9 | 0.2 | 6.3 | 0.4 | 6.3 | 3.7 | 0.2 | 0.5 | 6.0 | 28.8 |
| 2010 | 2.5 | 3.0 | 0.2 | 6.3 | 0.3 | 6.3 | 3.8 | 0.2 | 0.5 | 6.1 | 29.3 |
| 2011 | 2.7 | 3.2 | 0.2 | 6.4 | 0.4 | 6.1 | 3.9 | 0.2 | 0.6 | 6.2 | 29.9 |
| Percentage change 2010 to 2011 | *7.7* | *4.7* | *11.2* | *2.4* | *6.8* | *-2.3* | *1.9* | *-1.0* | *5.2* | *1.2* | *1.9* |
| 2001 to 2011 | *48.4* | *20.9* | *106.7* | *65.1* | *0.0* | *-12.1* | *4.8* | *-19.7* | *78.9* | *11.8* | *16.8* |

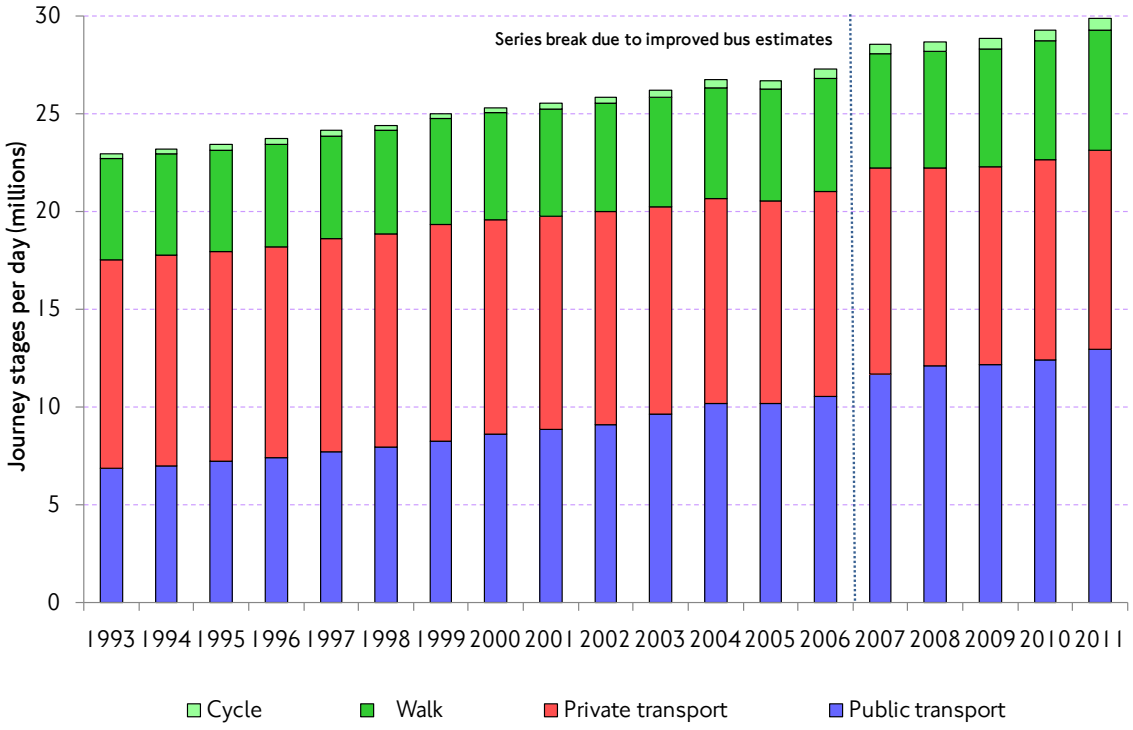
*Source: TfL Group Planning, Strategic Analysis.*
*1. A journey stage is a part of a trip made by a single mode of transport.*
*2. Each rail interchange between train operating companies is a new journey stage.*
*3. Bus journey stages are counted by starting a new stage each time a new bus is boarded.*
*4. Underground journey stages are counted by station entries; interchanges within stations are ignored.*
*5. Walks are counted only when they form complete trips (ie walking all the way), not when they are part of trips using other modes of transport.*

Table 2.2 has been revised since Travel in London report 4 for the reasons explained in section 2.4. Annual growth in journey stages was particularly high for

public transport, with strong growth of 7.7 per cent and 11.2 per cent on National Rail and DLR respectively. Bus and Underground stages also increased in 2011, at a faster rate than the increase in the resident population. The number of cycle stages also increased again, by 5.2 per cent. Car driver stages continued to fall, and were 2.3 per cent lower than in 2010. The net result of these changes is a continuation in the established trend of increased public transport use in London, with a corresponding continued shift away from private motorised transport.

Notable from table 2.2 is the 10 year trend, showing a 16.8 per cent increase in total stages from 2001, with rail stages up by 48.4 per cent over the same period. Also notable is the 78.9 per cent increase in cycle stages since 2001.

Figure 2.2 Aggregate travel volumes in Greater London. Estimated daily average number of journey stages, 1993 to 2011.




*Source: TfL Group Planning, Strategic Analysis.*

## 2.7 Mode shares

In 2011, 43 per cent of journey stages in London were made by public transport, compared with 34 per cent by private transport. This reflects a now well-established trend of a net shift in London away from private motorised transport to the public transport modes. Since 2001 the public transport mode share for London has increased by 8.7 percentage points. In the latest year, the private transport mode share fell by a further 0.9 percentage points, while the public transport mode share increased by 1 percentage point. Cycling and walking mode shares remained at around 2 and 21 per cent respectively.

### Journey stage based mode shares

This trend towards higher public mode shares has been in evidence since the early 1990s, and had accelerated since the year 2000. Even during the recent economic downturn, this trend has continued, with public transport mode share increasing by 8.7 percentage points since 2001. The private transport mode share

correspondingly decreased by 8.5 percentage points - the difference being made up by a 1 percentage point increase in cycling mode share over the decade (table 2.3).

Table 2.3 Percentage shares of journey stages by type of transport, 1993 to 2011.

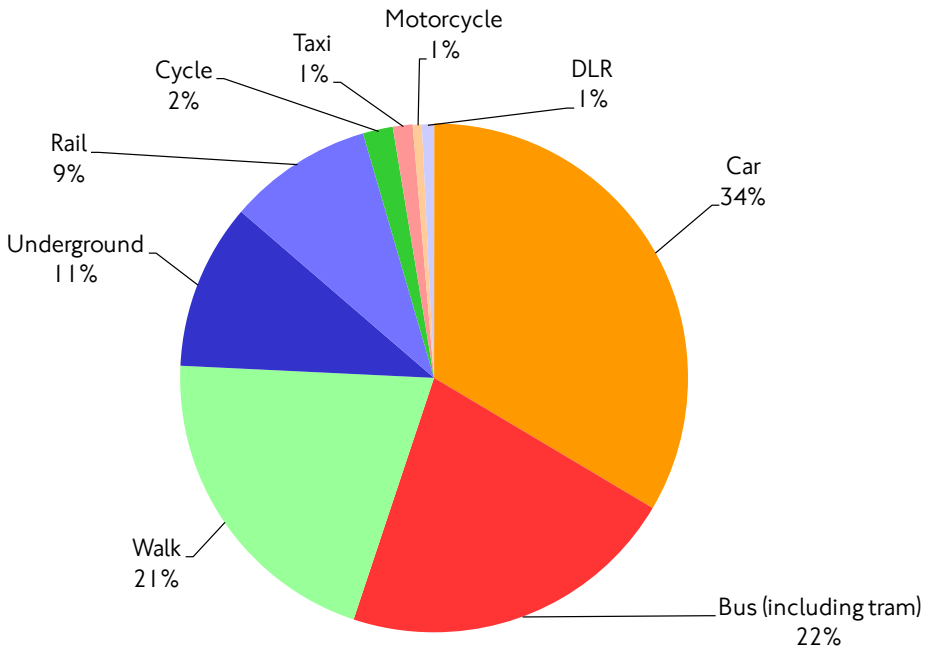
| | Percentage of journey stages | | | |
|---|---|---|---|---|
| Year | Public transport | Private transport | Cycle | Walk |
| 1993 | 30% | 46% | 1% | 22% |
| 1994 | 30% | 46% | 1% | 22% |
| 1995 | 31% | 46% | 1% | 22% |
| 1996 | 31% | 46% | 1% | 22% |
| 1997 | 32% | 45% | 1% | 22% |
| 1998 | 33% | 45% | 1% | 22% |
| 1999 | 33% | 44% | 1% | 22% |
| 2000 | 34% | 43% | 1% | 21% |
| 2001 | 35% | 43% | 1% | 22% |
| 2002 | 35% | 42% | 1% | 21% |
| 2003 | 37% | 41% | 1% | 21% |
| 2004 | 38% | 39% | 1% | 21% |
| 2005 | 38% | 39% | 2% | 22% |
| 2006 | 39% | 38% | 2% | 21% |
| 2007 | 41% | 37% | 2% | 20% |
| 2008 | 42% | 35% | 2% | 21% |
| 2009 | 42% | 35% | 2% | 21% |
| 2010 | 42% | 35% | 2% | 21% |
| 2011 | 43% | 34% | 2% | 21% |

*Source: TfL Group Planning, Strategic Analysis.*
*Note: Mode shares are calculated from the consistent series for journey stages given in Table 2.2. Totals may not add up to 100 per cent due to rounding.*

### Trip based mode shares

The decrease of 8.5 percentage points between 2001 and 2011 in the private transport mode share in terms of journey stages is equivalent to a decrease of 7.8 percentage points in terms of trips. Similarly, public transport mode share, which increased by 8.7 percentage points in terms of journey stages, increased by 7.0 percentage points in terms of trips since 2001. Public transport accounted for 35.5 per cent of trips in 2011, up from 34.5 per cent in 2010 and 28.5 per cent in 2001. Over the most recent year, private transport mode share decreased by 1.1 percentage points to 38.4 per cent. Cycle and walk mode shares remained constant, at 2 per cent and 24 per cent respectively.

Figure 2.3 Modal shares of daily journey stages in London, 2011.




*Source: TfL Group Planning, Strategic Analysis.*

Table 2.4 Trip-based mode shares – public and private transport by main mode.

| | Percentage of trips | | | |
|---|---|---|---|---|
| **Year** | **Public transport** | **Private transport** | **Cycle** | **Walk** |
| 1993 | 24% | 50% | 1% | 25% |
| 1994 | 25% | 49% | 1% | 25% |
| 1995 | 25% | 49% | 1% | 24% |
| 1996 | 26% | 49% | 1% | 24% |
| 1997 | 26% | 48% | 1% | 24% |
| 1998 | 27% | 48% | 1% | 24% |
| 1999 | 27% | 48% | 1% | 24% |
| 2000 | 28% | 47% | 1% | 24% |
| 2001 | 28% | 46% | 1% | 24% |
| 2002 | 29% | 46% | 1% | 24% |
| 2003 | 30% | 44% | 1% | 24% |
| 2004 | 31% | 43% | 1% | 24% |
| 2005 | 31% | 43% | 2% | 25% |
| 2006 | 31% | 43% | 2% | 24% |
| 2007 | 32% | 43% | 2% | 23% |
| 2008 | 34% | 40% | 2% | 24% |
| 2009 | 34% | 40% | 2% | 24% |
| 2010 | 34% | 39% | 2% | 24% |
| 2011 | 36% | 38% | 2% | 24% |

*Source: TfL Group Planning, Strategic Analysis.*

## 2.8 Travel by London residents

### Introduction to the London Travel Demand (LTDS) survey

London residents account for about three-quarters of all travel in London. The travel behaviour of Londoners is surveyed annually in depth through TfL's LTDS survey. Results from this survey provide essential information about how Londoners use the transport system - the reasons why they travel, when, where and how, and the ways in which their socio-demographic characteristics are related to the travel choices they make. It can therefore provide a unique window on the travel needs of Londoners, and their likely responses to a range of potential policies. The survey is organised on a rolling annual basis, with a sample size of about 8,000 London households each year. Interviews and one-day travel diaries are conducted with all members of each household. Data are available back to 2005/06.

This section provides a brief summary of selected findings from the 2011/12 (financial year) survey in the context of longer-term travel trends among residents. The full database, which can be accessed and manipulated through TfL's Romulus portal (see also: http://romulus.tfl.gov.uk/webview), supports a much wider range of analyses. For example disaggregate analysis of residents' travel at the sub-regional level and the detailed 'profiling' of the users of the various modes of transport. More extensive summaries of results and findings from previous surveys are also published periodically on the Travel in London website.

### Personal trip rates

Trip rates measure the frequency with which people travel. In 2011/12, London residents made 2.55 trips per day on average (on the basis of a 7-day week). This was 2.2 per cent higher than the equivalent value for 2010/11 and 5.9 per cent higher than the equivalent value for 2009/10, reflecting some recovery from the recent economic recession, but still lower than trip rates typical over the period 2005 to 2008 (around 2.6 trips per person per day). It is important to note that these are average trip rates for the population surveyed – some people will travel less, some considerably more. In the context of a growing London population, stable trip rates will equate to increasing total numbers of trips – as there are more people actually travelling.

Table 2.5 Trips per person per day, by main mode. Seven day week.

| | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|---|---|
| National Rail[1] | 0.11 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 |
| Underground/ DLR | 0.17 | 0.17 | 0.19 | 0.19 | 0.17 | 0.19 | 0.19 |
| Bus/tram | 0.35 | 0.37 | 0.36 | 0.37 | 0.36 | 0.38 | 0.38 |
| Taxi/Other | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Car driver | 0.75 | 0.73 | 0.73 | 0.63 | 0.62 | 0.64 | 0.65 |
| Car passenger | 0.33 | 0.36 | 0.35 | 0.30 | 0.31 | 0.31 | 0.31 |
| Motorcycle | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cycle | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.07 |
| Walk | 0.79 | 0.80 | 0.81 | 0.74 | 0.73 | 0.75 | 0.78 |
| **All** | **2.59** | **2.65** | **2.64** | **2.42** | **2.41** | **2.49** | **2.55** |

*Source: TfL Group Planning, Strategic Analysis. Notes: 1. Includes London Overground.*

Table 2.5 shows how average trip rates break down by the principal travel modes, with the 'main mode' of a multi mode trip being defined as the method of transport used on the longest distance stage of the trip. Previous Travel in London reports had highlighted a visible impact of the economic recession on travel by Londoners through a distinct reduction in trip rates for car drivers and car passengers. This change persisted in 2011/12 with only a marginal rebound in car driver trip rates. The dramatic increase in cycle trip rates among residents seen in recent years continued in 2011/12 - up by a further 24 per cent since 2010/11 and showing a 75 per cent increase since 2005/06.

### Mode shares

Table 2.6 summarises the percentage mode shares of table 2.4. The main trends over the available survey years are:

- General increases in mode shares for the three principal public transport modes – National Rail, Underground and bus or tram.
- General (and largely corresponding) decreases in mode share for private vehicle trips (car driver and passenger).
- Relatively dramatic proportionate increases in mode share for cycling trips – up from 1.5 per cent of all trips in 2005/06 to 2.7 per cent of all trips in 2011/12 – but from a relatively low base.
- Apparent stability in the walk mode share.

As would be expected these changes in mode share, for London residents, are mirrored by those previously described for all travellers in London (including non-residents).

Table 2.6 Mode share of trips by London residents, Trip-based main mode.

| | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|---|---|
| National Rail[1] | 4.3 | 4.1 | 4.0 | 4.7 | 4.8 | 5.0 | 4.9 |
| Underground/ DLR | 6.5 | 6.6 | 7.0 | 7.7 | 7.2 | 7.8 | 7.5 |
| Bus/tram | 13.7 | 14.0 | 13.8 | 15.4 | 14.9 | 15.2 | 14.8 |
| Taxi/ Other | 1.1 | 1.5 | 1.3 | 1.1 | 1.3 | 1.4 | 1.3 |
| Car driver | 29.0 | 27.7 | 27.5 | 25.9 | 25.9 | 25.7 | 25.4 |
| Car passenger | 12.7 | 13.6 | 13.4 | 12.3 | 12.9 | 12.2 | 12.3 |
| Motorcycle | 0.6 | 0.7 | 0.6 | 0.5 | 0.5 | 0.3 | 0.4 |
| Cycle | 1.5 | 1.7 | 1.9 | 1.9 | 2.1 | 2.2 | 2.7 |
| Walk | 30.6 | 30.2 | 30.5 | 30.4 | 30.4 | 30.0 | 30.4 |
| **All** | **100.0** | **100.0** | **100.0** | **100.0** | **100** | **100.0** | **100.0** |

*Source: TfL Group Planning, Strategic Analysis.*
*1. Includes London Overground.*

### Other indicators of travel demand: time spent travelling and distance travelled

The average time that individuals spend travelling primarily reflects trip rates. Historically this has tended to be relatively stable - both year to year and over the longer term. The average distance travelled per person has also tended to be relatively stable from year to year, evolving only slowly in relation to changing land-use and commuting patterns. The relationship between the two for London residents therefore provides an indication of how transport demand and service

provision are evolving in the context of a growing city, although the seven survey years so far available from LTDS are a limited timescale over which to detect trends.

Looking first at table 2.7, specifically the average total time spent travelling, the pattern is one of a relatively sharp reduction around 2006-2008, just before the onset of the economic recession. In 2010/11 the average London resident spent 6.7 per cent less time travelling than in 2005/06, with evidence from more recent years suggesting, on balance, a slow continuing downward trend. Relating this to trip rates and therefore looking at the average time spent travelling per trip (rather than in total), the trend is again, on balance, one of a slow decline.

In interpreting this table, it should be borne in mind that average journey times reflect the characteristics of each mode, with those modes that tend to be used for longer journeys tending to have higher average travel times.

Table 2.7 Time spent travelling per day by London residents (trip-based, minutes) average day (7-day week).

| | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|---|---|
| National Rail[1] | 7.1 | 7.6 | 7.1 | 7.8 | 8.1 | 8.5 | 8.6 |
| Underground/ DLR | 8.6 | 9.1 | 9.5 | 9.7 | 9.2 | 10.1 | 9.8 |
| Bus/ tram | 14.7 | 14.4 | 13.9 | 14.7 | 14.2 | 14.5 | 14.1 |
| Taxi/ Other | 0.8 | 1.4 | 1.1 | 0.7 | 1.0 | 0.9 | 0.9 |
| Car driver | 18.4 | 18.5 | 17.7 | 16.8 | 16.4 | 16.6 | 15.2 |
| Car passenger | 8.0 | 9.4 | 8.4 | 7.5 | 8.0 | 7.3 | 7.6 |
| Motorcycle | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 |
| Cycle | 0.8 | 1.0 | 1.0 | 1.0 | 0.9 | 1.2 | 1.5 |
| Walk | 13.4 | 11.5 | 10.5 | 9.5 | 9.7 | 9.6 | 9.7 |
| **All** | **72.4** | **73.4** | **69.6** | **68.1** | **67.8** | **69.0** | **67.6** |
| **Average per trip** | **27.9** | **27.7** | **26.4** | **28.1** | **28.1** | **26.7** | **26.5** |

*Source: TfL Group Planning, Strategic Analysis.*
*1. Includes London Overground.*

Table 2.8, which shows the average distance travelled per day by London residents, suggests an indefinite trend over the available survey years. A best assessment would be that, in terms of all travel at least, this indicator has been broadly constant at around 14-15 kilometres travelled per person per day.

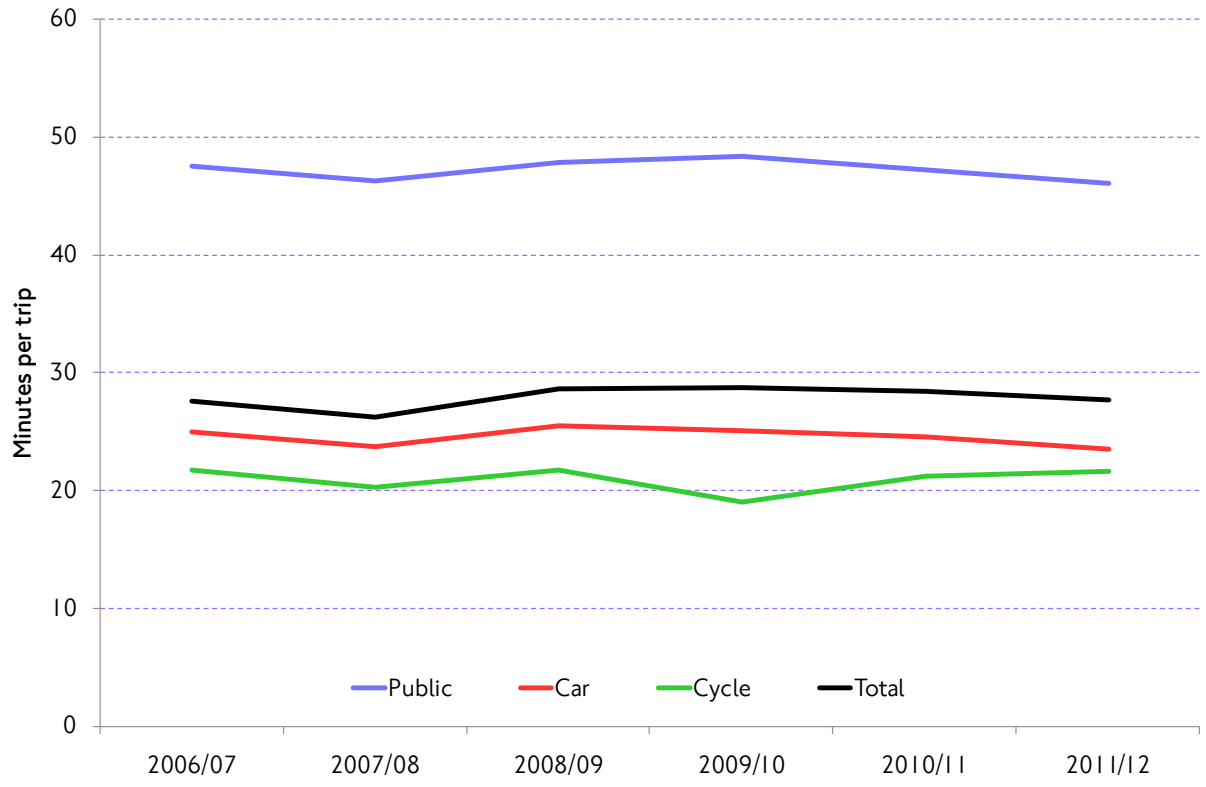
The average travel times for each mode in table 2.7 primarily reflect the overall usage (mode shares) themselves. Likewise, the mode-specific average distances primarily reflect the characteristics of the individual modes. Figures 2.4 and 2.5 control for these differences, normalising against the trip rates for the individual (principal) modes. Thus, from figure 2.4, it is seen that the average cycle trip takes about 20 minutes, the average public transport trip 47-48 minutes, and the average car trip 24-25 minutes. Looking at the trends, however, little change can be discerned, except perhaps a tendency for car trips to have got marginally shorter in terms of duration. Mean trip lengths for the principal modes also show no clear evidence of change over the review period, although there is a suggestion that the average duration of cycle trips has fallen.

Table 2.8 Distance travelled per day by London residents, (kilometres) average day (7-day week).

| | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|---|---|
| National Rail[1] | 1.9 | 2.4 | 2.1 | 2.2 | 2.5 | 2.6 | 2.7 |
| Underground/ DLR | 1.6 | 1.7 | 1.7 | 1.8 | 1.6 | 1.9 | 1.8 |
| Bus/ tram | 1.5 | 1.7 | 1.6 | 1.5 | 1.6 | 1.6 | 1.7 |
| Taxi/ Other | 0.2 | 0.4 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 |
| Car driver | 5.2 | 5.7 | 5.5 | 5.1 | 4.9 | 5.0 | 5.0 |
| Car passenger | 2.3 | 2.9 | 2.7 | 2.5 | 2.6 | 2.5 | 2.7 |
| Motorcycle | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Cycle | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 |
| Walk | 1.3 | 0.8 | 0.7 | 0.5 | 0.5 | 0.5 | 0.5 |
| **All** | **14.1** | **15.9** | **14.9** | **14.0** | **14.5** | **14.5** | **14.9** |
| **Average per trip** | **5.4** | **6.0** | **5.7** | **5.8** | **6.0** | **5.8** | **5.8** |

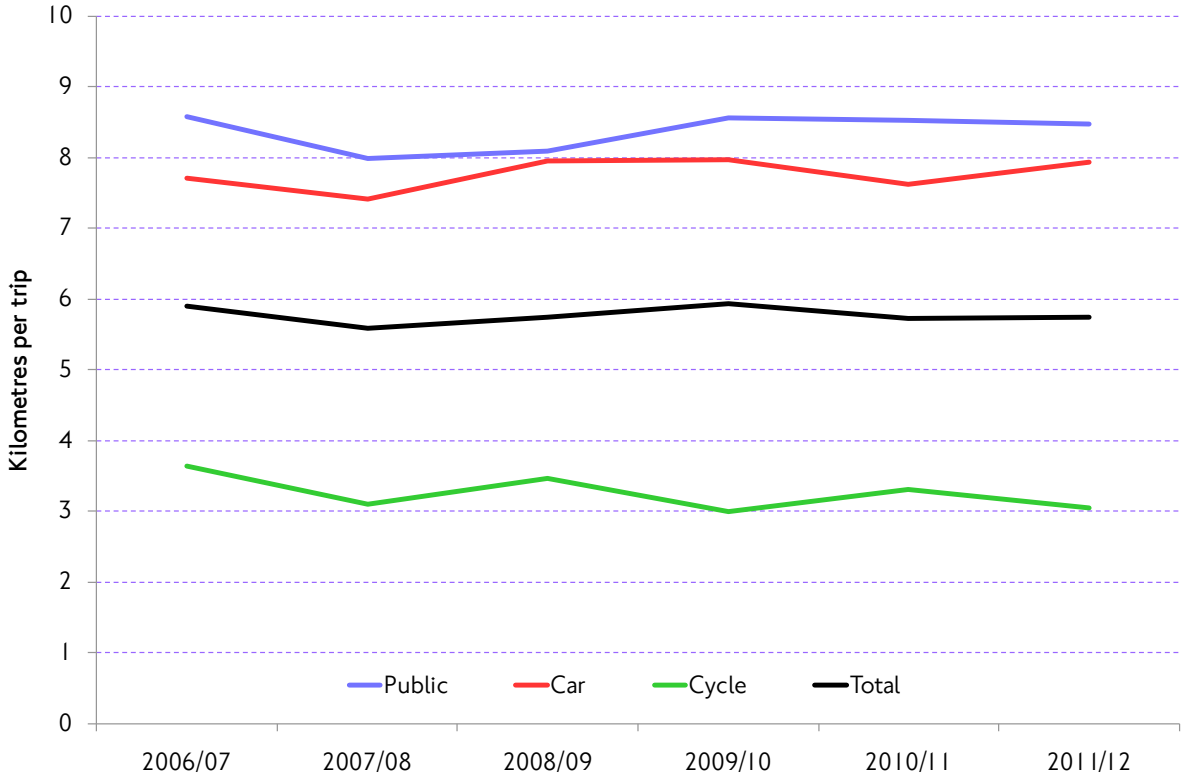
*Source: TfL Group Planning, Strategic Analysis.*
*1. Includes London Overground.*

Figure 2.4 Change in average time (minutes) per trip, by principal mode (London residents).




*Source: TfL Group Planning, Strategic Analysis.*

Figure 2.5 Change in average distance (kilometres) per trip, by principal mode (London residents).

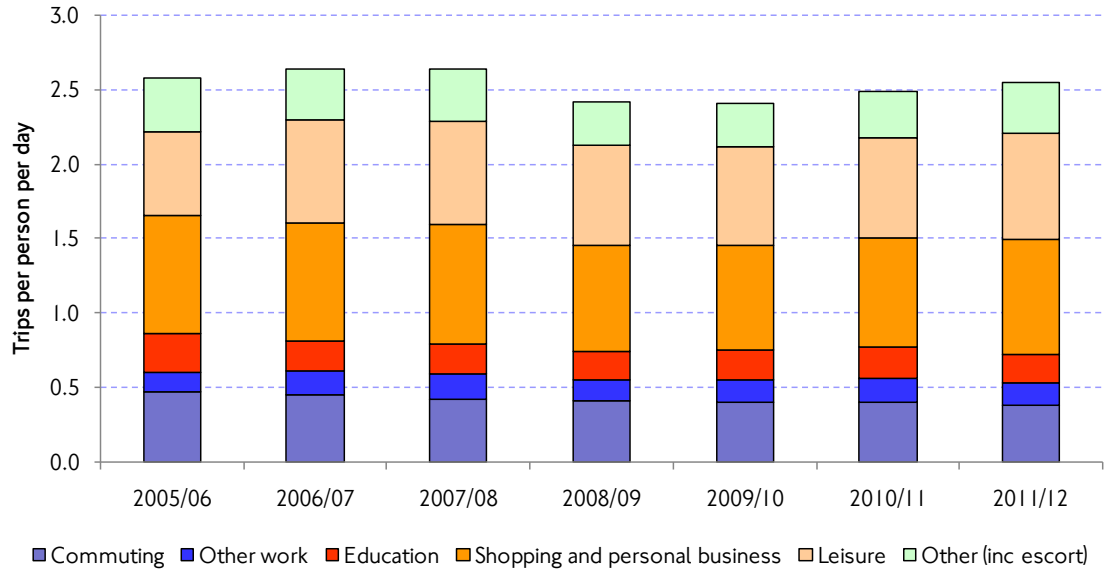



*Source: TfL Group Planning, Strategic Analysis.*

### The purposes for which Londoners travel

Figure 2.6 shows how travel (in terms of trip rates) breaks down by journey purpose. The available time-series shows evidence of several trends. First is a fall in trip rates to or from a regular workplace (commuting) – down from an average of 0.47 trips per person per day in 2005/06 to 0.38 trips per person in 2011/12. This is a much larger reduction than would be implied by the loss of jobs in the recent recession, probably reflecting a combination of this and more flexible working patterns, offset also by a growth in commuting to the London area by those living outside. Second is a 2.4 per cent fall since 2005/06 in trip rates for shopping and personal business, consistent with other evidence of the impact of the recession, although leisure travel appears to have increased. The apparent sharp drop between 2005/06 and 2006/07 in education trips reflects the nature of the 2005/06 survey, which did not include the school summer holiday period (the change between these years is not therefore representative).

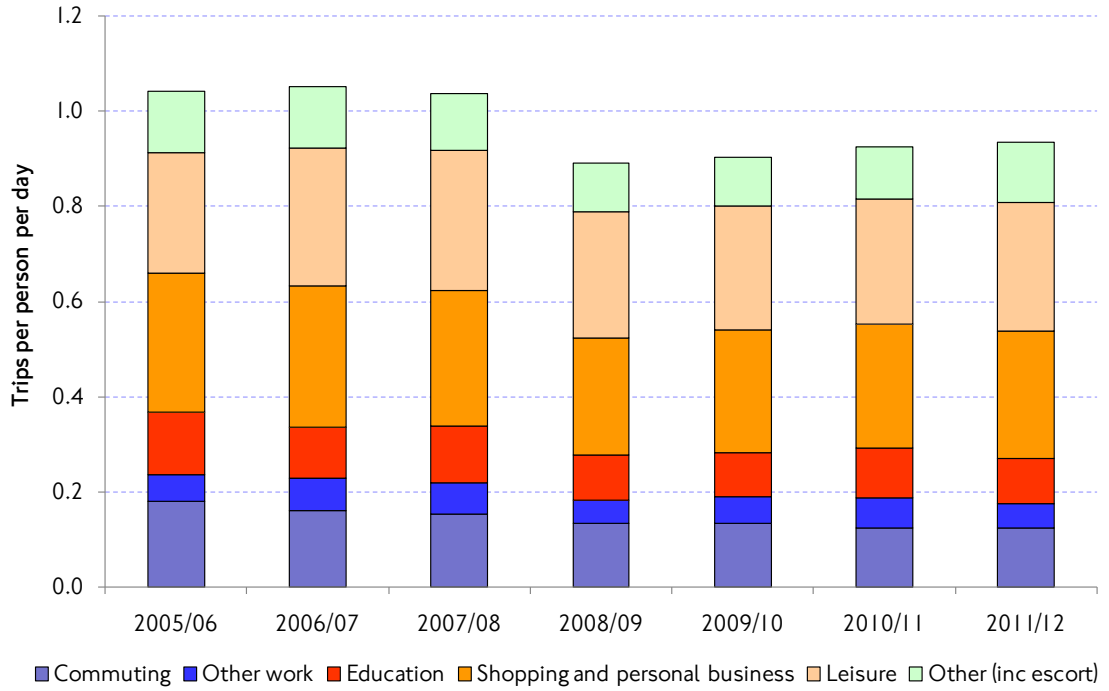
Figure 2.6 Trip rates by journey purpose – London residents.




*Source: TfL Group Planning, Strategic Analysis.*

Looking at this for just car trips (driver and passenger – figure 2.7), and noting the overall reduction in car trip rates referred to earlier, particular reductions are seen for commuting and shopping or personal business trips, average trip rates having reduced by 32 and 9 per cent respectively over the available data series. There has also been a 6 per cent reduction in car trip rates for 'other work' purposes over the available data timescale.

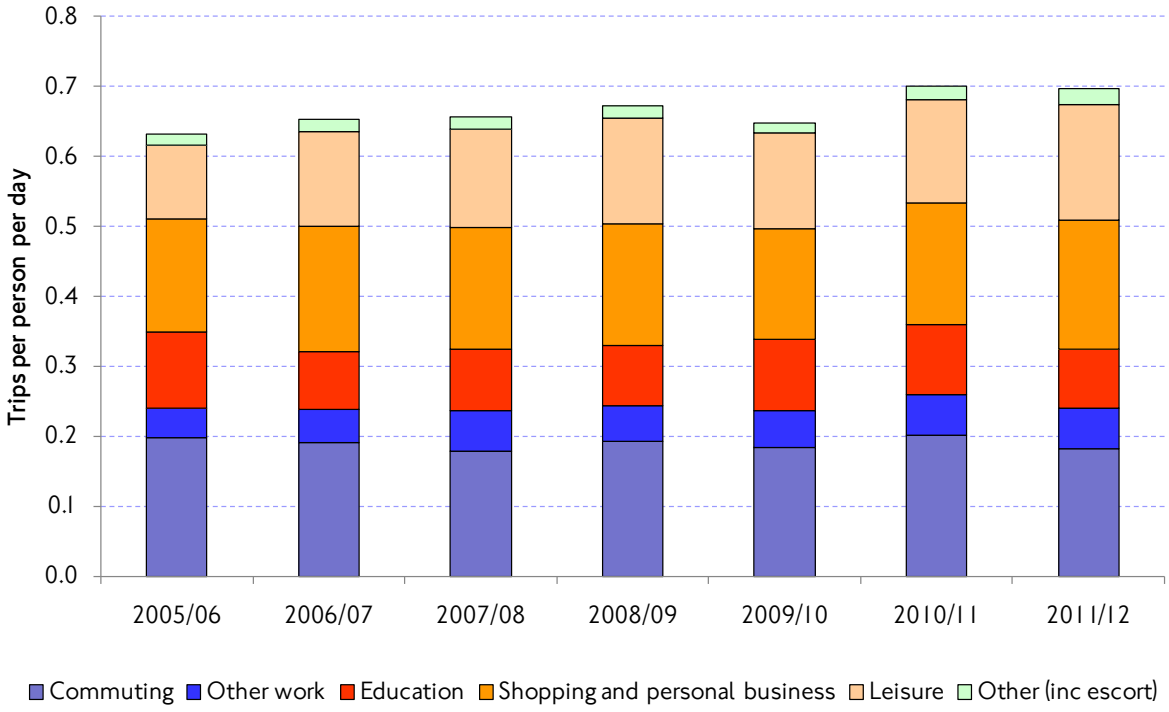
Figure 2.7 Trip rates by journey purpose. London residents – car driver and passenger only.




*Source: TfL Group Planning, Strategic Analysis.*

For public transport trips and in the context of increasing average trip rates (figure 2.8), the biggest proportionate increases are seen in leisure trips, up by 57 per cent, and 'other (including escort)', up by 45 per cent. Interestingly, public transport trip rates for commuting among residents fell by 8 per cent, while those for 'other work' purposes increased by 39 per cent, perhaps reflecting changed working and travel-for-work patterns.

Figure 2.8 Trip rates by journey purpose. London residents – public transport modes only.

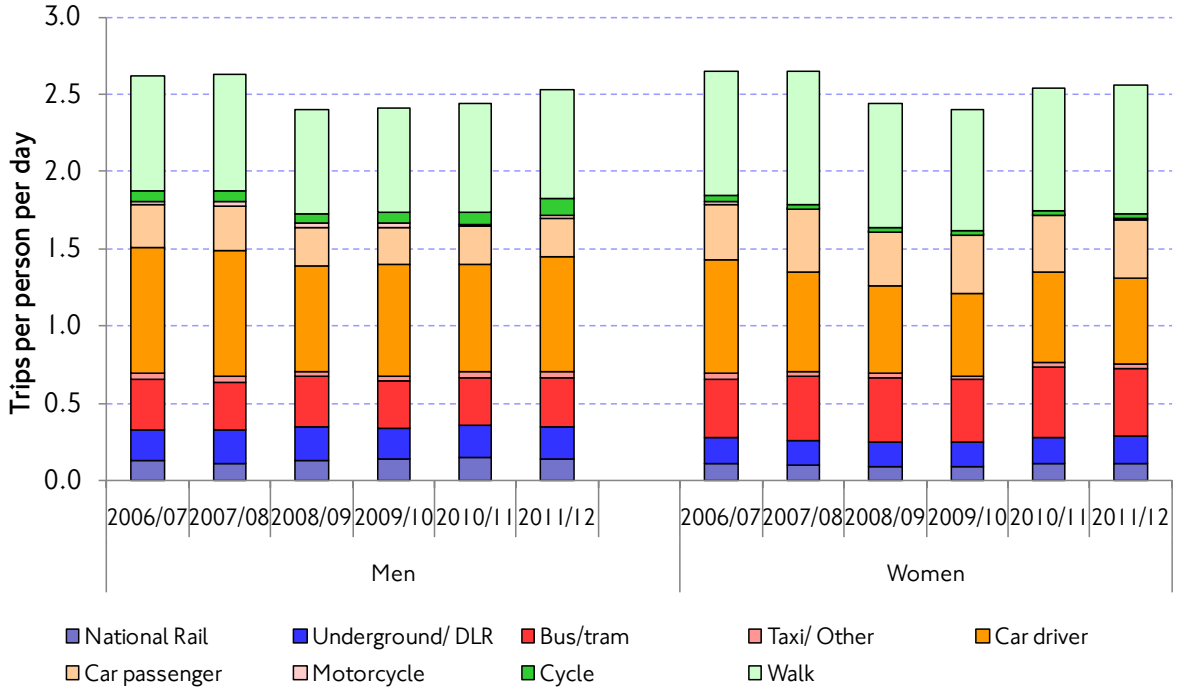



*Source: TfL Group Planning, Strategic Analysis.*

### Socio-demographic factors – how personal trip rates vary by gender and residential location

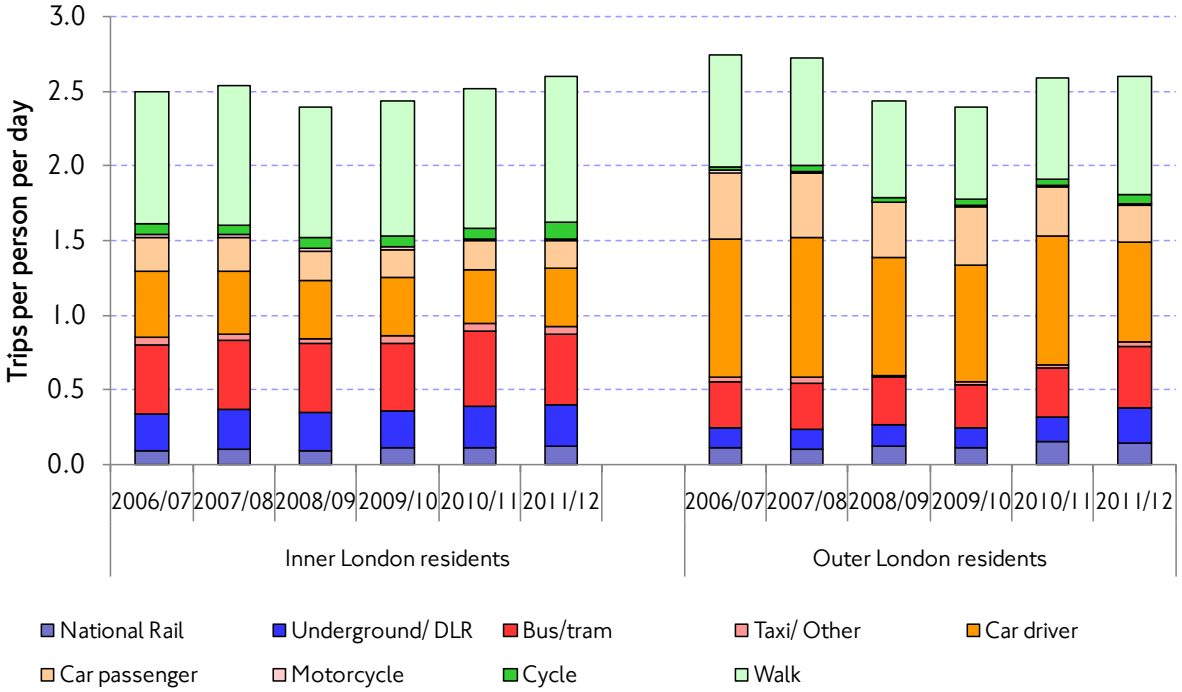
Figure 2.9 illustrates how travel (in terms of trip rates) breaks down by gender and main mode of travel, while figure 2.10 looks at how travel varies by residency of Inner or Outer London. These patterns change little from year to year, albeit that overall trip rates vary, but are important in that they reflect the basic 'market' to which transport provision is addressed. For example, there are well-established gender biases towards different forms of transport, with women on average being less-frequent car drivers than men, and more frequent bus users. Similar biases are seen in residential location, with residents of Outer London using the car more frequently than those of Inner London and making less relative use of the public transport modes, perhaps reflecting the less-intensive provision of public transport in Outer London. These patterns reflect a much wider interplay of travel needs and transport provision, and analysis at this socially-disaggregate level (as permitted by the range of socio-demographic variables in LTDS) is necessary to ensure that transport policies continue to be appropriately directed at evolving travel needs.

Figure 2.9 Personal trip rates by gender and main mode of transport.




*Source: TfL Group Planning, Strategic Analysis.*

Figure 2.10 Personal trip rates by residency of Inner and Outer London and main mode of transport.

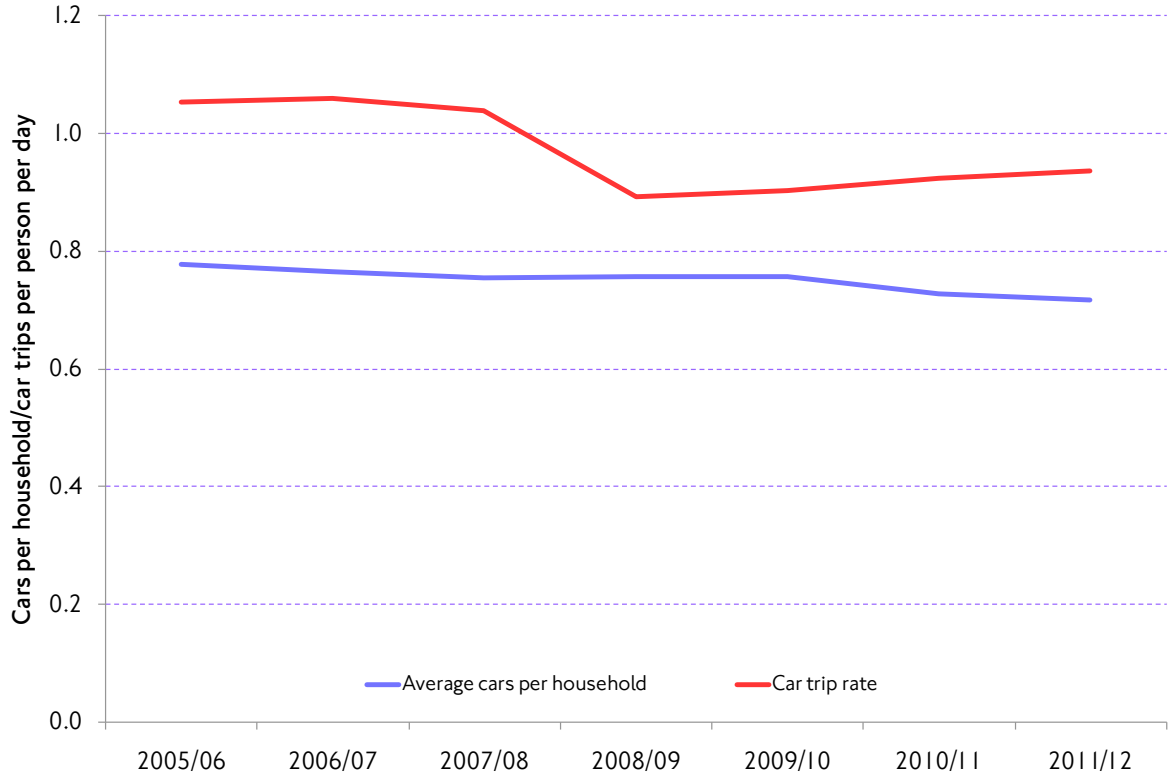



*Source: TfL Group Planning, Strategic Analysis.*

### Car ownership and use

Previous Travel in London reports have highlighted the slow but consistent decline in household car ownership rates in London. This is thought to reflect a complex interplay of factors such as increased public transport provision, increased population and 'densification' of Inner London, as well as social factors, such as more single-person households and other factors encouraging lower car ownership and use by younger people. Figure 2.11 shows the relationship between household car ownership and car trip rates (both as driver and as passenger). The relationship is clearly not a direct one – car trip rates being broadly stable except for a sharp decline between 2007/08 and 2008/09 – this sharp drop having been previously highlighted in Travel in London reports and broadly attributed to the economic recession.

Figure 2.11 Relationship between car ownership and use in London.




*Source: TfL Group Planning, Strategic Analysis.*

## 2.9 London's population and the 2011 Census

London population is now 8.2 million, higher than the previous peak of 8.6 million in the late1930s and up by 12 per cent from the previous Census estimate in 2001. The new Census estimate for 2011 is 4.8 per cent higher than the 2010 mid-year estimate, reflecting an under-estimation of London's population throughout the previous decade of approximately 300,000 people - the difference between the estimate and the 'true' population having widened progressively since 2001.

The number of people who live within Greater London is a fundamental factor influencing travel demand. London's population has been growing strongly. According to MTS projections, London is expected to see 1.25 million more people and more than 750,000 additional jobs between 2007 and 2031 – these bringing a

commensurate increase in demand for transport, which needs to be met through investment in transport infrastructure.

**The 2001 and 2011 Census of population and mid-year estimates**

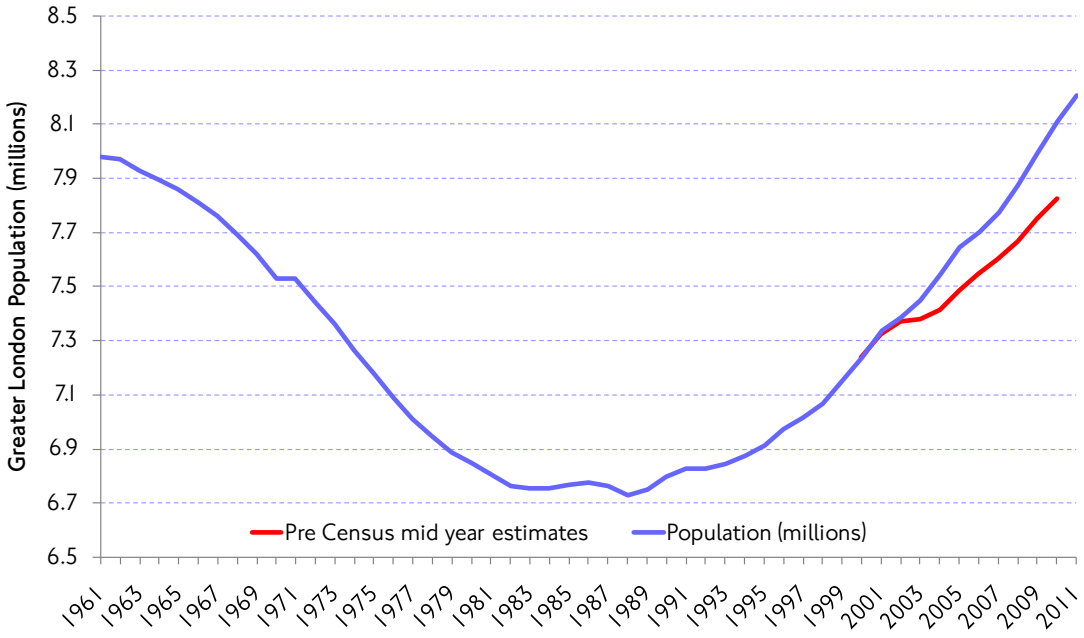
Up until 2011 estimates of London's population were based on the 2001 Census, mid-year estimates for each year to 2011 being developed based on local records of natural change (births and deaths) and migration, along with future projections of population based on these trends. The projections in MTS were based on these mid-year estimates as they stood about half way through the decade.

In mid-2012, however, new direct estimates of London's population became available as initial figures from the 2011 Census of population were released (http://www.ons.gov.uk/ons/guide-method/census/2011/census-data/2011-census-data/index.html). These new numbers showed London's population to be significantly higher than previously thought. Most of this difference seemed to have arisen from an under-estimate of population growth in the period since 2001 (the mid-year estimates) rather than a sudden dramatic increase in the most recent year or underestimation in 2001. In summary (figure 2.12):

- London population is now 8.2 million, higher than the previous peak of 8.0 million in the 1960s and up by 12 per cent from the previous Census estimate in 2001.
- The new mid-year estimate, based on the 2011 Census, is 4.8 per cent higher than the 2010 mid-year estimate, the last comparison point available, the difference between the estimate and the 'true' population having widened progressively since 2001.

The overall pattern shown by figure 2.12 is characteristic. London's population has been growing strongly and consistently since a low point in the late 1980s – and continues to do so The new Census figures, and a revised (provisional) 'back-series' created using them, suggest a relatively constant rate of growth rather than the slight slackening off in the second half of the decade implied by the previous mid-year estimates. Based on the provisional new back-series, produced by the GLA, it is estimated that London's population grew by 1 per cent in 2011 and by 12 per cent since the 2001 Census.

Figure 2.12 Greater London resident population – with comparison against pre-Census mid-year estimates.




*Source: Greater London Authority.*

### Implications of the new population estimates

The main factors explaining the difference against the previous population estimates are likely to be an underestimate of the 2001 base population that would have carried through into subsequent mid-year estimates, and an underestimation of international in-migrants for London as a whole.

The Greater London Authority (GLA) and TfL are currently assimilating these new population estimates, which are not yet available at a full level of detail. However, it is already clear that this development will have several important implications for transport planning in London. For example, it will mean that the GLA's future population projections will have to be revised – probably upwards. In terms of interpreting the travel demand trends considered in chapters 2 and 3 of this report, the realisation that there are more people living in London than previously recognised means, in general, a higher proportion of the increase in demand for public transport observed in recent years is 'explained' by a higher resident population. If London resident trip rates do not change then levels of future transport demand will be higher than previously estimated in the MTS.

The latest information on the 2011 Census can be found on the GLA's website (http://data.london.gov.uk/census/).

## 2.10 London's economy

The UK emerged from recession (defined as two quarters of negative Gross Value Added growth) in Quarter 1 2010, following six consecutive quarterly falls in GVA. However, economic growth remained uncertain and the UK returned to recession in Quarter 1 2012. The current recession has not only been deeper, but recovery is taking considerably longer than previous recessions, with UK output remaining at just under 4 per cent below pre-recessionary levels at Quarter 2 2012.

Total workforce jobs in London fell from 5.0 million to 4.75 million (a fall of 4.5 per cent) between Quarter 4 2008 and Quarter 4 2009 but have been generally increasing since to beyond pre-recessionary levels, with 5.02 million jobs in Quarter 2 2012, although in the context of increasing population. The sharpness of the trough in London employment in 2009 contrasts with the general stability of travel demand over this period.

### The economic recession and travel demand in London

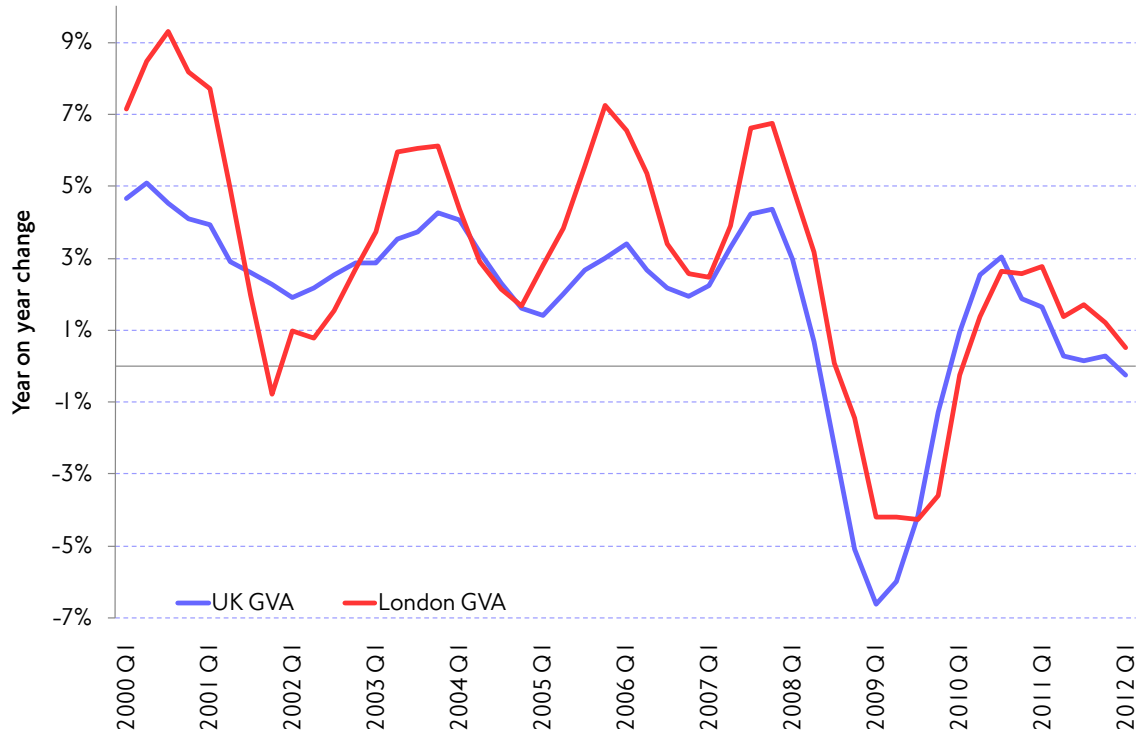
The UK and London have experienced one of the deepest economic recessions of recent times. Reducing economic output and business and consumer activity feeds through, all other things being equal, to reduced travel demand and this has been seen in what now appears to have been a temporary pause (between 2007 and 2009) in the established rates of growth in demand for the principal modes of public transport in London. The most recent economic indicators show only a relatively muted recovery, with market and consumer confidence still a big issue acting against future growth.

### Gross Value Added (GVA) – recent trends

Gross Value Added (GVA) is a measure of the value of goods and services produced in a region. It is a basic indicator of economic output. Figure 2.13 shows the trend for London and UK GVA since 2000.

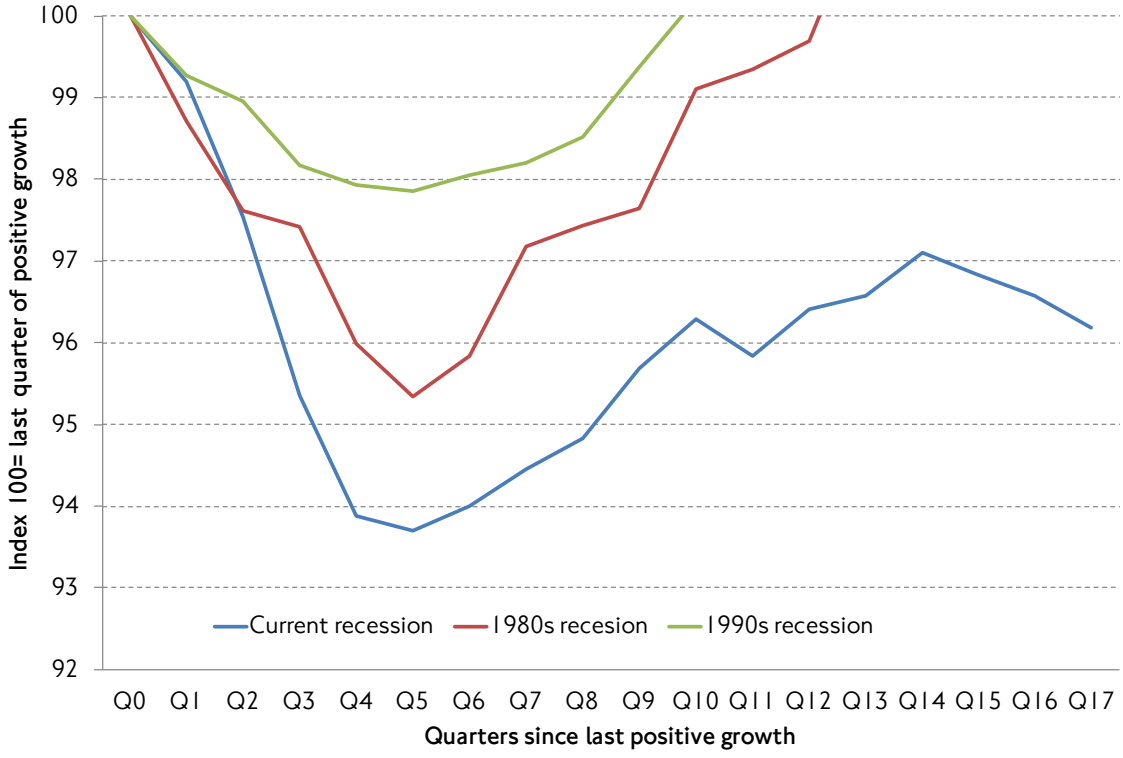
The basic historic pattern of reasonably consistent economic growth through the middle part of the last decade, followed by a recession of unprecedented depth starting in Quarter 3 2008, associated primarily with the banking crisis of 2008, has been described in previous Travel in London reports. The UK emerged from recession (defined as two quarters of negative GVA growth) in Quarter 1 2010, following six consecutive quarterly falls in GVA, which in total reduced UK economic output by 7.2 per cent. However, economic growth remained uncertain and the UK returned to recession in Quarter 1 2012.

Figure 2.13 Gross Value Added (GVA) – London and UK trends compared. Year-on-year percentage change.




*Source: ONS, Experian Economics.*

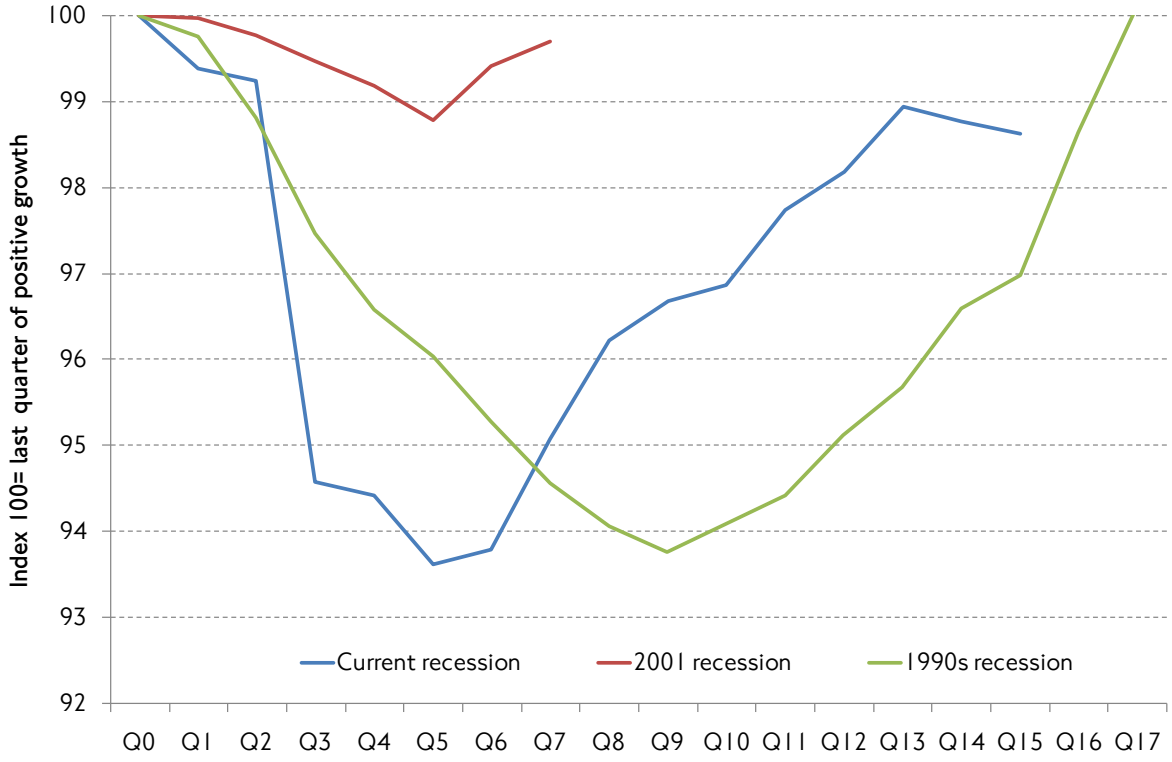
Figure 2.14 Comparison of past recessions at the UK level – quarterly GVA index compared to last quarter before start of recession.




*Source: ONS, Experian Economics.*

Figure 2.14 compares the length and depth of the current recession with equivalent slowdowns in the 1980s and 1990s at the whole UK level. It shows the time taken for economic output to return to the level prevailing before the start of the recession. It took about 3 years after the recessions of the 1980s and 1990s for UK output to return to pre-recession levels. However, the current recession has not only been deeper, but recovery is taking considerably longer, with UK output remaining at just under 4 per cent below pre-recessionary levels at Quarter 2 2012.

Figure 2.15 Comparison of past recessions in Greater London – quarterly GVA index compared to last quarter before start of recession.



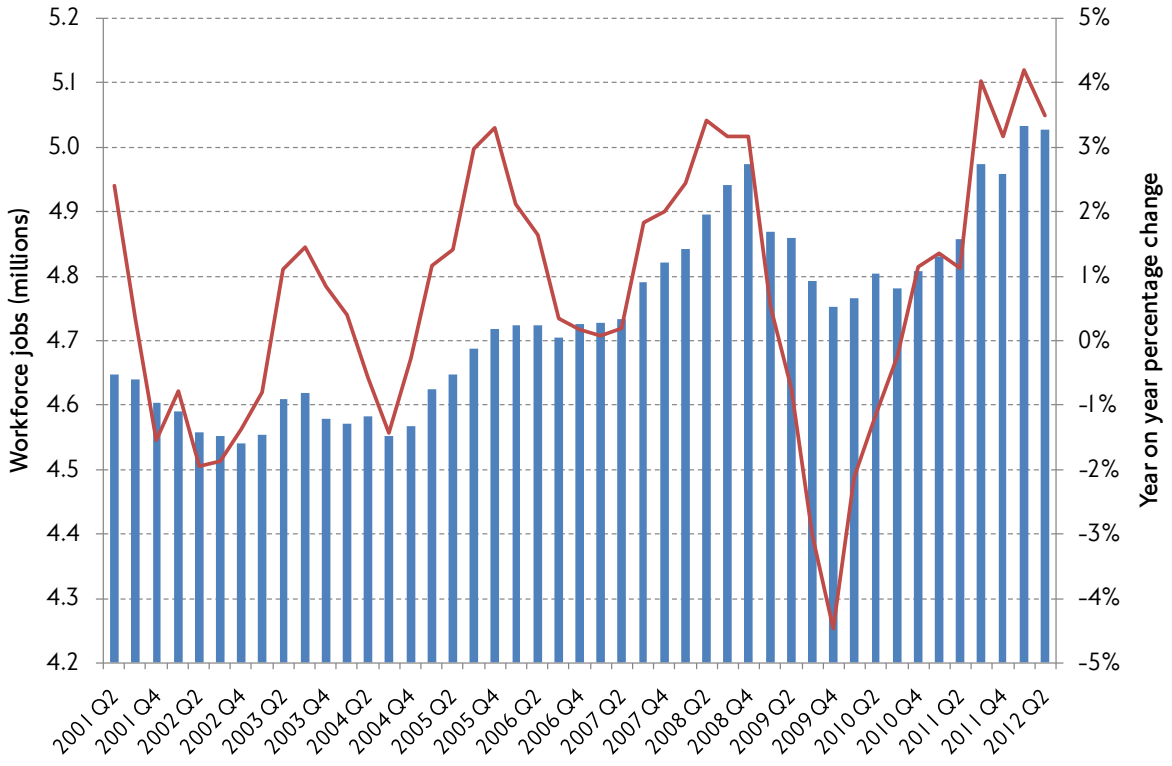

*Source: ONS, Experian Economics.*

Figure 2.15 shows an equivalent comparison for Greater London. Here, the pace of recovery, in terms of returning to pre-recessionary levels of GVA, was initially faster in the case of the current recovery compared to that of the 1990s recession, although the rate of recovery has slackened noticeably over more recent quarters.

**London's employment – recent trends**

Employment trends in London, as in the UK, have mirrored those of the general economy, with the impact of the recession clearly visible in figure 2.16. Total workforce jobs fell from 5.0 million to 4.75 million (a fall of around 4.5 per cent) between Quarter 4 2008 and Quarter 4 2009 but have been generally increasing since to beyond pre-recessionary levels, with 5.03 million jobs in Quarter 2 2012. The sharpness of the trough in employment in 2009 contrasts with the general stability of travel demand over this period, although in the context of an increasing population.

Figure 2.16 Trends in London workforce jobs and year-on-year change.



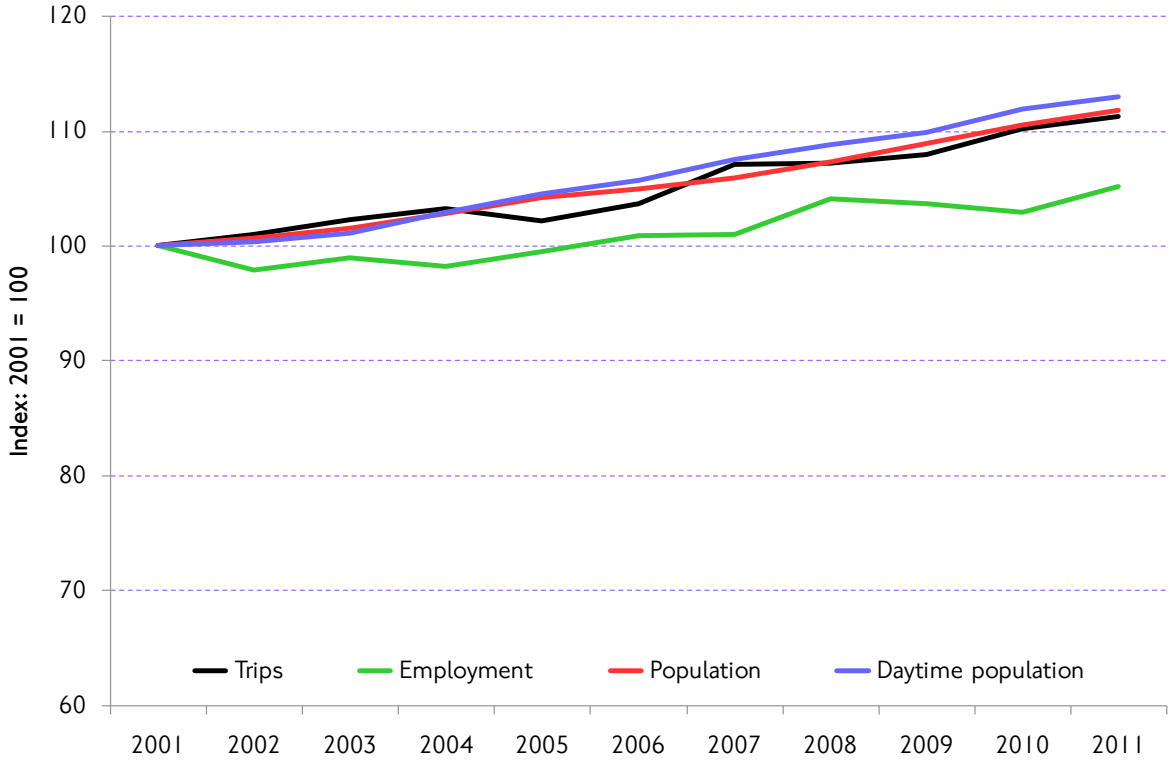

*Source: ONS, Experian Economics.*

## 2.11 Assessment of recent trends and their implications for transport policy in London

Figure 2.17 shows how travel in London has grown over the last ten years, and how this compares with population and employment growth. Since 2001, the total number of trips in London has grown by 11.3 per cent, with the London population growing by 11.8 per cent in the same period. This suggests a very strong linear relationship between travel and population, and implies that the number of trips people make has remained more or less constant over the decade. As previously mentioned, trip rates have remained relatively constant over the past ten years, at around 2.8 trips per person per day when including London's extended daytime population.

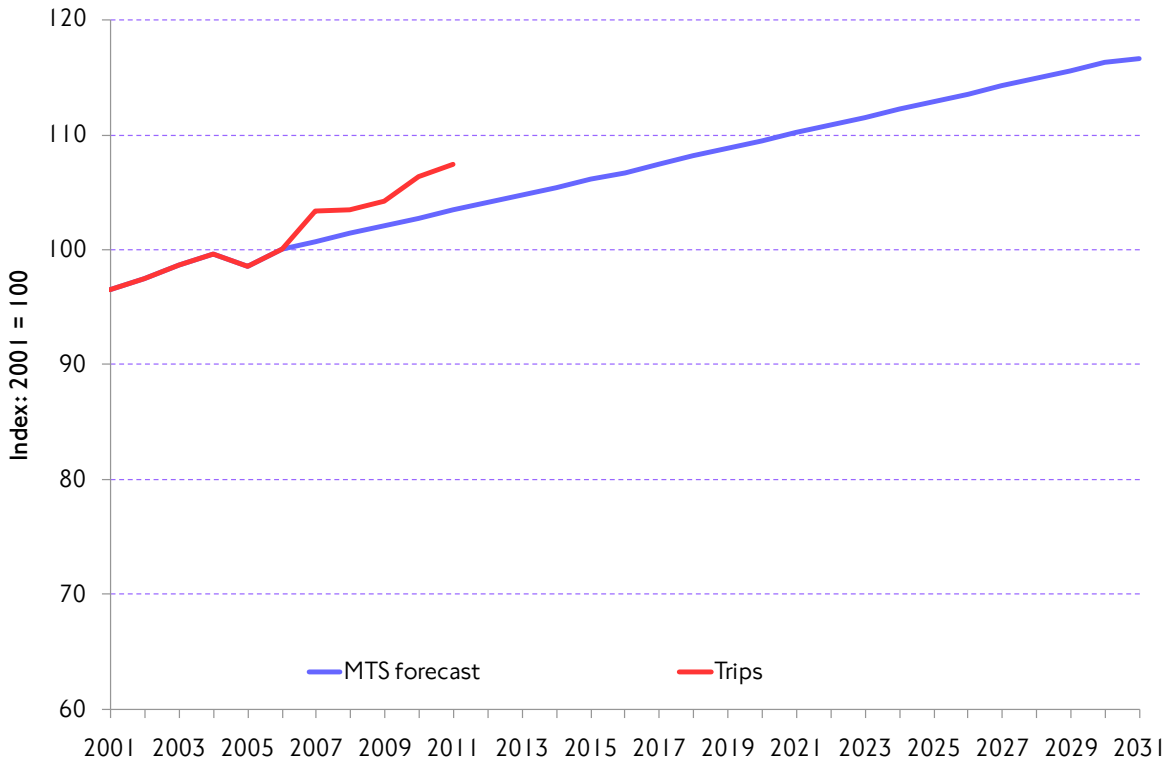
Employment growth seems to have less of an impact on trip-making than population growth. Over the past ten years, the number of jobs in London has increased by 5.2 per cent, much lower than the rate of growth in trips, and has also shown cyclic variation following wider economic trends, which is not immediately apparent in the trip data.

Figure 2.17 Trends in trips in London, trips, population and employment growth.




*Source: Group Planning, Strategic Analysis.*

Figure 2.18 Trips in London compared with MTS forecast, 2006 = 100.




*Source: TfL Group Planning, Strategic Analysis.*

Figure 2.18 compares growth of travel in London with the forecast growth in the Mayor's Transport Strategy. Trips have increased at a faster rate than the MTS forecast, and in 2011 were 4.6 per cent higher than forecast partly, it is now known, as a result of greater population growth in London revealed by the 2011 Census. This amounts to an extra 430 million trips in the year in the trip calculations, the net result of 640 million additional trips by public transport and 290 million fewer trips by private vehicles. There were around 80 million extra walking and cycling trips. The revised population estimates thereby account for a much larger proportion of the growth in travel than previously understood and, if current trends continue, the projected MTS population increases to the year 2031 will be reached sooner than this.

# 3. Travel trends by mode

## 3.1 Introduction and content

Chapter 2 of this report looked at trends in aggregate travel demand and mode shares in London. This chapter looks in more specific detail at travel demand trends for each of the principal modes of transport. Chapter 4 of this report then looks at corresponding trends in 'supply-side' factors for each of the principal modes, covering aspects of service provision and operational performance. This section covers trends to the 2011 calendar year or 2011/12 financial year. It does not cover travel associated with the 2012 London Olympic and Paralympic Games (see chapter 10 of this report).

## 3.2 Overview of recent travel demand trends for specific modes of transport – decade to 2011 or 2011/12

**Public transport patronage**

Use of public transport in London has grown substantially over recent years, and has continued to do so despite the economic recession. This growth largely reflects increased population, now known to have been higher than previously assessed (see section 2.9) and increased service provision on the public transport networks.

**Roads – general traffic levels**

In contrast to the strong growth in public transport patronage, volumes of travel by road have declined – by about 10.2 per cent overall. This trend was well-established in central and Inner London over most of the last decade, but has now also become established in Outer London. Over the long term this trend is thought to reflect a combination of more and improved public transport, travel behavioural change by individuals (such as more non-car households) and changes to the road network that have had the effect of removing capacity for general road traffic.

**Other modes**

Other significant developments since 2000 have included an estimated 99.6 per cent increase in cycle journey stages in Greater London. This reflects measures by successive Mayoral administrations to promote and encourage cycling through the provision of new infrastructure and related initiatives. London is broadly on track to achieve the MTS cycling target of a 400 per cent increase in cycle trips by 2025, and the dramatic growth in cycling over the last ten years contrasts very strongly with effectively static levels for this mode throughout the 1990s.

Alongside this, and again reflecting investment by successive administrations, the volume of passenger traffic on the river Thames more than doubled between 2000/01 and 2011/12, with nearly 4.4 million trips made on the river Thames in 2011/12. The licensing of private hire vehicles in London from 2003 was another significant step forward, with 53,960 of these licensed to work in London in 2012, an estimated 46 per cent increase from 2005. More recent years have seen the advent and expansion of the Barclays Cycle Hire scheme in central London, which now accounts for an average of 20,700 cycle trips per day, together with the brand new Emirates Air Line (cable car) across the river Thames in London's Docklands, which opened just before the London 2012 Games.

Although on a relatively small scale, these latter two innovations illustrate both the rapid pace of change for transport services in London, and the creation of new and beneficial travel markets where none existed before.

## 3.3 Summary of travel demand trends by mode – most recent three years

Demand trends for the principal transport modes continued to follow now well-established patterns over the most recent year. Public transport ridership increased in aggregate by 4.8 per cent, with 2.4 per cent more passengers on the buses and 5.7 per cent more on the Underground. The rapidly-developing Overground and DLR networks saw patronage increase by 91 and 10 per cent respectively (journey stages). Meanwhile, vehicle kilometres on London's roads continued to fall – down by 2 per cent in 2011 on 2010. Cycling continued to grow in popularity with a 5.2 per cent increase in cycle journey-stages across London, and a 9 per cent increase in the number of cyclists observed on London's major roads.

Table 3.1 brings together indicators of transport patronage over the most recent three years. The percentage change over the most recent year is also shown. These trends are examined in more detail for each specific mode of transport in the following sections.

Table 3.1 Summary of key indicators of travel demand for principal travel modes in London.

| Mode and indicator | Units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | Difference (%) 2011 or 2011/12 vs. previous year |
|---|---|---|---|---|---|
| **Public transport** | | | | | |
| Total PT passenger kilometres | Millions per year | 17,410 | 18,124 | 18,987 | 4.8% |
| Total PT journey stages | Millions per year | 3,452 | 3,560 | 3,732 | 4.8% |
| Bus passenger kilometres | Millions per year | 8,013 | 8,082 | 8,219 | 1.7% |
| Bus journey stages | Millions per year | 2,257 | 2,289 | 2,344 | 2.4% |
| Underground passenger kms. | Millions per year | 8,456 | 8,875 | 9,519 | 7.3% |
| Underground journey stages | Millions per year | 1,065 | 1,107 | 1,171 | 5.7% |
| DLR passenger kilometres. | Millions per year | 365 | 414 | 456 | 10.0% |
| DLR journey stages | Millions per year | 69 | 78 | 86 | 9.9% |
| London Tramlink passenger kilometres. | Millions per year | 139 | 146 | 148 | 1.5% |
| London Tramlink journey stages | Millions per year | 27 | 28 | 29 | 2.4% |
| Overground passenger kms | Millions per year | 437 | 606 | 645 | 6.4% |
| Overground journey stages | Millions per year | 34.6 | 53.6 | 102.6 | 91.4% |
| National Rail pass. kms (L&SE) | Millions per year | 23,788 | 25,037 | 26,462 | 5.7% |
| National Rail journeys (L&SE) | Millions per year | 842 | 918 | 994 | 8.3% |
| **Road traffic** | | | | | |
| Motor vehicle kms – GLA | Billions per year | 30.1 | 29.7 | 29.1 | -2.0% |
| Motor vehicle kms – central | Billions per year | 1.0 | 1.0 | 1.0 | -2.0% |
| Motor vehicle kms – inner | Billions per year | 8.2 | 8.0 | 7.8 | -2.8% |
| Motor vehicle kms – outer | Billions per year | 20.8 | 20.6 | 20.3 | -1.7% |
| Central London cordon | '000 motor vehicles | 1179 | 1133 | 1161 | 2.5% |
| Inner London cordon | '000 motor vehicles | 1980 | 1945 | n/a | n/a |
| Outer London cordon | '000 motor vehicles | 2533 | 2548 | 2562 | 0.6% |
| Thames screenline | '000 motor vehicles | 785 | 772 | n/a | n/a |

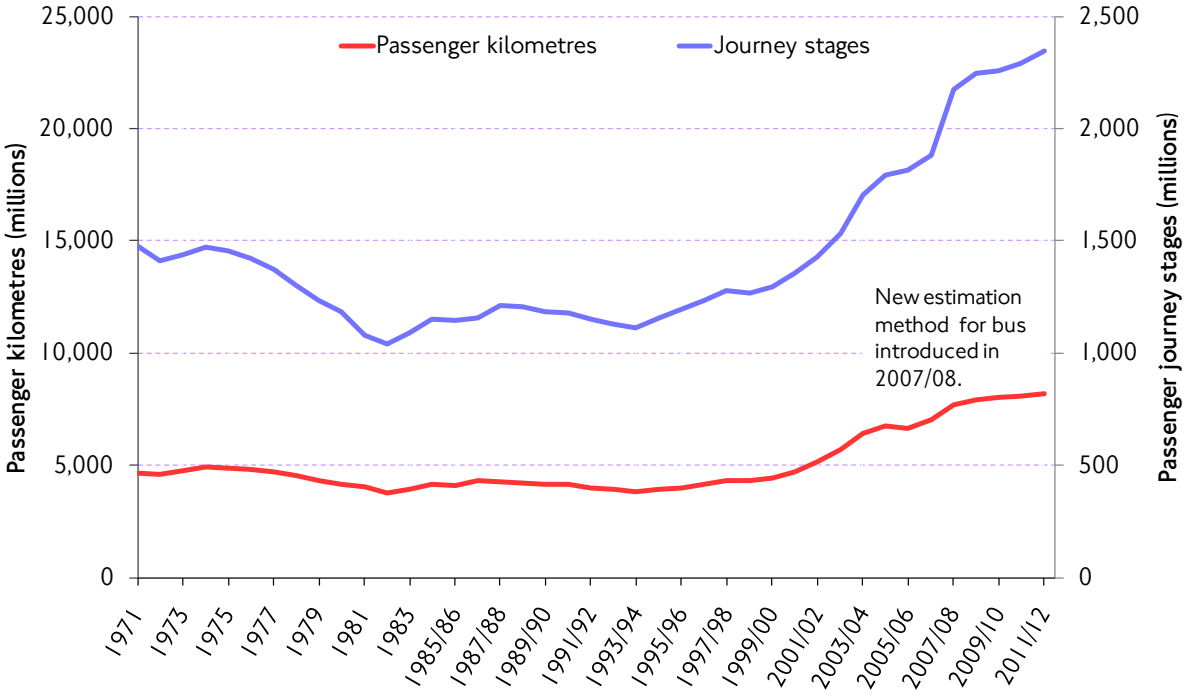
| | | | | | |
|---|---|---|---|---|---|
| **Cycling** | | | | | |
| Cycle flows on TLRN | Cycles counted (index 2000/01=100) | 217.5 | 250.1 | 272.6 | 9% |
| Cycles – central cordon | Cycles counted thousand | 120 | 137 | 147 | 7.3% |
| Cycles – inner cordon | Cycles counted thousand | 48 | 52 | n/a | n/a |
| Cycles – outer cordon | Cycles counted thousand | 14 | 15 | 15 | 3.4% |
| Cycles – Thames screenline | Cycles counted thousand | 64 | 67 | n/a | n/a |
| **Other modes** | | | | | |
| Rail freight lifted | Tonnes(million) | 6.7 | 6.4 | 7.3 | 15.5% |
| Waterborne freight lifted | Tonnes (million) | 8.1 | 7.8 | 9.0 | 16.4% |
| Air freight moved | Tonnes (million) | 1.6 | 1.8 | 1.8 | -0.3% |
| Airport terminal passengers | Millions | 130.13 | 127.17 | 133.63 | 5.1% |
| River Thames passengers | Number | 4,189 | 4,142 | 4,357 | 5.2% |
| Licensed taxis | Vehicles (thousand) | 22.4 | 22.6 | 23.1 | 2.4% |
| Licensed taxi drivers | Number (thousand) | 24.9 | 25.1 | 25.3 | 1.1% |
| Licensed private hire | Vehicles (thousand) | 49.4 | 50.7 | 54.0 | 6.5% |
| Licensed private hire | Drivers (thousand) | 59.2 | 61.2 | 64.1 | 4.7% |

*Source: TfL Group Planning, Strategic Analysis.*

## 3.4 Principal TfL public transport modes: bus

Figure 3.1 shows the long-term trend for bus patronage in London. The bus has been one of London's transport success stories, with the historic pattern of slowly-declining patronage being dramatically reversed in the late 1990s to one of strong growth. Over the ten years from 2000/01 to 2010/11, the number of bus journey stages increased by 54 per cent, and passenger-kilometres grew by 67 per cent. The rate of growth has levelled out in more recent years, perhaps reflecting the recession, although the most recent year shows a 2.4 per cent increase in journey stages and a 1.7 per cent increase in bus passenger kilometres (compared to growth of 1.4 per cent and 0.9 per cent respectively between 2009/10 and 2010/11). It is noteworthy that the figure 3.1 implies a general trend towards shorter overall bus stage lengths, perhaps reflecting intensification of the bus network in Inner London and a variety of fares initiatives, such as the daily fares cap with Oystercard and the increase in concessionary travel, such as free travel for under 16s, these having the effect of encouraging the use of buses for shorter journeys.

Figure 3.1 Passenger kilometres and journey stages travelled by bus.



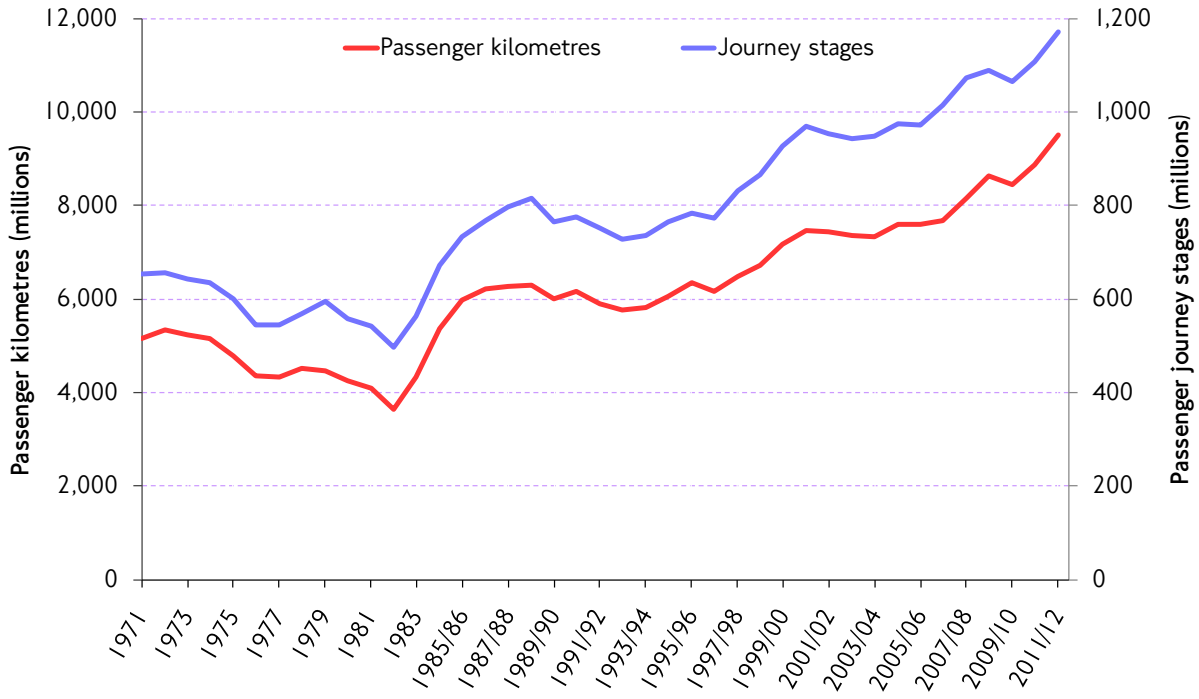

*Source: TfL Service Performance data.*

## 3.5 Principal TfL public transport modes: Underground

Figure 3.2 shows the long-term trend for travel by London Underground. Here the trend was one of falling patronage until the early 1980s, rather like that seen for buses, when substantial changes to the fares structure stimulated passenger demand increases of about two thirds during the remainder of the decade. Demand was fairly static during the late 1980s and early 1990s but started to grow again in the late 1990s and has continued to grow strongly since.

The number of people using the Underground in 2011/12 was the highest ever, 1,171 million passenger journeys (journey stages). Growth during the last year was particularly strong, with 5.7 per cent more journey stages and 7.3 per cent more passenger kilometres than the previous year, along with an increase of train kilometres operated of 5 per cent.

Figure 3.2 Passenger kilometres and journey stages by Underground.




*Source: TfL Service Performance data.*

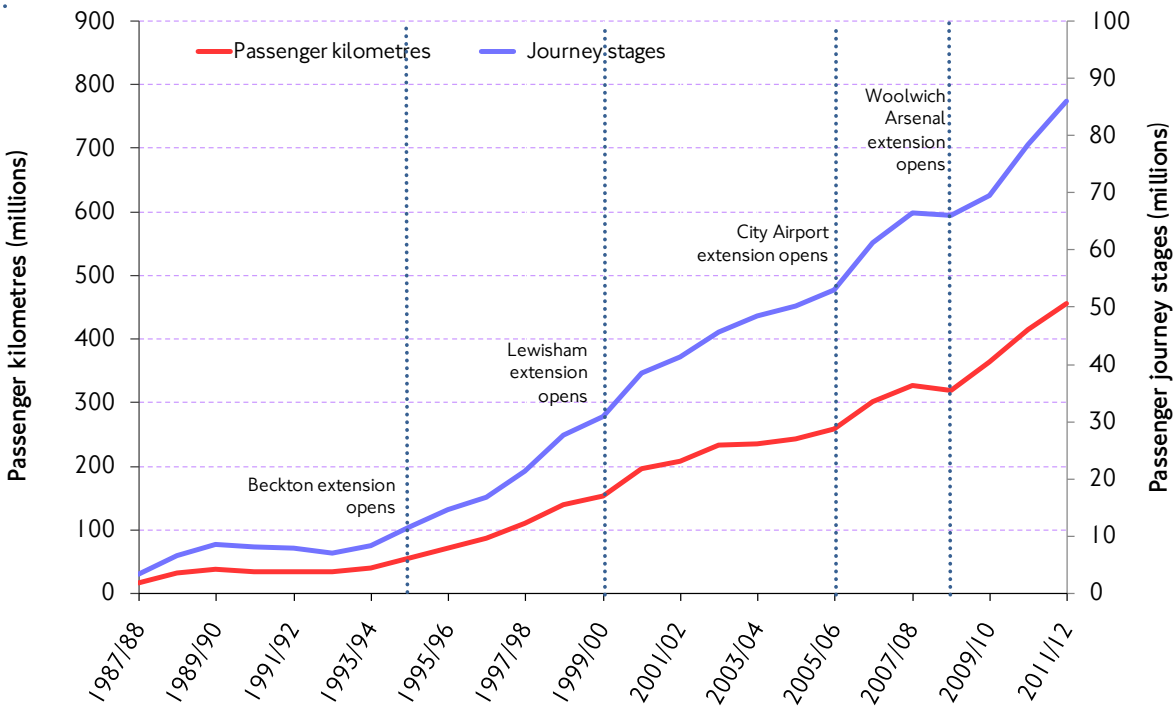
The relationship between passenger kilometres and journey stages by Underground is rather more consistent than the equivalent for bus, perhaps reflecting the comparatively stable nature of the Underground network and pricing disincentives for short journeys, particularly in the central area.

## 3.6 Principal TfL public transport modes: DLR

Figure 3.3 shows the trend for travel by DLR since its initial opening in 1987. Patronage has grown steadily over this period as the network has progressively expanded. Principal milestones in the development of the network are shown in the figure to aid interpretation.

In 2011/12 456 million passenger kilometres were travelled on the DLR, equivalent to 86 million journey stages. Despite successive 'step' enhancements to the network, the rate of growth in DLR patronage has been relatively consistent since the opening of the initial network in 1987, averaging 15.1 per cent per year for passenger kilometres and 14.6 per cent for journey stages. Indicators of service supply for the DLR are not straightforward, as changing train lengths have also been a significant factor. Nevertheless, train kilometres operated have increased at an (indicative) rate of 10.1 per cent per year since the opening of the initial network.

Figure 3.3 Passenger kilometres and journey stages by DLR.

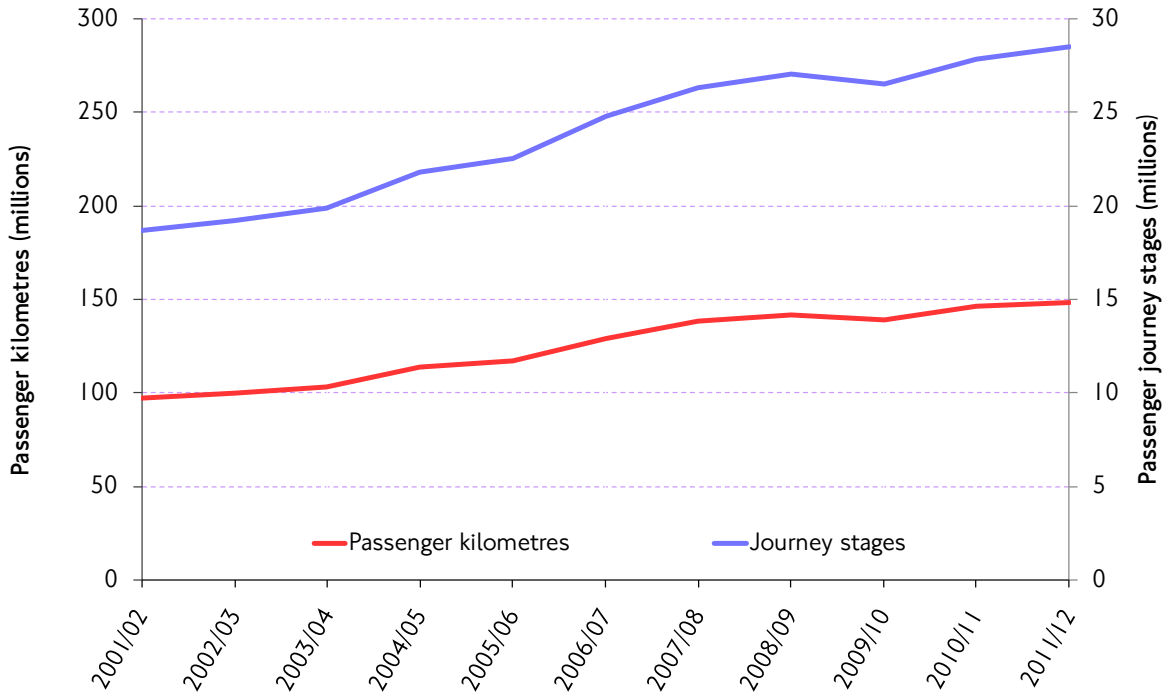



*Source: TfL Service Performance data.*

## 3.7 Principal TfL public transport modes: London Tramlink

London Tramlink initially opened in 2000 and the network has been relatively stable since, albeit with a service restructuring in 2006. Figure 3.4 shows steady patronage averaging 4.3 per cent growth for passenger kilometres and 4.3 per cent growth for journey stages over the period since opening in 2001/02. Aggregate growth since 2001/02 has been 53 per cent for both journey stages and passenger kilometres. Tram kilometres operated have increased by 12 per cent over the period since 2001/02. In the most recent year there were 1.5 per cent more passenger kilometres and 2.4 per cent more journey stages than in 2010/11.

Figure 3.4 Passenger kilometres and journey stages by Tramlink.



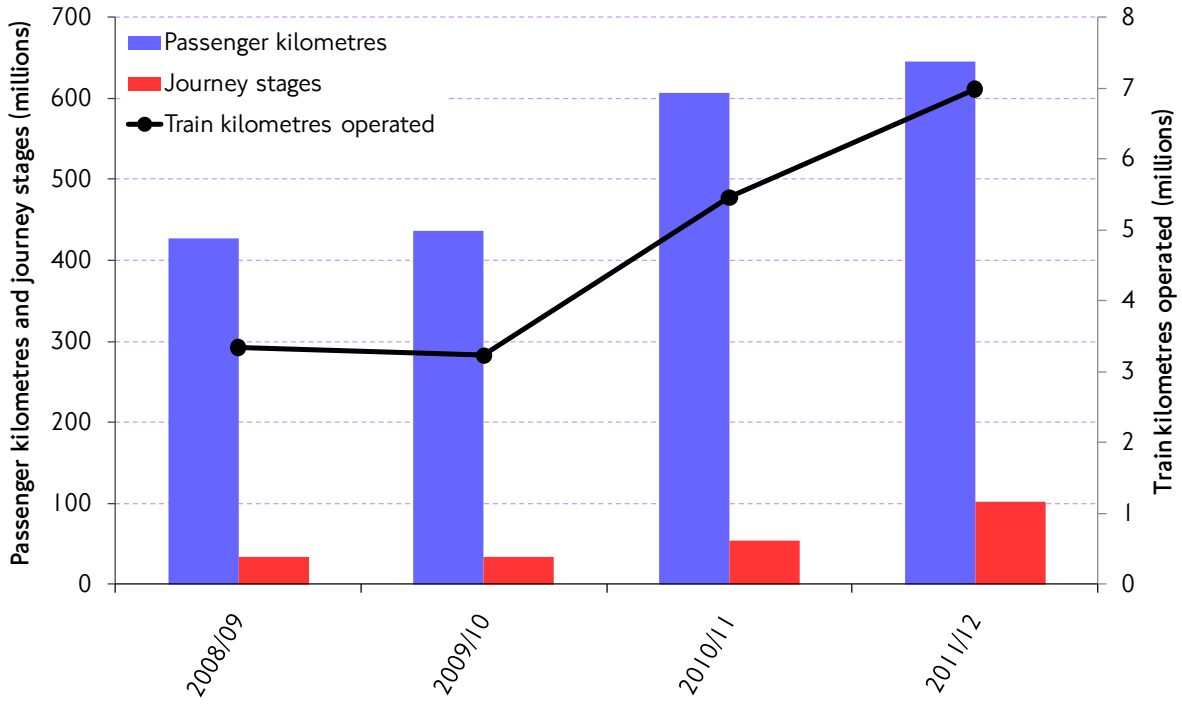

*Source: TfL Service Performance data.*

## 3.8 Principal TfL public transport modes: London Overground

Since the first full year of operation of the London Overground in 2008/09, passenger kilometres have increased by 51 per cent, with a 210 per cent increase in passenger journey stages and a 109 per cent increase in train kilometres operated. This reflects the comprehensive transformation of the network. In 2011/12 a major infrastructure upgrade project led to the introduction of the May 2011 timetable which provides four peak trains an hour from Stratford to Richmond and four peak trains an hour from Stratford to Willesden, and a 'turn up and go' service of 8 trains an hour in the central section. Patronage can be expected to increase again in 2012/13, with the opening of the extension of the network from Clapham Junction to Highbury & Islington, via Surrey Quays, scheduled to open in December 2012, completing the orbital route.

In 2011/12, passenger kilometres increased by 6 per cent on the previous year, to 645 million and passenger journey stages increased by 91 per cent to 103 million.

Figure 3.5 Passenger kilometres and journey stages by London Overground.




*Source: TfL Service Performance data.*

## 3.9 National Rail in London

National Rail travel has grown strongly at the national level over the past decade, with only a brief hiatus during the recession. This pattern is reflected for travel on services defined by the Office of Rail Regulation (ORR) as 'London and South East' (L&SE). Passenger kilometres and passenger journeys increased for the second year in a row with increases of 5.7 per cent in passenger kilometres and 8.3 per cent in journeys – the number of journeys in 2011/12 being 49.6 per cent higher than at the start of the decade (2000/01) – see table 3.2.

Table 3.2 Passenger kilometres and passenger journey stages by National Rail – operators classified by ORR as L&SE operators.

| Year | Passenger kilometres (billions) | Year-to-year percentage change | Passenger journeys (millions) | Year-to-year percentage change |
|---|---|---|---|---|
| 1998/99 | 17.1 | .. | 616 | .. |
| 1999/00 | 18.4 | 7.6 | 639 | 3.6 |
| 2000/01 | 19.2 | 4.3 | 664 | 4.0 |
| 2001/02 | 19.3 | 0.5 | 663 | -0.1 |
| 2002/03 | 19.8 | 2.6 | 679 | 2.4 |
| 2003/04 | 20.1 | 1.7 | 690 | 1.6 |
| 2004/05 | 20.5 | 1.9 | 704 | 2.1 |
| 2005/06 | 20.7 | 1.1 | 720 | 2.2 |
| 2006/07 | 22.2 | 7.1 | 769 | 6.9 |
| 2007/08 | 23.5 | 6.1 | 828 | 7.7 |
| 2008/09 | 24.2 | 2.9 | 854 | 3.1 |
| 2009/10 | 23.8 | -1.8 | 842 | -1.4 |
| 2010/11 | 25.0 | 5.3 | 917 | 8.9 |
| 2011/12 | 26.5 | 5.7 | 994 | 8.3 |

*Source: Office of Rail Regulation.*

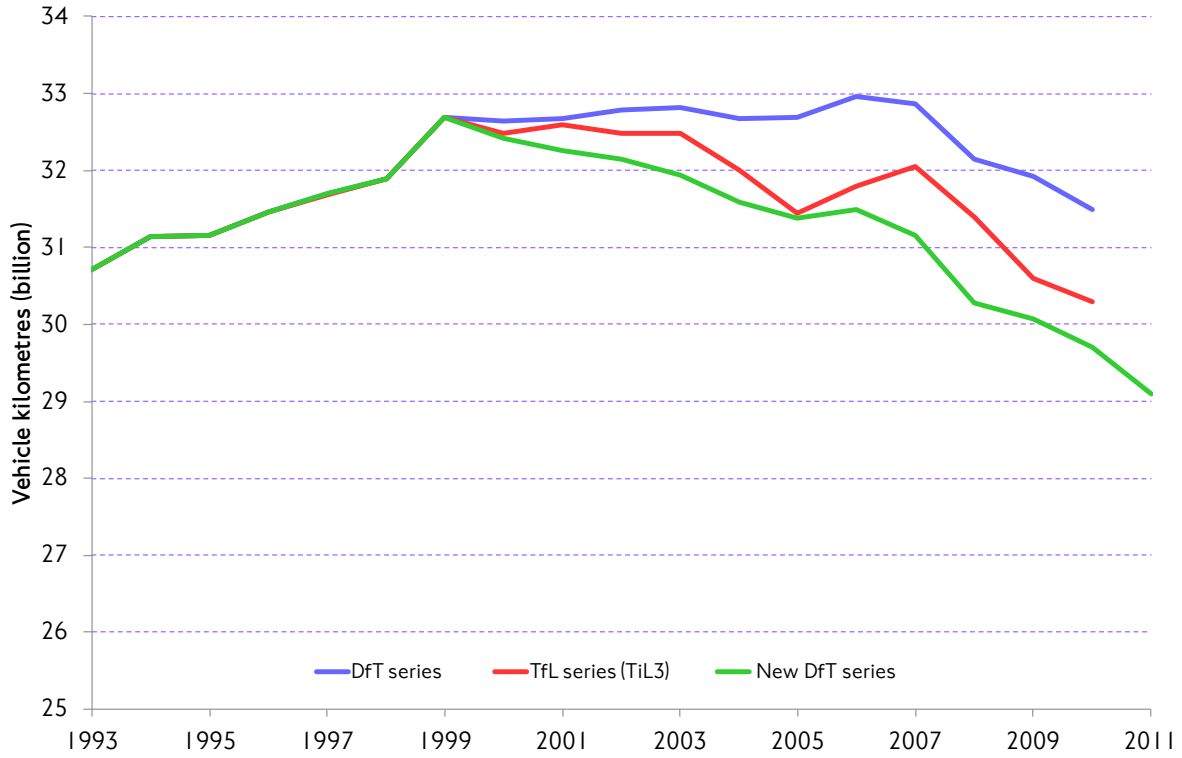
## 3.10 Road traffic trends in London

The road traffic data series for this report has been revised, following the planned benchmarking exercise of the Department for Transport's (DfT's) traffic series for London – https://www.gov.uk/government/organisations/department-for-transport/series/road-traffic-statistics.

Previous Travel in London reports have described the reasoning behind TfL producing a separate traffic series for London, as the DfT series previously did not reflect observed trends in minor road traffic in London. However, a major re-benchmarking of the DfT's road traffic estimates took place in 2010, leading to a revision of the DfT's road traffic series for London. Figure 3.6 shows the difference between these three series (DfT's previous and new series, and TfL's revised series).

The original DfT series showed an increase in traffic in London up until 2006, with year-on-year falls in the following years. TfL's traffic series showed the decline in traffic happening much earlier, from around 2003, which corresponded with the introduction of Congestion Charging in central London (although this was not the only factor involved). The revised DfT series now shows a much more similar pattern to the TfL series, with traffic falling throughout the whole of the last decade, except in central London. TfL will now be adopting the revised DfT series, which means that estimates for previous years will be revised to accord with the DfT series at the Greater London level, although the general trend remains the same (figure 3.6).

Figure 3.6 Comparison of recent traffic series for London – previous DfT series, TfL series, and re-benchmarked DfT series.



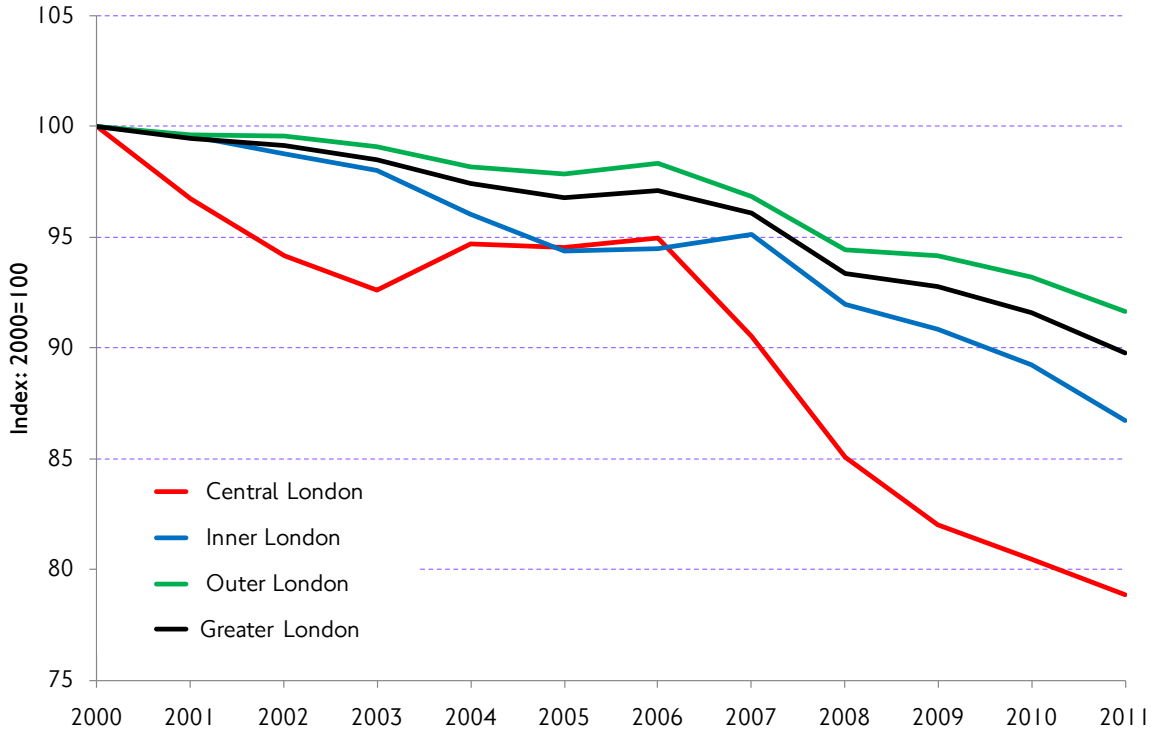

*Source: TfL Group Planning, Strategic Analysis/ Department for Transport.*

According to the new DfT series, traffic in London has been falling over the last decade, with vehicle kilometres in the latest year 10.2 per cent lower than in 2000. This fall has been particularly prominent in central London (an area larger than the Central London Congestion Charging Zone), where vehicle kilometres in 2011 were 21.1 per cent below the 2000 level. In Inner London, the equivalent fall was 13.3 per cent, while vehicle kilometres in Outer London fell by 8.4 per cent. Traffic in Outer London only started to fall steadily in the second half of the decade, from 2007 onwards, after a slight increase in 2006.

In the latest year, traffic has continued to fall. Vehicle kilometres were down by 2 per cent overall, with the biggest fall in Inner London, which was 2.8 per cent down on the previous year. Traffic in central and Outer London fell by 2 and 1.7 per cent respectively (figure 3.7).

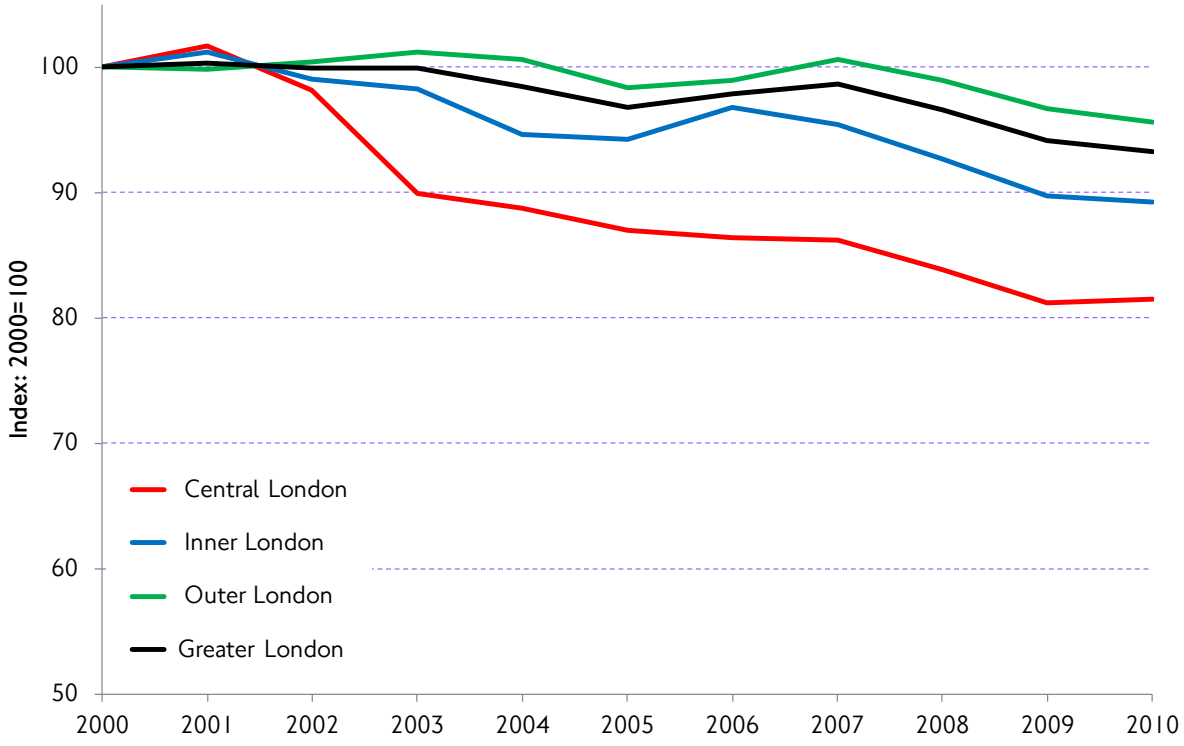
In interpreting the trend for central London shown by the DfT series, it is important to recognise that this reflects a different area and set of conditions to that previously reported by TfL through the Congestion Charging Impacts Monitoring reports. In particular, the DfT series relies on only a small number of permanent counters in central London, most of which are outside of the Congestion Charging zone (for example on the Inner Ring Road). Furthermore, the area defined as 'Central London' in the figure is substantially bigger than the charging zone. The apparent increase in traffic between 2003 and 2005, does not therefore relate directly to congestion charging effects, although the overall trend for traffic in central London over the period covered by the figure is clear enough.

Figure 3.7 Trends in road traffic (vehicle kilometres), all motor vehicles in central, Inner and Outer London. Index: year 2000=100. Revised DfT series.




*Source: TfL Group Planning, Strategic Analysis/Department for Transport.*

Figure 3.8 Trends in road traffic (vehicle kilometres), all motor vehicles in central, Inner and Outer London. Index: year 2000=100. Previous TfL series (for comparison only).




*Source: TfL Group Planning, Strategic Analysis.*

Table 3.3 London road traffic (billion vehicle kilometres) by central, Inner and Outer London. All motor vehicles.

| Year | Central London | Inner London | Outer London | Greater London | Great Britain |
|---|---|---|---|---|---|
| 1993 | 1.3 | 8.7 | 20.7 | 30.7 | 412.3 |
| 1994 | 1.3 | 8.8 | 21.0 | 31.1 | 421.5 |
| 1995 | 1.3 | 8.9 | 21.0 | 31.2 | 429.7 |
| 1996 | 1.3 | 8.9 | 21.3 | 31.5 | 441.1 |
| 1997 | 1.3 | 8.9 | 21.5 | 31.7 | 450.3 |
| 1998 | 1.3 | 8.9 | 21.7 | 31.9 | 458.5 |
| 1999 | 1.3 | 9.1 | 22.3 | 32.7 | 467.0 |
| 2000 | 1.3 | 9.0 | 22.1 | 32.4 | 466.2 |
| 2001 | 1.2 | 9.0 | 22.0 | 32.3 | 472.6 |
| 2002 | 1.2 | 8.9 | 22.0 | 32.1 | 483.7 |
| 2003 | 1.2 | 8.8 | 21.9 | 31.9 | 486.7 |
| 2004 | 1.2 | 8.7 | 21.7 | 31.6 | 493.9 |
| 2005 | 1.2 | 8.5 | 21.7 | 31.4 | 493.9 |
| 2006 | 1.2 | 8.5 | 21.8 | 31.5 | 501.1 |
| 2007 | 1.2 | 8.6 | 21.4 | 31.2 | 505.4 |
| 2008 | 1.1 | 8.3 | 20.9 | 30.3 | 500.6 |
| 2009 | 1.0 | 8.2 | 20.8 | 30.1 | 495.8 |
| 2010 | 1.0 | 8.0 | 20.6 | 29.7 | 487.9 |
| 2011 | 1.0 | 7.8 | 20.3 | 29.1 | 488.9 |

*Source: TfL Group Planning, Strategic Analysis/ Department for Transport.*

Traffic in central London has fallen the most over the last decade. However, central London accounts for just 3.5 per cent of all traffic in Greater London, with the rest of Inner London making up 26.9 per cent. As Outer London therefore makes up the remaining 69.7 per cent, it is clear that trends in traffic in Greater London will closely reflect trends in Outer London.

### London and Great Britain – traffic trends compared

Table 3.4 Index of London road traffic (all motor vehicles, based on vehicle kilometres). Index: year 2000=100.

| Year | Central London | Inner London | Outer London | Greater London - all roads | Great Britain |
|---|---|---|---|---|---|
| 2000 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2001 | 96.7 | 99.6 | 99.6 | 99.5 | 101.4 |
| 2002 | 94.2 | 98.8 | 99.6 | 99.1 | 103.8 |
| 2003 | 92.6 | 98.0 | 99.1 | 98.5 | 104.4 |
| 2004 | 94.7 | 96.0 | 98.2 | 97.4 | 106.0 |
| 2005 | 94.5 | 94.4 | 97.9 | 96.8 | 105.9 |
| 2006 | 95.0 | 94.5 | 98.3 | 97.1 | 107.5 |
| 2007 | 90.6 | 95.1 | 96.8 | 96.1 | 108.4 |
| 2008 | 85.1 | 92.0 | 94.4 | 93.4 | 107.4 |
| 2009 | 82.0 | 90.9 | 94.1 | 92.7 | 106.4 |
| 2010 | 80.5 | 89.2 | 93.2 | 91.6 | 104.7 |
| 2011 | 78.9 | 86.7 | 91.6 | 89.8 | 104.9 |

*Source: TfL Group Planning, Strategic Analysis.*

At the national level, road traffic volumes increased in 2011 following three successive years of falls. However, vehicle-kilometres driven nationally are still lower than at any time since 2003 (table 3.4).

## 3.11 Cycling

This section looks at recent trends in levels of cycling in London, including average daily cycle stages and trips, and cycle flows on the Transport for London Road Network (TLRN) major road network.

### Overall levels of cycling in London

Travel in London 3 discussed the methodology behind the new cycling estimate used for journey stages and trips in London. This shows that, in 2011, there were 570,000 cycle stages in London on an average day, which is a 5.2 per cent increase on 2010. This follows a 5.8 per cent increase in the previous year, with a 78.9 per cent increase in cycle stages since 2001 (figure 3.5).

Table 3.5 Daily average cycle stages and trips in London.

| | Cycle stages | | Cycle trips |
|---|---|---|---|
| | Millions | year on year change % | Millions |
| 2000 | 0.29 | 6 | 0.27 |
| 2001 | 0.32 | 12 | 0.30 |
| 2002 | 0.32 | 1 | 0.30 |
| 2003 | 0.37 | 14 | 0.32 |
| 2004 | 0.38 | 3 | 0.33 |
| 2005 | 0.41 | 9 | 0.39 |
| 2006 | 0.47 | 12 | 0.42 |
| 2007 | 0.47 | - | 0.42 |
| 2008 | 0.49 | 5 | 0.44 |
| 2009 | 0.51 | 5 | 0.47 |
| 2010 | 0.54 | 6 | 0.49 |
| 2011 | 0.57 | 5 | 0.50 |

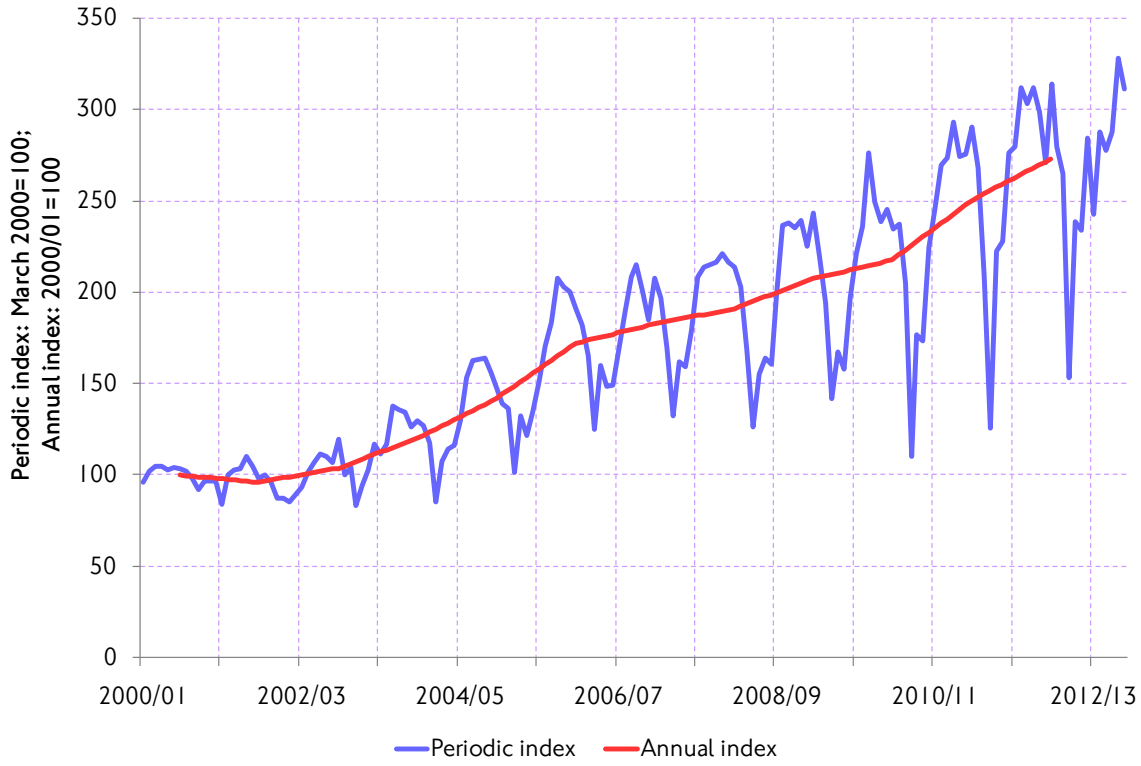
*Source: TfL Group Planning, Strategic Analysis.*

### Cycle flows on major roads in London

TfL monitors levels of cycling on the TLRN through data collected by automatic cycle counters. Figure 3.9 shows the data as an index with base year 2000/01, calculated as the average daily cycle flows within each 4-week reporting period.

Between 2000/01 and 2011/12, the index increased by 173 per cent. Following a 15 per cent increase between 2009/10 and 2010/11, the index increased a further 9 per cent in 2011/12. This is broadly in line with the estimate for the increase in cycle stages (on a London-wide basis) of 5 per cent, as the majority of the counters are in central and Inner London, where cycle flows and growth in cycling generally have tended to be greater than in Outer London. The chart also shows the seasonal variations in cycling, with peaks and troughs in the series corresponding with summer and the Christmas and New Year holidays respectively.

Figure 3.9 Trends in cycle flows on the TLRN – annualised and periodic indices.



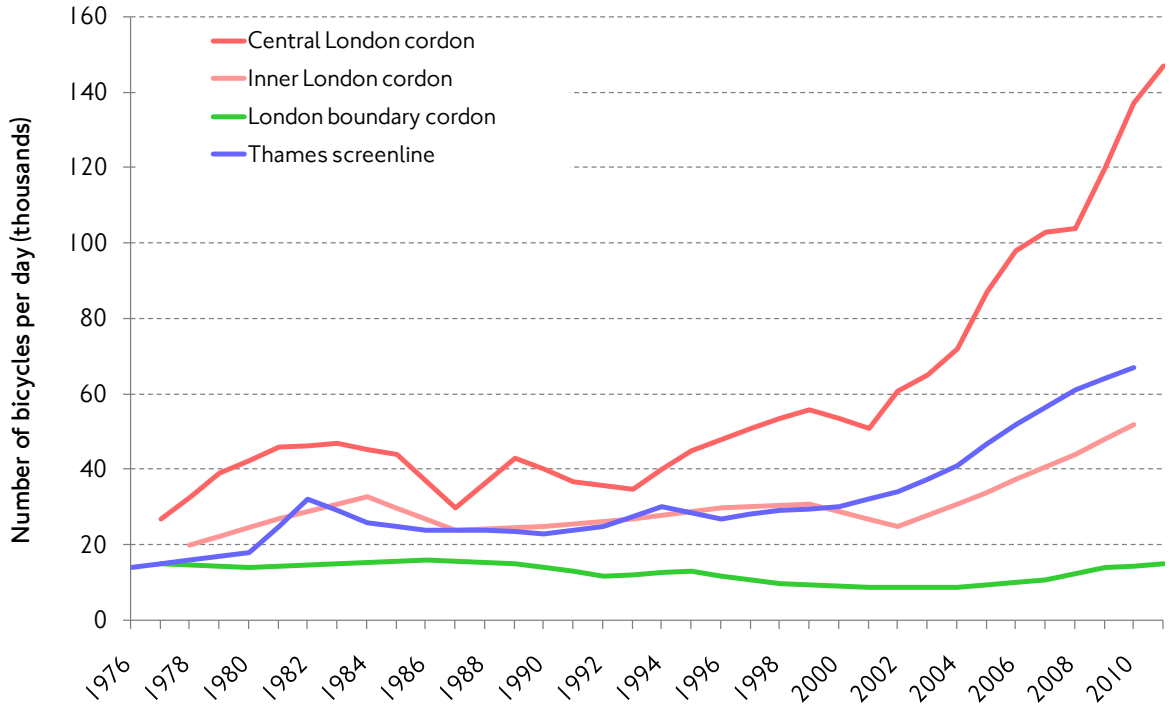

*Source: TfL Surface Transport Delivery & Planning.*

Figure 3.10 shows the levels of cycle flows crossing the three strategic counting cordons in London and the Thames screenline between 1976 and 2011. These data are the total number of cycles crossing the cordon in a full weekday (24-hours). Surveys are taken at the same time of year, to ensure there is no seasonal bias.

The long term trends are clear, with cycling levels at all cordons remaining broadly constant until the year 2000, after which they started to increase. Rates of growth are highest at the central cordon and on the Thames screenline, with cycle flows at the Thames screenline growing by 10 per cent between 2008 and 2010. Flows across the central cordon grew by 15 per cent in 2009 and 14 per cent in 2010, although this growth has slowed down in 2011, where flows increased by 7 per cent. Figures for 2011 for the Thames screenline are not available as the survey was not carried out that year.

Growth has also occurred at the Inner and boundary cordons, although the growth started later and at a much lower rate than in central London. Data for 2011 is available for the London boundary cordon only, where cycle flows increased by 4 per cent compared with 2009.

Figure 3.10 Long-term trends in cycling across strategic cordons and screenlines in London, 24-hour weekdays, both directions.




*Source: TfL Surface Transport.*

### Barclays Cycle Hire in central and inner-east London

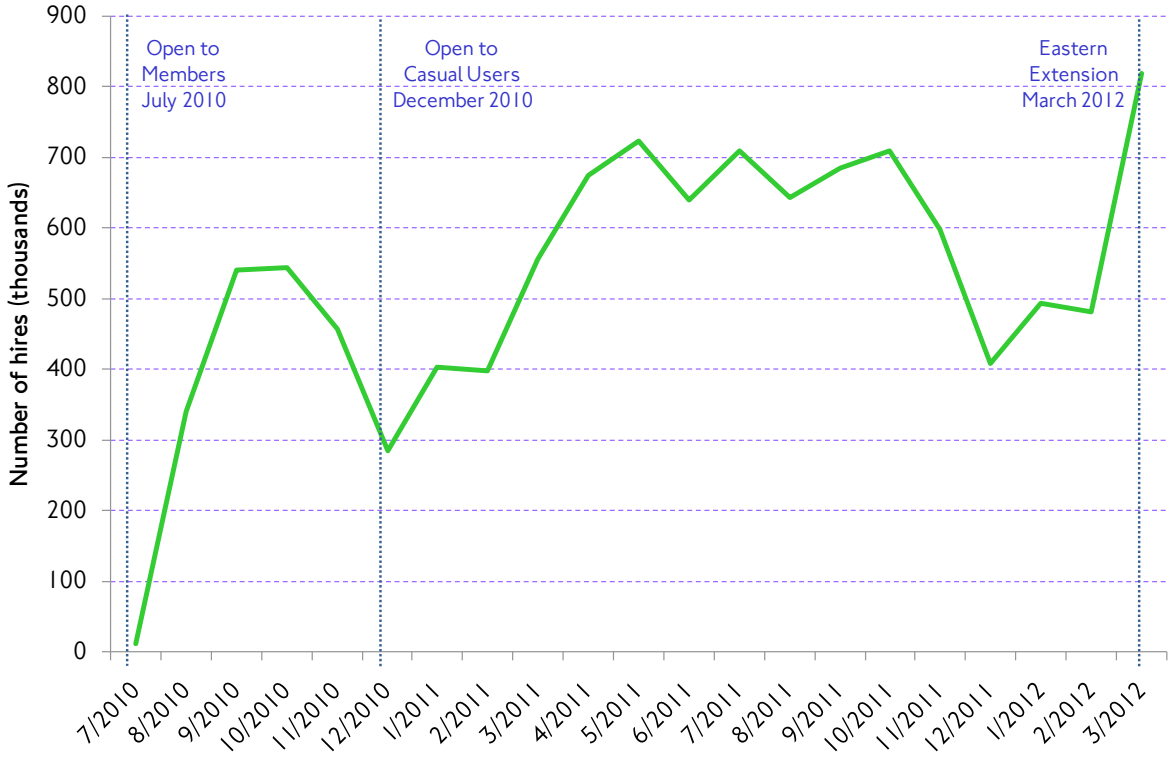
The Barclays Cycle Hire scheme began in July 2010 and has grown steadily over the 21 months to the end of 2011/12, with an average of 20,700 cycle hires a day in 2011/12 and the total number of cycle hires for 2011/12 at 7.6 million.

The scheme has progressively expanded. At first, the Barclay Cycle Hire was only available to members. December 2010 saw the introduction of casual users, a change that allowed anyone to hire a cycle.

The scheme was further expanded to the east in March 2012, with more than 2,700 new docking points provided. In addition to the eastern expansion an extra 1,500 docking points were installed in the original central area and 600 new docking points were provided in a spur to the west. As part of the expansion more than 2,300 new upgraded cycles were provided.

In total more than 8,000 bicycles are available from more than 570 docking stations and 15,000 docking points.

Figure 3.11 Trend in monthly cycle hires by type of hire. Barclays Cycle Hire scheme.




*Source: TfL Surface Transport.*

This progressive expansion is reflected in patronage (figure 3.11), with average hires standing at about 800,000 per month in spring 2012, just at the point where the eastwards extension went live.

## 3.12 Relationship of travel demand on selected travel modes to population change

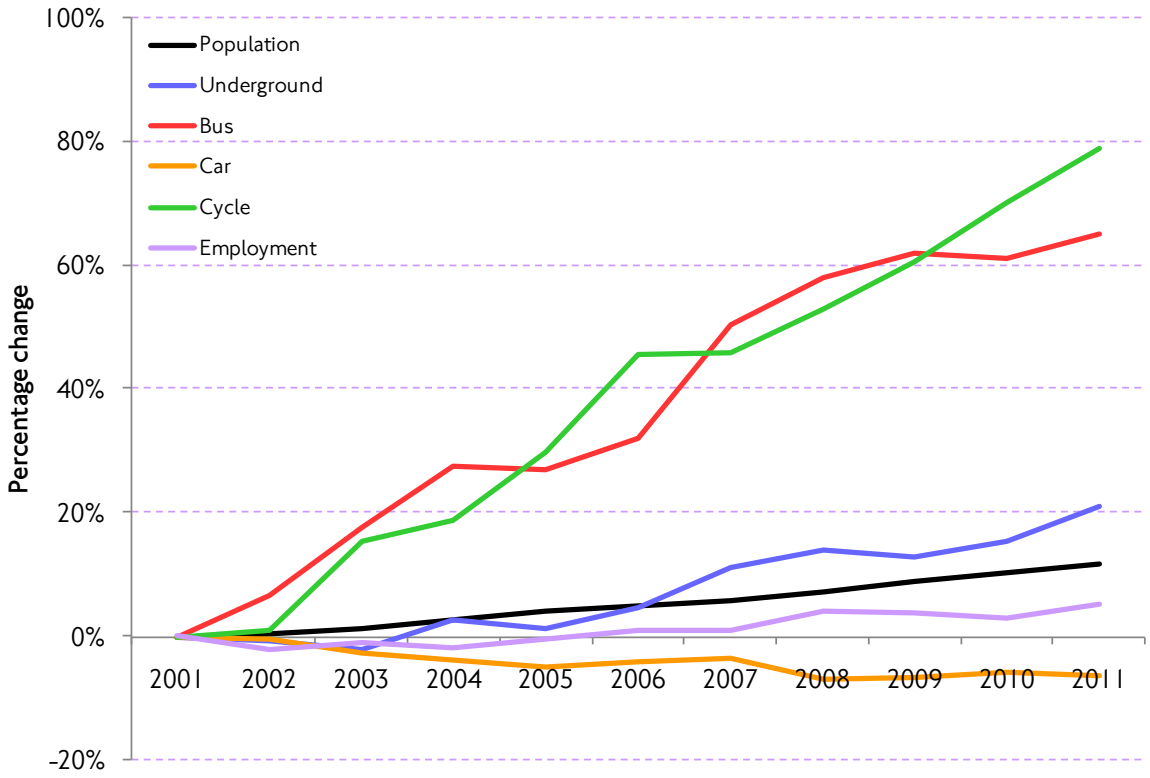
Figure 3.12 shows the relationship of population growth to changes in trip rates on the principal public transport modes. The black line in the figure shows the revised provisional resident population back-series, based on 2011 Census data (see section 2.9). Other lines show trip rates by London residents for key modes indexed to the same 2001 base. London employment is also shown.

It is not the case that increased population implies increased travel across all modes. Other factors are clearly at work. The average rate of population increase between 2001 and 2011 has been 1.1 per cent per year. Only for the Underground is there a reasonably direct relationship - Tube trip rates growing by 8.0 per cent over the period. Bus and cycle trip rates have grown at a much faster (and interestingly similar) rate (4.1 per cent and 5.0 per cent per year respectively).

Basic travel demand (in terms of general trip rates per head of population) varies only little (see section 2.8). There are other factors making these modes differentially more attractive. It is no coincidence that both the bus network and provision for cycling in London have seen substantial improvements over the last decade. Car travel, on the other hand, has not only declined in relative terms, but also in absolute terms, falling by an average of 1.7 per cent per year. The reasons behind this are complex, but the road network has been generally static in terms of

its extent, the evidence suggests that the effective capacity of the road network for general traffic has fallen significantly over the decade (see Travel in London report 4).

Figure 3.12 Relationship of travel demand trends to population change.




*Source: TfL Group Planning, Strategic Analysis.*

The relationship of travel demand to employment is not straightforward. For most modes the trend of growing demand has been consistent despite the impact of the recession on employment, suggesting that population increase has been the primary driver of increased travel volumes over the last decade.

## 3.13 Pedestrian activity in London

Despite being a near-universal travel mode, there remains a general lack of good data on walking in London. The work reported in chapter 10 of this report in connection with the London 2012 Olympic and Paralympic Games has taken this forward in several ways, through trying to derive estimates of total walking in London across summer 2012. However, while representing the best currently available, these estimates are based on relatively incomplete evidence.

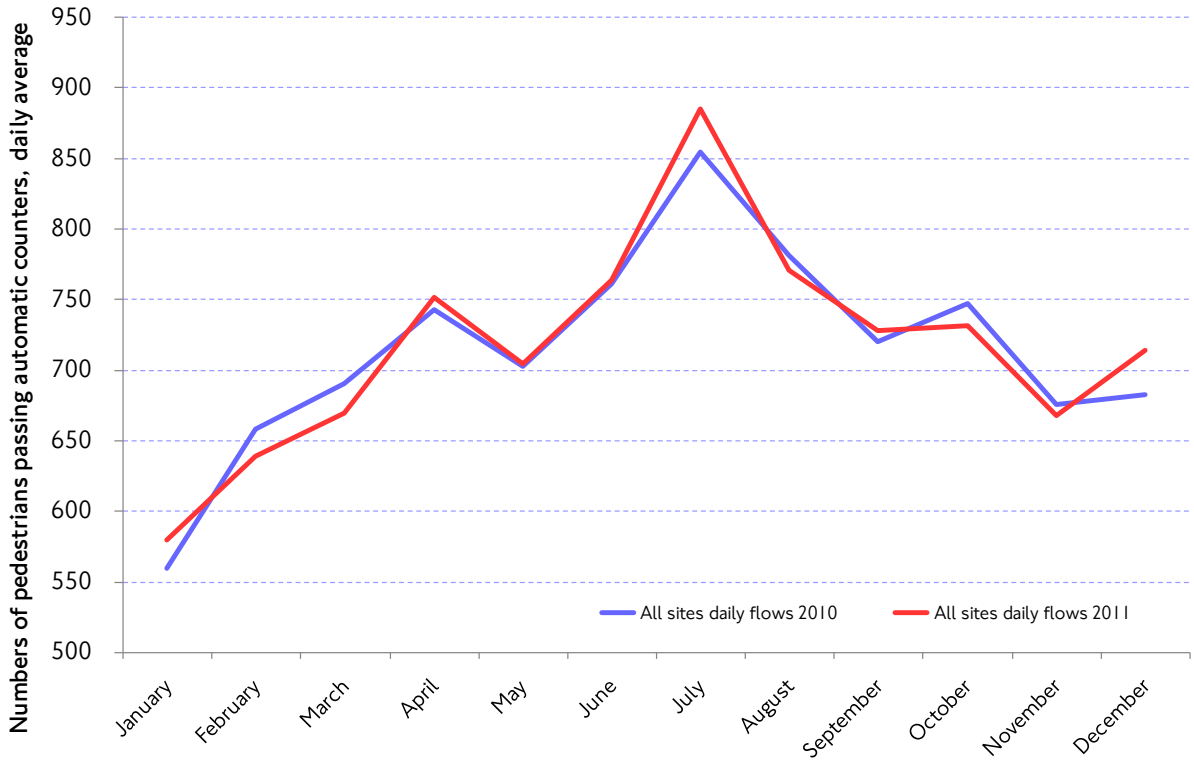
One data source that is available is from automatic pedestrian counters. These are typically located in public places, such as shopping centres, which are likely to see relatively high levels of pedestrians. They are not therefore 'typical' of all locations in London (most of which, of course, see very few pedestrians), and cannot be 'grossed up' to reflect absolute levels of walking, such as person-kilometres. But they do give an indication of relative change in pedestrian activity that is insightful.

One indicator that can be derived from the data is the change in pedestrian levels by time of year, mainly reflecting seasonal variations in the weather (although the relationship is more complex than that). This variation is illustrated by figure 3.13. In

both years, pedestrian volumes follow a very similar pattern, with low flows in the winter months, gradually increasing through the year to peak in July (with a slight dip in May). Walking levels then fall back to winter levels throughout the second half of the year, although levels in December are around 20 per cent higher than in January (reflecting the retail-based location of many of these counters). Numbers of pedestrians in July are around 20 per cent higher than the yearly average, and 53 per cent higher than the low point in January.

TfL is reviewing possible approaches to improving walking data collection in London.

Figure 3.13 Variation in numbers of pedestrians by time of year. Non-representative selection of automatic pedestrian count sites in London.




*Source: TfL Group Planning, Strategic Analysis.*

## 3.14 Freight in London – key trends

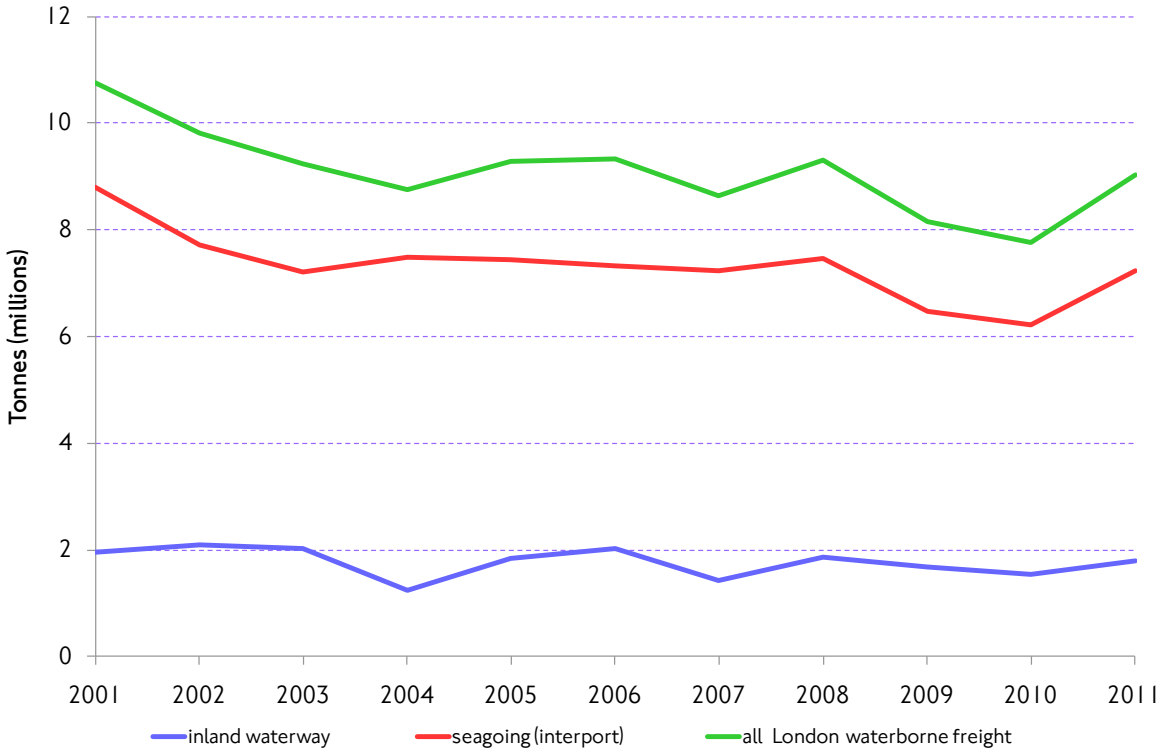
### Road freight

Trends in road freight and servicing vehicle flows are measured through TfL's cordon-based surveys of central, Inner and Outer London. The historic data series for goods vehicle flows at these cordons were described in Travel in London report 4. Only the Outer London (boundary) cordon was updated in 2011. Van flows at this cordon were up slightly in 2011 compared to 2009, the overall trend for vans at this cordon remaining upwards. Van flows in 2011 were 15 per cent greater than 2001, and 139 per cent greater than 1980. The historic trend for heavier goods vehicles at this cordon has however been steadily downwards, with flows in 2009 being 11 per cent lower than in 2001, and 32 per cent below 1980. In 2011 the number of heavier goods vehicles rose, by 10 per cent against 2009.

### Waterborne freight

Overall trends for waterborne freight in London are shown by figure 3.14. This traffic is of two types, inland waterway freight and sea-going cargo through the Port of London. Tonnes lifted have edged down over most of the last decade. However, tonnages increased in 2011 – mainly reflecting increased aggregate traffic associated with major construction projects – notably Crossrail and the Lea Tunnel.

Figure 3.14 Waterborne freight lifted in Greater London: inland waterway and seagoing cargo.

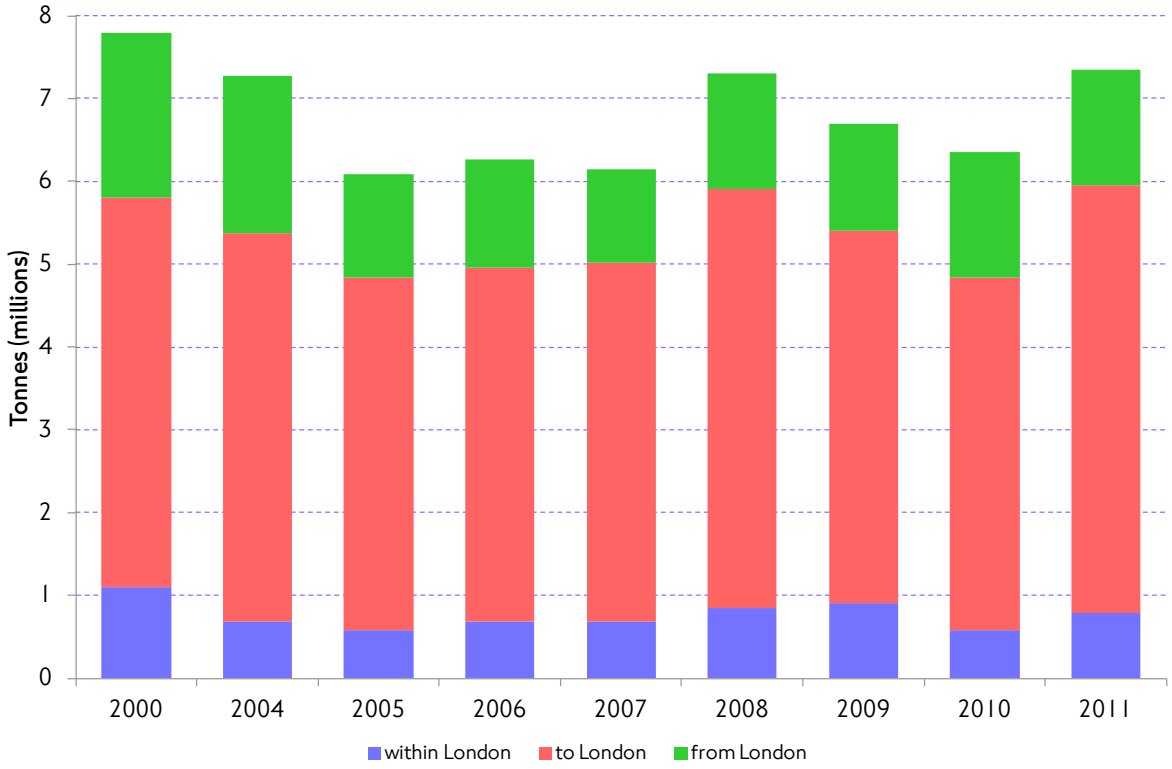



*Source: Port of London Authority.*

### Rail freight

Figure 3.15 shows that total tonnage of rail freight lifted to, from and within London in 2011 increased 15.5 per cent on 2010. Total London rail freight lifted exceeded 7 million tonnes in 2011 for the first time since 2008.

Figure 3.15 Rail freight lifted to, from, and within Greater London.

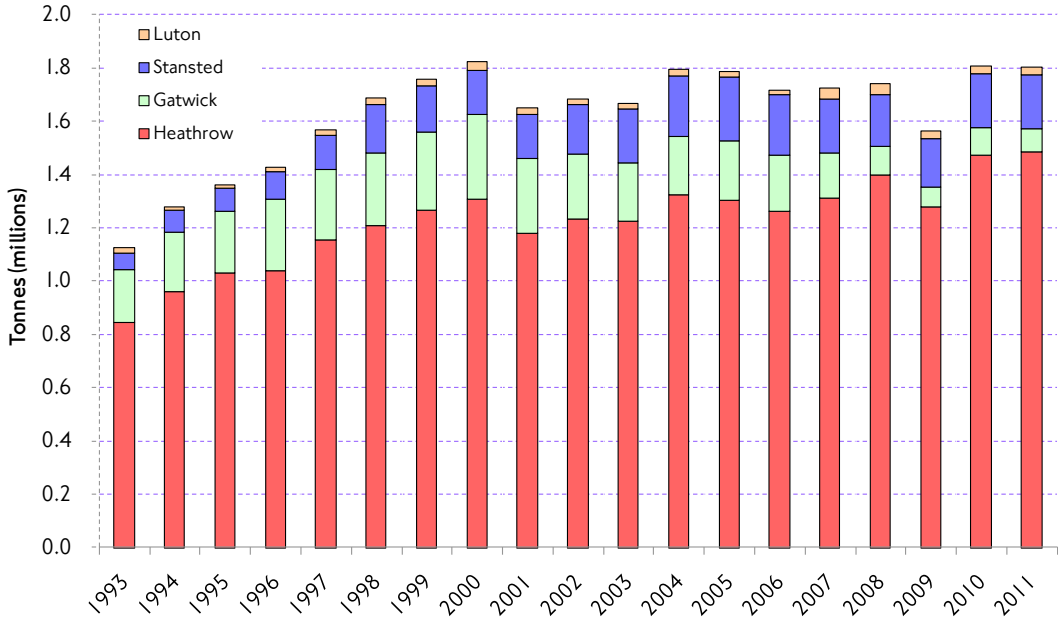



*Source: Transport for London.*

## Air freight

Tonnages of air freight lifted through London area airports in 2011 were similar to the previous year (figure 3.16). About 82 per cent of all London air freight passes through Heathrow.

Figure 3.16 Air freight moved through London's principal airports.



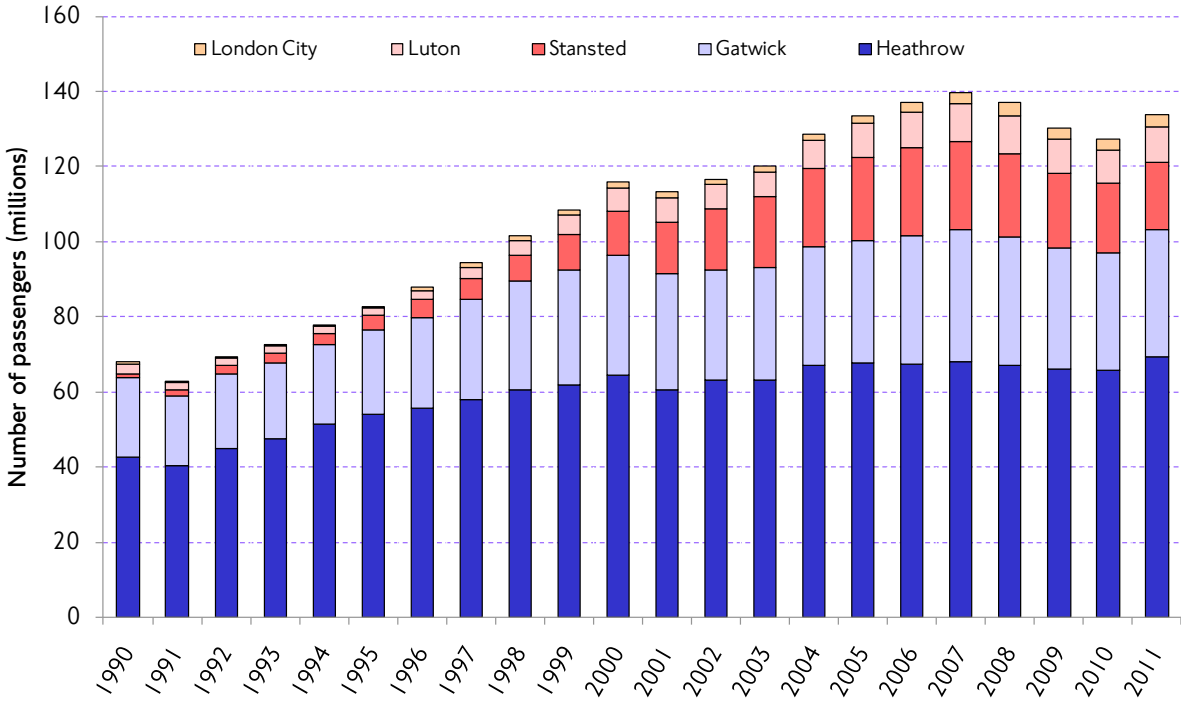

*Source: Civil Aviation Authority.*

## 3.15 Other modes

### Travel by air

London has five international airports, of which three are amongst the 25 busiest airports in Europe. Heathrow saw the highest number of passengers in 2011, with 69.39 million passengers. The previous highest figure was in 2007 (67.85 million). Heathrow accounted for 52 per cent of London's air passengers, with Gatwick accounting for 25 per cent. There was a 5 per cent increase in the total number of passengers using London's airports between 2010 and 2011.

Figure 3.17 Terminal passengers by London area airport.

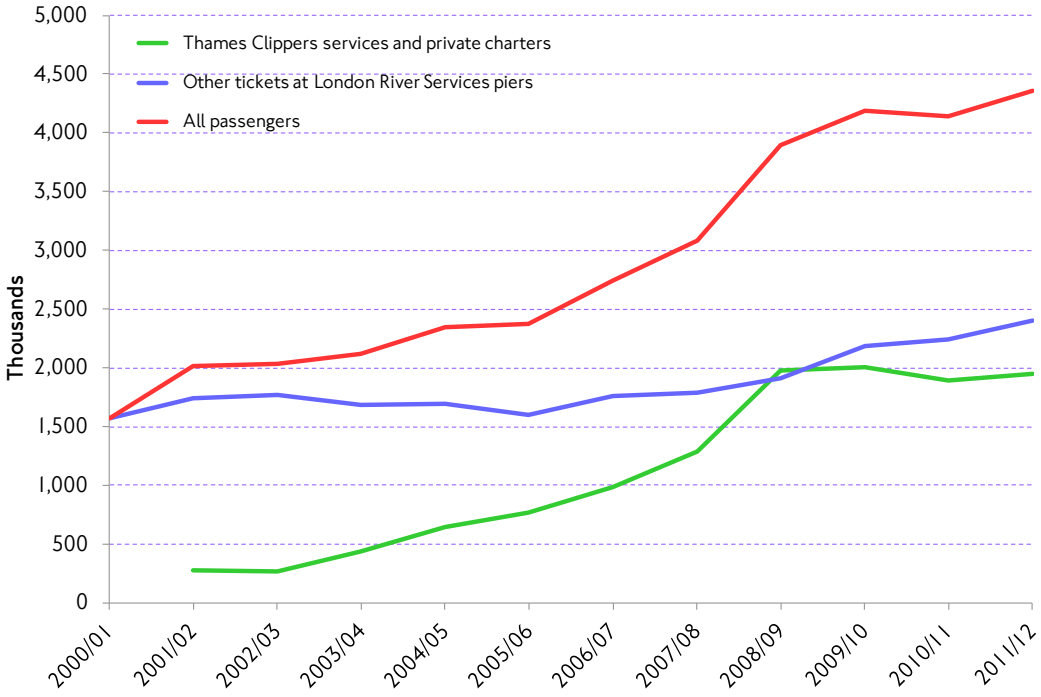



*Source: Civil Aviation Authority.*
*Note: Terminal passengers are those passengers either joining or leaving an aircraft, including interlining and transfer passengers.*

### River services

Figure 3.18 shows a strong pattern of growth, with a 177 per cent increase in the total number of passenger using the river Thames since 2000/01. Total patronage grew by 5 per cent in 2011/12 on the previous year, following a slight decline in 2010/11.

Figure 3.18 Trends for passenger traffic using the river Thames.




*Source: TfL Strategic Analysis.*

### Licensed London taxis and private hire vehicles

In 2012 there were 25,336 drivers in London licensed to ply for hire – an increase of 1 per cent on 2011. There were 23,009 licensed taxis – the highest recorded level. The year 2012 also saw a 6.5 per cent increase in the number of licensed private hire vehicles, alongside a 4.7 per cent increase in licensed private hire drivers. Trends for both of these modes reflect well-established patterns of growth over the past decade.

# 4. Performance of the transport networks

## 4.1 Introduction and content

This chapter reviews aspects of service supply and the operational performance provided by London's transport networks, updating the range of indicators introduced in previous Travel in London reports, and following on from the trends in travel demand on the different transport modes described in the previous chapter. It provides a summary of the performance of the TfL operated mass public transport networks, together with National Rail in London – in terms of indicators of service provision and operational reliability. It then looks at the performance of London's road network – in terms of measures such as traffic speeds, journey times and journey time reliability.

## 4.2 Overview of recent trends in service provision and operational performance for public transport in London

The public transport networks in London have, in recent years, benefitted from the longest run of sustained high performance and service provision ever recorded. The levels of service provided for most major modes are now at all-time highs. Indicators of service provision and performance have improved, in some cases substantially, over the last decade, and this continued in 2011/12.

Table 4.1 summarises key measures of service provision and operational performance, comparing values at the start of the last decade (nominally 2000/01), with those for the 2010/11 financial year and the most recent financial year (2011/12). Clear and sometimes dramatic improvements are evident over the decade, as are the generally high levels of service and operational excellence now being sustained.

Table 4.1 Key indicators of public transport service provision and performance since 2000/01. Summary of typical values.

| Mode | Measure | Start of decade | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|---|---|
| **Service provision** | | | | | |
| Buses | Kilometres operated | 365 million | 483 million | 486 million | 490 million |
| LU | Kilometres operated | 64 million | 69 million | 69 million | 72 million |
| DLR | Kilometres operated | 2.9 million | 4.6 million | 4.7 million | 4.9 million |
| London Tramlink | Kilometres operated | 2.4 million | 2.6 million | 2.7 million | 2.7 million |
| London Overground | Kilometres operated | n/a | 3.2 million | 5.5 million | 6.9 million |
| **Service performance** | | | | | |
| Buses | Excess wait time | 2.2 minutes | 1.1 minutes | 1.0 minutes | 1.0 minutes |
| LU | Excess journey time | 8.6 min | 6.4 min | 6.5 min | 5.8 min |
| DLR | Reliability | 96% | 95% | 97% | 98% |
| London Tramlink | Reliability | 99% | 99% | 99% | 99% |
| National Rail | ORR L&SE PPM | 80% | 92% | 91% | 91% |
| London Overground | ORR PPM | n/a | 93% | 95% | 97% |

*Source: TfL Group Planning, Strategic Analysis.*

Table 4.2 Indicators of public transport service provision and performance by mode.

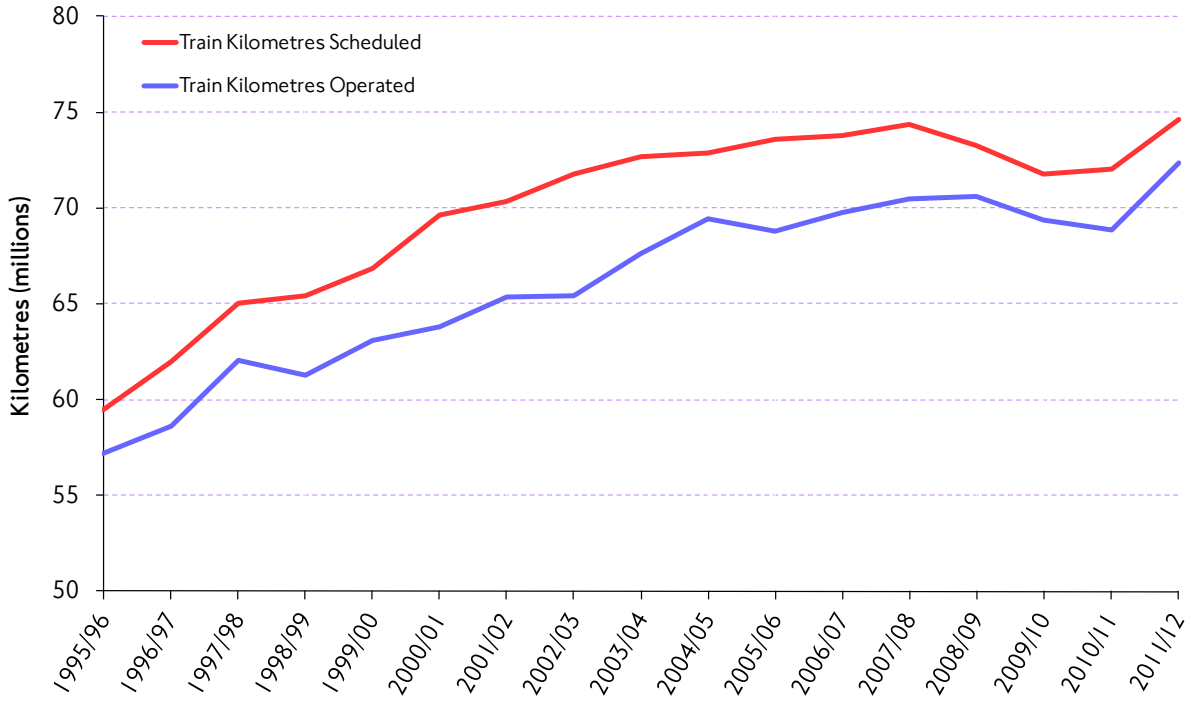
| Service and indicator | Units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | Trend |
|---|---|---|---|---|---|
| **Underground** | | | | | |
| Level of service scheduled | Million train kms | 71.8 | 72.1 | 74.6 | Increasing – historic high |
| Level of service operated | % of schedule | 96.6 | 95.6 | 97.0 | Improving |
| Service reliability | Standardised journey time | 44.1 | 44.6 | 43.8 | Improving |
| Service reliability | Excess journey time | 6.4 | 6.5 | 5.8 | Improving |
| **Bus** | | | | | |
| Level of service scheduled | Million bus kms | 497.2 | 498.5 | 501.6 | Increasing |
| Level of service operated | Percent | 97.1 | 97.4 | 97.6 | Increasing |
| Service reliability | Excess Journey time | 1.1 | 1.0 | 1.0 | Improving |
| **DLR** | | | | | |
| Level of service operated | Million train kms | 4.6 | 4.7 | 4.9 | Increasing – historic high |
| Level of service operated | % of schedule | 97.2 | 97.5 | 97.7 | Improving |
| Service reliability | % of trains on time | 94.8 | 97.4 | 97.5 | Improving |
| **London Tramlink** | | | | | |
| Level of service scheduled | Million train kms | 2.62 | 2.72 | 2.74 | Increasing – historic high |
| Level of service operated | % of schedule | 99.2 | 99.2 | 98.9 | Stable |
| **National Rail** | | | | | |
| Service reliability – all L&SE operators | ORR PPM (% peak only) | 88.8 | 86.8 | 88.1 | Variable |
| Service reliability – all L&SE operators | ORR PPM (% all services) | 91.4 | 91.1 | 91.3 | Stable |
| Service reliability – London Overground | ORR PPM (% all services) | 93.1 | 94.8 | 96.6 | Second highest score for any L&SE Train Operating Company in 2011/12 |

*Source: TfL Group Planning, Strategic Analysis.*

## 4.3 Principal TfL public transport modes: Underground

London Underground has substantially increased its service offering – in the context of a largely static physical network. This reflects the success of the Tube upgrade programme, providing the ability to increase both capacity and service reliability. Train kilometres scheduled in 2011/12 were 7.2 per cent higher than in 2000/01, while train kilometres operated were 13.4 per cent higher.

Figure 4.1 London Underground: train kilometres scheduled and train kilometres operated.




*Source: London Underground.*

Figure 4.1 shows two other significant features. First is that the previous three years have seen small falls in both measures (although note the origin point of the graph). This largely reflects the impact of the Tube upgrade plan, in the form of planned closures of parts of the network at the weekends. The second feature is that the gap between the service scheduled and that actually operated has tended to narrow – denoting a more reliable service (table 4.3). In 2011/12, 97 per cent of scheduled train kilometres were operated.

Underground reliability can also be expressed in terms of passenger focused measures such as average journey time and excess journey time. This is the additional time that passengers have to wait over and above that implied by the schedule as a result of unreliability in the service. Excess journey time has reduced by more than a quarter since that start of the last decade, and by a further 10.8 per cent in the latest year, to an average of 5.8 minutes – this feeding through to substantial reliability benefits for Tube users.

Table 4.3 London Underground – service reliability and journey times.

| Year | Train kilometres scheduled (millions) | Percentage of scheduled kilometres operated | Average actual journey time (minutes) | Average generalised (weighted) journey time (minutes) | Excess journey time (weighted) (minutes) | Excess as % of generalised journey time |
|---|---|---|---|---|---|---|
| 2000/01 | 69.6 | 91.6 | 28.6 | 45.7 | 8.6 | 18.9 |
| 2001/02 | 70.4 | 92.9 | 28.3 | 45.2 | 8.1 | 18.0 |
| 2002/03 | 71.8 | 91.1 | 29.1 | 46.7 | 9.7 | 20.7 |
| 2003/04 | 72.7 | 93.1 | 27.9 | 44.3 | 7.4 | 16.8 |
| 2004/05 | 72.9 | 95.3 | 27.7 | 44.0 | 7.2 | 16.4 |
| 2005/06 | 73.6 | 93.6 | 27.8 | 44.3 | 7.5 | 16.9 |
| 2006/07 | 73.8 | 94.5 | 28.0 | 44.7 | 8.1 | 18.0 |
| 2007/08 | 74.4 | 94.8 | 27.8 | 44.5 | 7.8 | 17.4 |
| 2008/09 | 73.2 | 96.4 | 27.5 | 43.9 | 6.6 | 15.1 |
| 2009/10 | 71.8 | 96.6 | 27.7 | 44.1 | 6.4 | 14.5 |
| 2010/11 | 72.1 | 95.6 | 28.0 | 44.6 | 6.5 | 14.6 |
| 2011/12 | 74.6 | 97.0 | 27.5 | 43.8 | 5.8 | 13.3 |

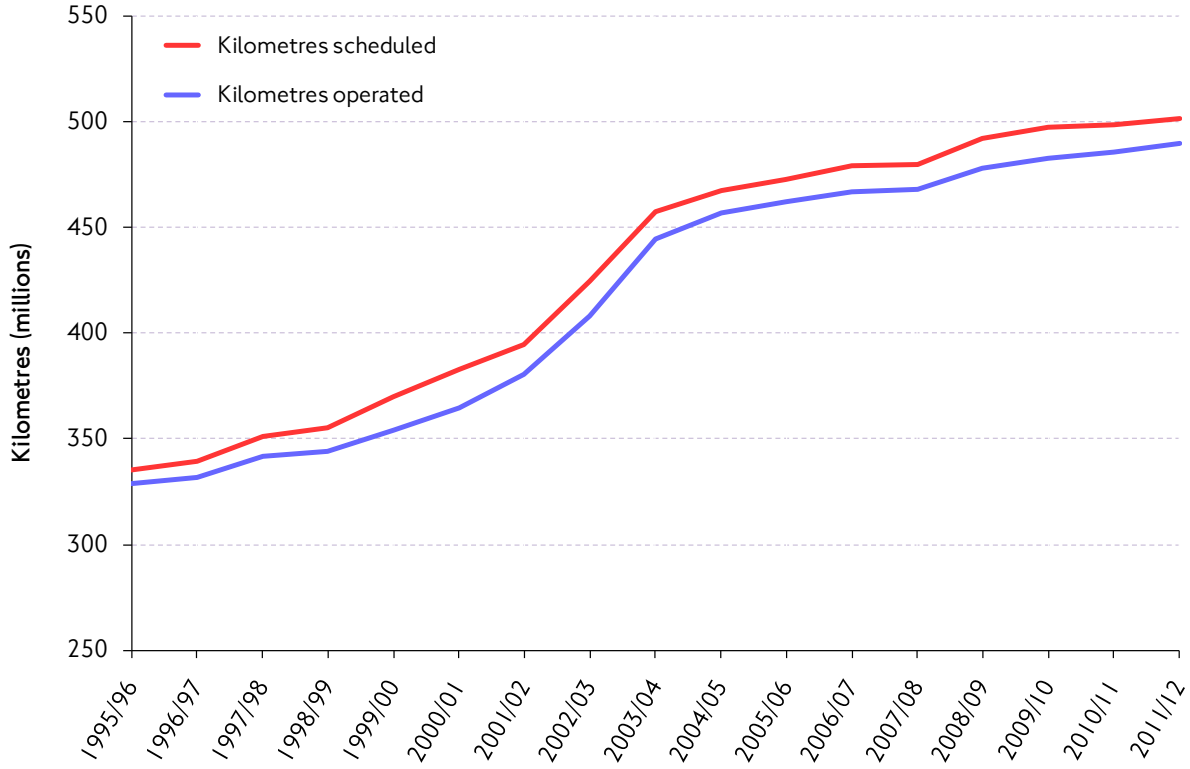
*Source: London Underground.*
*1. Excess journey time is the difference between actual journey time and that expected if services run to time, and weighted to reflect how customers value time.*

## 4.4 Principal TfL public transport modes: bus

### Bus service supply

The bus is one of London's transport success stories. Buses in London carried 2.3 billion people in 2011 – the highest level since the early 1960s. In the financial year 2011/12 London Buses operated 490 million bus-kilometres, 97.6 per cent of the scheduled service, up from 486 million bus kilometres and 97.4 per cent in 2010/11 respectively. This continues the trend of year-on-year increases seen since the start of the last decade.

Figure 4.2 Bus service provision – scheduled and operated bus kilometres.




*Source: London Buses.*

### Bus service performance

Table 4.4 shows measures of bus service reliability. The percentage of timetabled services on time for low frequency bus routes increased again. The average wait time on high frequency bus routes, both actual and 'excess', remained the same in 2011/12 as in 2010/11, at 5.4 minutes and 1 minute respectively. Since 2000/01 there has been a 21 per cent improvement in actual waiting time, with excess waiting time reduced by more than half from 2.2 minutes to 1 minute.

Table 4.4 Indicators of bus service reliability.

| Year | Kilometres scheduled (millions) | Percentage of scheduled kilometres | | | High frequency services[1] | | Low frequency services[2] |
|---|---|---|---|---|---|---|---|
| | | Operated | Lost due to traffic congestion[4] | Lost due to other causes[5] | Average wait time (minutes) | | Percentage of timetabled services on time[3] |
| | | | | | Actual | Excess | |
| 2000/01 | 383 | 95.3 | 2.1 | 2.6 | 6.8 | 2.2 | 67.7 |
| 2001/02 | 395 | 96.4 | 2.0 | 1.6 | 6.6 | 2.0 | 69.4 |
| 2002/03 | 425 | 96.1 | 2.6 | 1.3 | 6.4 | 1.8 | 70.5 |
| 2003/04 | 457 | 97.2 | 1.7 | 1.1 | 5.8 | 1.4 | 74.6 |
| 2004/05 | 467 | 97.7 | 1.6 | 0.8 | 5.6 | 1.1 | 77.1 |
| 2005/06 | 473 | 97.7 | 1.7 | 0.6 | 5.6 | 1.1 | 77.2 |
| 2006/07 | 479 | 97.5 | 1.9 | 0.6 | 5.5 | 1.1 | 78.1 |
| 2007/08 | 480 | 97.5 | 2.0 | 0.5 | 5.5 | 1.1 | 79.1 |
| 2008/09 | 492 | 97.0 | 2.3 | 0.7 | 5.5 | 1.1 | 80.8 |
| 2009/10 | 497 | 97.1 | 2.3 | 0.6 | 5.5 | 1.1 | 80.5 |
| 2010/11 | 499 | 97.4 | 2.1 | 0.5 | 5.4 | 1.0 | 81.4 |
| 2011/12 | 502 | 97.6 | 1.9 | 0.5 | 5.4 | 1.0 | 83.2 |

*Source: London Buses.*
*1. High frequency services are those operating with a scheduled frequency of 5 or more buses an hour.*
*2. Low frequency services are those operating with a scheduled frequency of fewer than 5 buses an hour.*
*3. Buses are defined as 'on time' if departing between two and a half minutes before and 5 minutes after their scheduled departure times.*
*4. Also includes other lost kilometres outside the control of the operator.*
*5. Includes all lost kilometres within the control of the operator.*

## 4.5 Principal TfL public transport modes: DLR

Since 2000/01 the DLR has increased the number of kilometres operated from 2.9 million to 4.9 million, an increase of 68 per cent (table 4.5). Over this time period the percentage of scheduled services operated has fallen slightly, from 98.2 to 97.7 per cent., although generally being sustained at very good levels.

Table 4.5 DLR service provision and reliability.

| Year | Kilometres operated (millions) | Percentage of scheduled services operated | Percentage of trains on time |
|---|---|---|---|
| 2000/01 | 2.9 | 98.2 | 96.3 |
| 2001/02 | 2.9 | 98.3 | 96.6 |
| 2002/03 | 3.2 | 98.1 | 96.3 |
| 2003/04 | 3.4 | 98.2 | 96.6 |
| 2004/05 | 3.3 | 98.5 | 97.1 |
| 2005/06 | 3.6 | 98.7 | 97.3 |
| 2006/07 | 4.3 | 99.2 | 97.8 |
| 2007/08 | 4.4 | 99.1 | 97.3 |
| 2008/09 | 3.9 | 98.4 | 94.6 |
| 2009/10 | 4.6 | 97.2 | 94.8 |
| 2010/11 | 4.7 | 97.5 | 97.4 |
| 2011/12 | 4.9 | 97.7 | 97.5 |

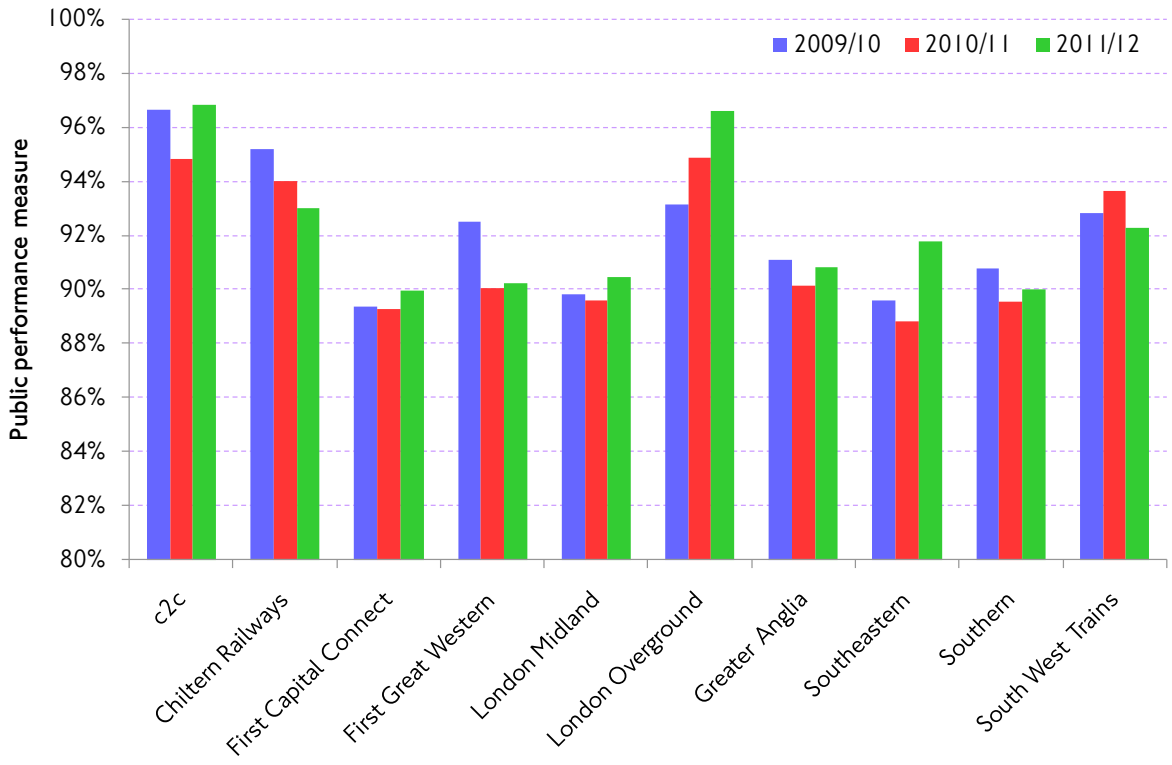
*Source: Docklands Light Railway.*

## 4.6 National Rail and London Overground

This section looks at the performance of National Rail services in London, including TfL's London Overground network. The reliability of National Rail services is measured through the public Performance Measure (PPM), which combines figures for punctuality and reliability into a single measure. The PPM is therefore the percentage of trains 'on time' compared to the number planned. A train is defined as 'on time' if it arrives no later than 5 minutes after the planned destination arrival time for services defined by the Office of Rail Regulation (ORR) as 'London and South East' (L&SE) and regional operators, or not later than 10 minutes for long-distance operators.

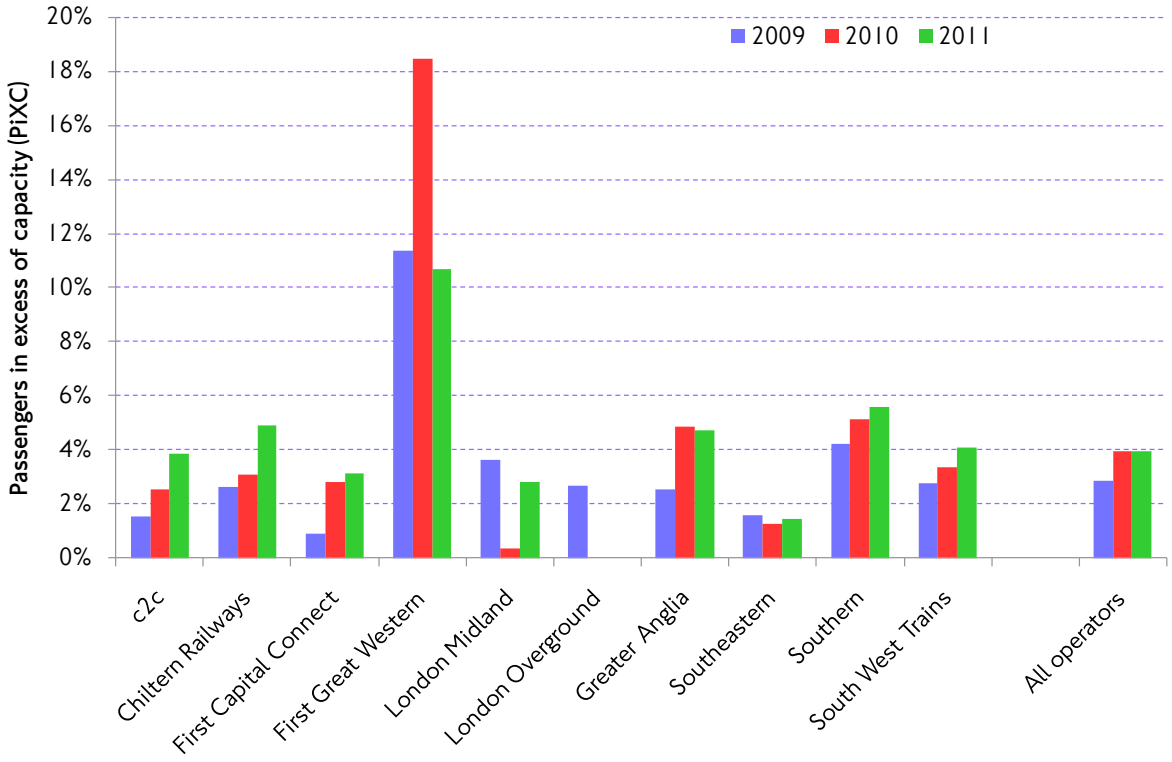
Figure 4.3 shows PPM measures for all services operated by L&SE operators over the last three years. Following general small declines across most operators in 2010/11, all but two operators showed an improvement in 2011/12. These two operators (Chiltern and South West Trains) nevertheless remain among the better-performing operators. London Overground was the second-best performing operator in 2011/12, just behind c2c (lines from London Fenchurch Street).

Figure 4.3 National Rail – public performance measure for London and South East Operators (moving annual average as at Quarter 4 each year).




*Source: Office of Rail Regulation.*

Figure 4.4 Passengers in excess of capacity (PiXC) for National Rail operators in London during the weekday morning peak.




*Source: Office of Rail Regulation.*

Crowding on National Rail is monitored using the DfT's PiXC (Passengers in Excess of Capacity) measure. This compares planned capacity on services arriving in or departing from central London, with PiXC being the difference between the two. Figure 4.4 shows PiXC results (for the morning peak) for the last three years by train operator. Most operators have values below 5 per cent, although there is a perceptible trend towards increases for the most recent year. First Great Western (services from London Paddington) again stands out – although the PiXC value for this operator has almost halved since the previous year, reflecting the introduction of additional trains. For the past two years London Overground had zero per cent of passengers in excess of capacity (PiXC) on Watford to Euston services (the only ones measured for PiXC). However, other parts of the revitalised London Overground network (not measured for PiXC) are experiencing rapid growth and levels of crowding, whilst not currently severe, will be a concern in the future.

## 4.7 Principal TfL public transport modes: London Tramlink

London Tramlink performance in 2011/12 was slightly down from the previous year, reflecting an impact from the civil disturbances of summer 2011. However, London Tramlink continues to deliver a very high level of reliability with 98.9 per cent of scheduled services being operated in 2011/12 – the eleventh year that this measure has been above 97 per cent.

Table 4.6 London Tramlink service reliability.

| Year | Scheduled kilometres (millions) | Operated kilometres (millions) [1] | Percentage of scheduled service operated |
|---|---|---|---|
| 2001/02 | 2.44 | 2.41 | 99.1 |
| 2002/03 | 2.49 | 2.46 | 98.9 |
| 2003/04 | 2.50 | 2.48 | 99.0 |
| 2004/05 | 2.49 | 2.42 | 97.2 |
| 2005/06 | 2.50 | 2.44 | 97.4 |
| 2006/07 | 2.57 | 2.54 | 98.7 |
| 2007/08 | 2.60 | 2.57 | 99.0 |
| 2008/09 | 2.70 | 2.66 | 98.5 |
| 2009/10 | 2.62 | 2.60 | 99.2 |
| 2010/11 | 2.72 | 2.70 | 99.2 |
| 2011/12 | 2.74 | 2.71 | 98.9 |

*Source: London Tramlink.*
*1. Operated kilometres exclude replacement bus services operated during period of track repair works.*

## 4.8 Public transport reliability (MTS indicator)

This section brings together and summarises key reliability statistics for the principal public transport modes in London, including National Rail, as (collectively) one of the Strategic Outcome Indicators for MTS. Values for each mode are shown separately in table 4.7 below, Values for the most recent year are either at, or close to, their long-term historic highs, indicating that high levels of performance on the public transport networks are being sustained.

Table 4.7 Summary of key reliability indicators for the principal public transport modes.

| Mode | Units/measure | 2009/10 | 2010/11 | 2011/12 | Trend |
|---|---|---|---|---|---|
| Underground | Standardised journey time (minutes) | 44.1 | 44.6 | 43.8 | Improving |
| Underground | Excess waiting time (minutes) | 6.4 | 6.5 | 5.8 | Improving |
| London Buses | Excess waiting time for high-frequency routes (minutes) | 1.1 | 1.0 | 1.0 | Improving |
| London Buses | Low frequency routes – percentage of buses on time | 80.5 | 81.4 | 83.2 | Improving |
| DLR | Percentage of trains that ran to time | 94.8 | 97.4 | 97.5 | Recent high |
| London Tramlink | Percentage of scheduled services operated | 99.2 | 99.2 | 98.9 | Slight fall |
| National Rail | ORR's PPM measure for L&SE operators (all services, average for year) | 91.4 | 91.1 | 91.3 | Stable |
| London Overground | ORR's PPM measure for L&SE operators (all services) | 93.1 | 94.8 | 96.6 | Best ever score |

*Source: TfL Group Planning, Strategic Analysis.*

## 4.9 Public transport capacity (MTS indicator)

For MTS monitoring purposes TfL produces an annual indicator of the total capacity provided by the public transport networks. This is calculated from established 'planning capacities' for the vehicles used for the different types of services, multiplied by the kilometres operated by each. The modes included in this indicator are: Underground, buses, DLR and London Tramlink, with values for each mode given separately.

Over the most recent year Underground capacity increased by 4.4 per cent following line upgrades. Bus and Tramlink capacity also increased, and there was a 12.7 per cent increase on DLR, largely reflecting the extension of 3-car operation to the network and (partly) the opening of the extension to Stratford International.

Table 4.8 Total yearly capacity provided by the principal public transport modes. Million place-kilometres.

| Mode | 2009/10 | 2010/11 | 2011/12 | Percentage change 2010/11 to 2011/12 |
|---|---|---|---|---|
| Underground[1] | 63,099 | 62,446 | 65,177 | +4.4 |
| Bus | 29,311 | 29,751 | 29,804 | +0.2 |
| DLR | 2,027 | 2,338 | 2,635 | +12.7 |
| London Tramlink | 544 | 564 | 566 | +0.5 |

*Source: TfL Group Planning, Strategic Analysis.*
*Notes: 1.Values for Underground have been revised to reflect published London Underground assumptions for standing capacity. The absolute values given in the table reflect these revised assumptions, and are internally consistent. They do differ, however, from equivalent values published in previous Travel in London reports, although the percentage changes between years are the same.*

## 4.10 Performance of the road network

### Measures of road network performance

There are three basic measures of road network performance, each having its own characteristics:

- **Average traffic speed** is the simplest measure, but tells us nothing about how actual network performance compares to what might be 'expected' for the network. This would clearly vary, for example, between major and minor or residential roads.
- **Excess delay** is the conventional measure used to describe traffic congestion, and compares the actual travel rate (expressed as minutes per kilometre) for a given journey against the travel rate for the same journey under uncongested conditions (typically and for practical purposes taken as the early hours of the morning).
- **Journey time reliability** is the MTS indicator for traffic smoothing, which quantifies the variability of actual journeys around a nominal average. The measure is independent of both absolute average speed and delay. This measure is described more fully in section 4.5 of Travel in London report 3.

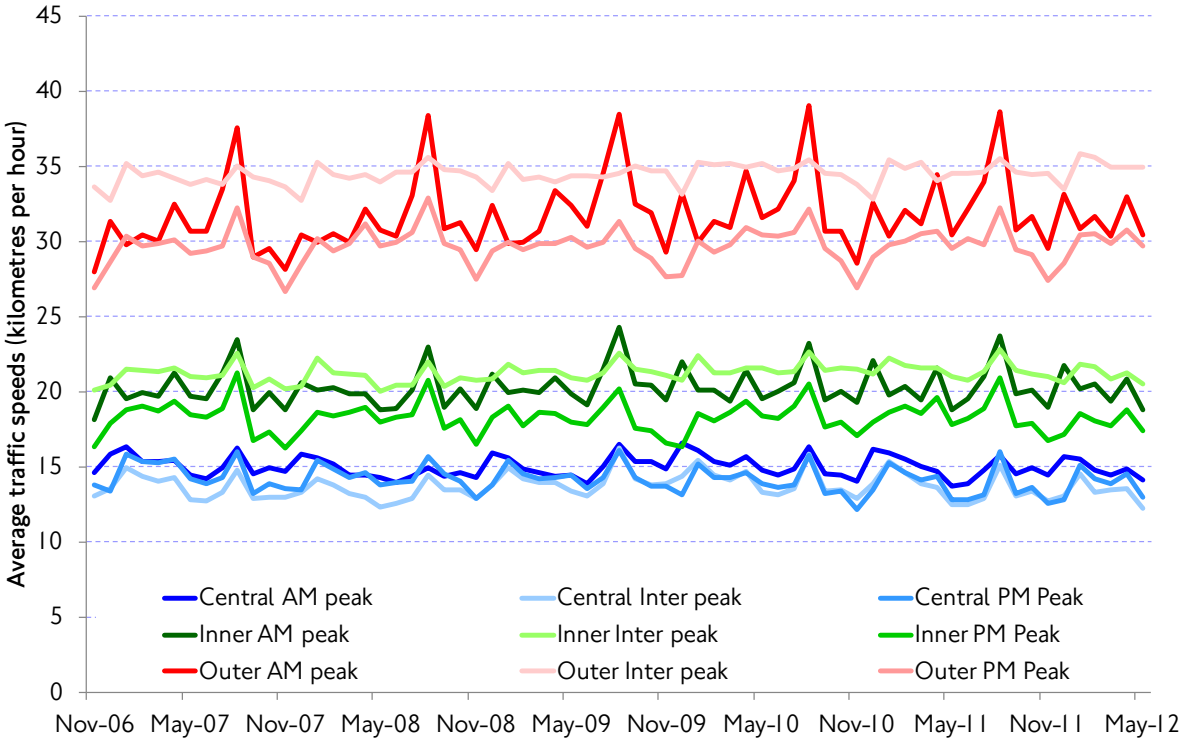
### Average traffic speeds – long-term trends

Section 4.12 of Travel in London report 4 describes the long-term trends of average traffic speeds. Until the late 1990s, there was a trend towards slower speeds. This largely reflected increased traffic demand, as traffic levels were increasing in London on a largely static road network. From the late 1990s onwards, however, traffic levels began to decline, and TfL established that the primary reason for the continued reductions to traffic speed, which would otherwise have been unexpected given falling traffic levels, was a substantial increase in interventions that reduced the effective capacity of the road network for general traffic. These interventions ranged widely, including policies to increase road safety, improve the urban realm, and prioritise public transport, pedestrian and cycle traffic, as well as a large-scale increase in road works by utilities and general development activity.

### Average traffic speeds – recent trends based on GPS satellite tracking data

From 2006 a new source of traffic speed data became available in the form of GPS satellite tracking of an anonymous sample (from general traffic) of 'probe' vehicles equipped with the necessary equipment. This data source is described further in section 4.12 of Travel in London report 4.

Figure 4.5 Average traffic speeds (kilometres an hour) by functional sector of London. Working weekdays, by time period. TfL's 'network of interest'.




*Source: TfL Surface Transport.*

Figure 4.5 shows GPS average speed data over the period November 2006 to May 2012, with values summarised in Table 4.9. Looking first at the figure, there are clear and expected patterns associated with seasonality and the fluctuations in traffic demand on the network over the course of each year. There are also clear and expected differences in the prevailing average speeds for each of central, Inner and Outer London.

The overall trend, however, is one of marked stability over the six year period, which is in contrast to the clear prevailing trends towards slower average speeds over the first half of the last decade shown by previous (moving car observer) measurements. The trend towards slower traffic in London appears, on the basis of this new data, to have been halted.

Table 4.9 Average traffic speeds (kilometres per hour) by functional sector of London. Working weekdays, by time period. TfL's 'network of interest'.

| Area and time period | 2007 speed (kph) | 2008 speed (kph) | 2009 speed (kph) | 2010 speed (kph) | 2011 speed (kph) |
|---|---|---|---|---|---|
| Central AM peak | 15.2 | 14.7 | 15.1 | 15.2 | 14.9 |
| Central inter-peak | 13.6 | 13.3 | 14.2 | 14.0 | 13.6 |
| Central PM peak | 14.5 | 14.3 | 14.3 | 14.0 | 13.8 |
| Inner AM peak | 20.2 | 20.0 | 20.7 | 20.5 | 20.4 |
| Inner inter-peak | 21.1 | 21.0 | 21.4 | 21.6 | 21.4 |
| Inner PM peak | 18.4 | 18.4 | 18.1 | 18.5 | 18.4 |
| Outer AM peak | 31.0 | 31.6 | 32.3 | 32.2 | 32.4 |
| Outer inter-peak | 34.2 | 34.5 | 34.4 | 34.7 | 34.7 |
| Outer PM peak | 29.4 | 30.0 | 29.5 | 29.8 | 29.8 |

*Source: TfL Surface Transport, based on data from Trafficmaster.*
*(1) Value derived by weighting geographic components by proportion of traffic flow within zone.*

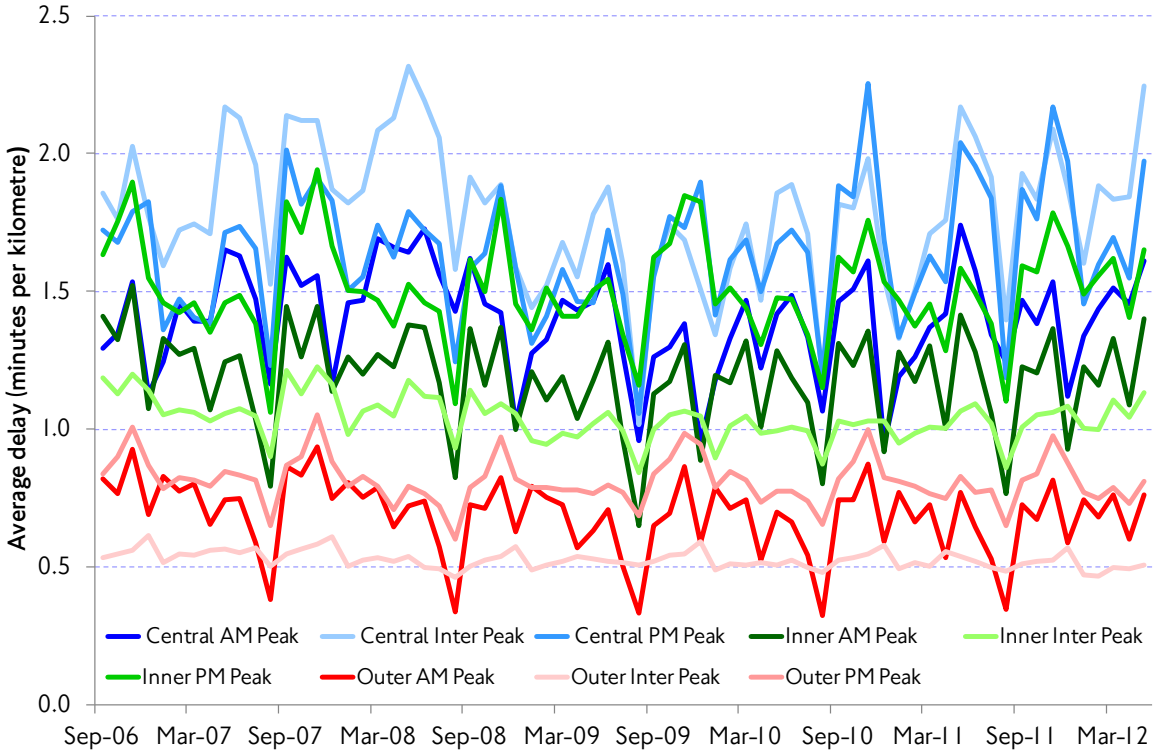
### Vehicle delay (congestion) – recent trends based on GPS satellite tracking data

Figure 4.6 shows congestion values derived from GPS data over the period September 2006 to May 2012, with average values summarised in table 4.10. Looking at figure 4.6 and table 4.10, and in contrast to the equivalent speed data, there was a trend towards reduced congestion values in 2009 relative to 2007 and 2008. However, in 2010 and 2011 congestion values have again edged higher than in 2009.

As well as the expected seasonal and geographical patterns shared with the speed data, figure 4.6 illustrates large differences in the degree of variability of traffic congestion by both area and time period. So, inter-peak congestion in Outer London remains remarkably stable from month to month at about 0.5 minutes per kilometre, whereas morning peak congestion here may vary by up to 100 per cent from month to month. In Inner London the degree of variation in peak-period congestion is also roughly twice that of inter-peak congestion.

In central London the pattern is reversed – inter-peak congestion being the most variable and this coinciding with the period of highest traffic demand on the network. This pattern is characteristic of networks where traffic demand routinely approaches the carrying capacity of the network. Congestion, as a measure of network instability, increases at a greater rate, and journey times are therefore more variable, the closer that traffic demand is to the carrying capacity of the network.

Figure 4.6 Average vehicle delay (minutes per kilometre) by functional sector of London. Working weekdays, by time period. TfL's 'network of interest'.




*Source: TfL Surface Transport.*

Table 4.10 Average vehicle delay (minutes per kilometre) by functional sector of London. Working weekdays, by time period. TfL's 'network of interest'.

| Area and time period | 2007 delay (min/km) | 2008 delay (min/km) | 2009 delay (min/km) | 2010 delay (min/km) | 2011 delay (min/km) |
|---|---|---|---|---|---|
| Central AM peak | 1.4 | 1.5 | 1.3 | 1.3 | 1.4 |
| Central inter-peak | 1.9 | 1.9 | 1.6 | 1.7 | 1.8 |
| Central PM peak | 1.6 | 1.6 | 1.5 | 1.7 | 1.7 |
| Inner AM peak | 1.2 | 1.2 | 1.1 | 1.2 | 1.2 |
| Inner inter-peak | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 |
| Inner PM peak | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Outer AM peak | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| Outer inter-peak | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 |
| Outer PM peak | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |

*Source: TfL Surface Transport, based on data from Trafficmaster.*
*(1) Value derived by weighting geographic components by proportion of traffic flow within zone.*

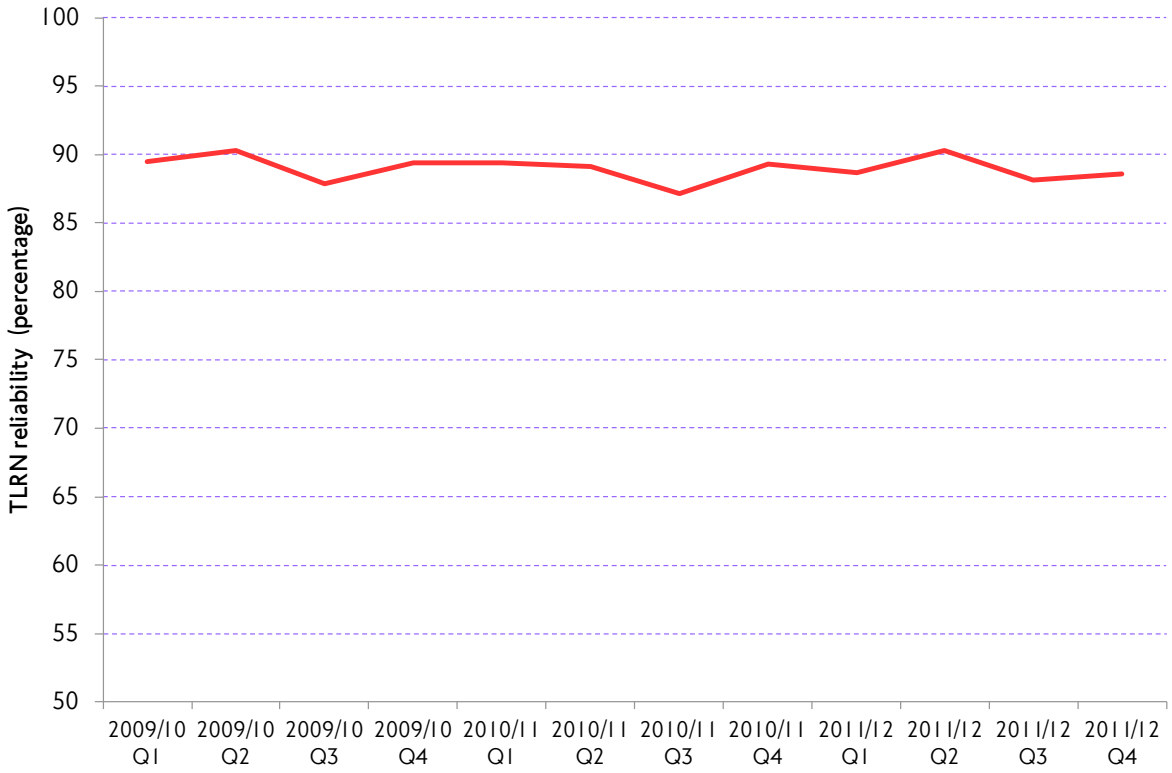
### Smoothing traffic flow and journey time reliability

The MTS seeks to mitigate the effects of road congestion through a range of initiatives aimed at smoothing traffic flow. This describes a broad approach to managing congestion and, in particular, improving road traffic journey time reliability and predictability for all users, including cyclists and pedestrians. The measure set out in the MTS for measuring the impact of these policies is journey time reliability (for general traffic). This is defined as the percentage of journeys completed within an 'allowable' excess of 5 minutes for a standard 30-minute road journey during the weekday morning peak period. This is measured quarterly on a road corridor basis, and has been described and base-lined in previous Travel in London reports.

### Journey time reliability – MTS Strategic Outcome Indicator

Figure 4.7 shows the trend in journey time reliability for the whole TLRN over the 12 quarters of data so far available. Seasonal factors appear to dominate the graphic and there is no evidence as yet, given the limited time-series available, of a clear 'directional' trend in the indicator. Indices for successive quarters hover between 88 and 90 per cent of road journeys in London being completed reliably.

Figure 4.7 Journey time reliability on the TLRN. Percentage of journeys completed within an allowable 'excess' of a normalised average journey time.




*Source: TfL Surface Transport.*

# Monitoring the Mayor's Transport Strategy: Developments and Case Studies

# 5. Safety and security on the transport system

## 5.1 Introduction and content

This chapter updates indicators of safety and personal security on the transport networks, covering road safety, casualties, safety while travelling on public transport, recorded crime on the public transport networks and the perception of crime while travelling.

## 5.2 Road safety

The number of people killed or seriously injured on London's roads during 2011 was the lowest since consistent records began in the 1980s, and follows substantial falls over the last decade. Within this positive overall trend, however, there remained particular areas of concern, especially casualties among cyclists, which have risen over more recent years.

### Historic achievement against road safety targets for 2010

Recent years have seen substantial and sustained reductions in the number of casualties from road traffic collisions in London. In many cases, the applicable targets to 2010 (see Travel in London report 4) had been met and sustained several years ahead of the target date. However, there remained two particular areas of concern. Pedal cyclist KSIs in 2010 were 18 per cent below the 1994-98 average, used as the baseline for the 2010 targets, following an 8 per cent increase in 2010 itself. London had not met the 50 per cent reduction target for pedal cyclist KSIs. Powered two-wheeler KSIs in London were 34 per cent below the 1994-98 average, after a 13 per cent decrease in 2010, the 40 per cent target reduction for this category having not been met. Figure 5.1 shows long-term progress towards the 2010 targets, and extends the trends to include values for 2011.

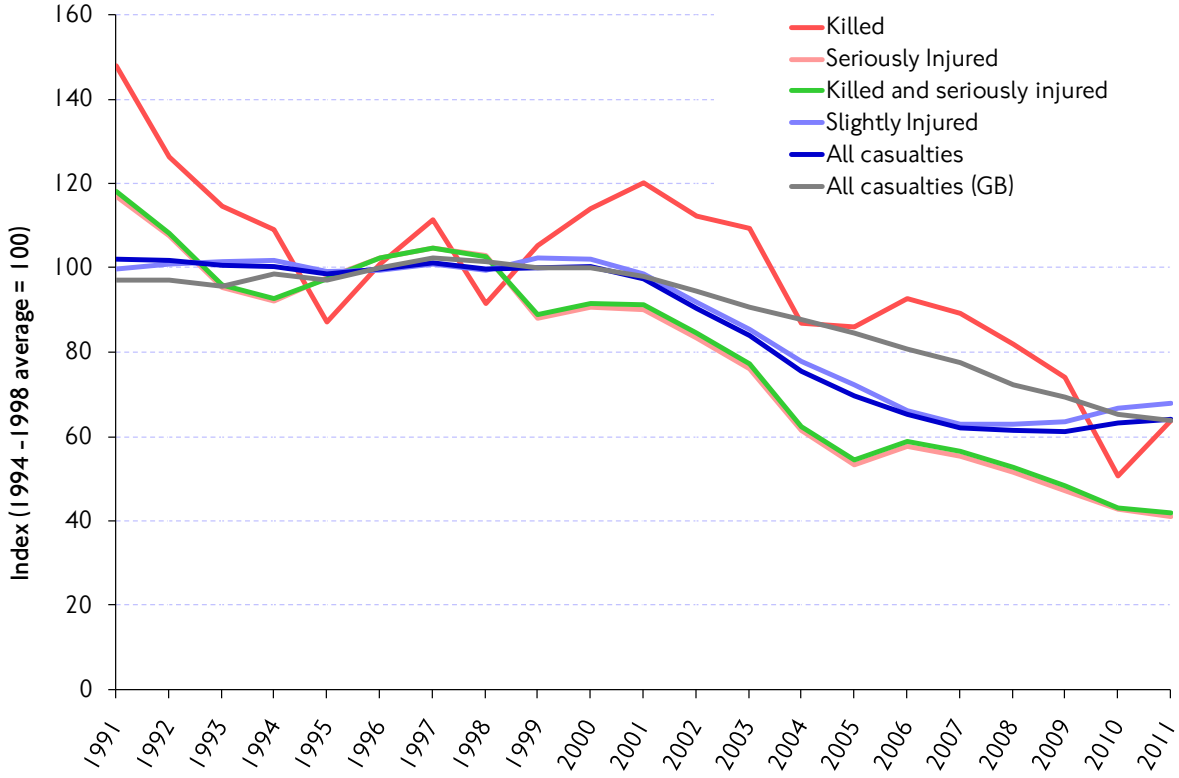
### New road safety targets for London

The Government published a new national Strategic Framework for Road Safety in May 2011 (http://www.dft.gov.uk/publications/strategic-framework-for-road-safety). This sets out the policies that are intended to continue to reduce deaths and injuries on the roads. It encourages local authorities to continue to improve road safety by adopting policies that reflect local priorities and circumstances, and contains forecasts of expected casualty reductions at the national level against a 2005-2009 average (the new baseline for assessing progress). However, the Strategic Framework does not set new formal targets at the national level for road casualty reduction.

### Developments in 2011

In 2011 a total of 24,443 road traffic collisions resulting in personal injury (all severities) were reported to the City and Metropolitan Police – a 1 per cent increase compared to 2010. These collisions resulted in 29,257 casualties. Of these, 159 were fatally injured, 2,646 seriously injured and 26,452 slightly injured.

Figure 5.1 Long term trend for road traffic casualties in London, by severity of injury.




*Source: TfL Delivery Planning, Surface Transport.*

Within this overall total:

- There was a 3 per cent decrease in all KSI casualties compared to 2010, continuing the trend of almost continuous year-on-year reduction since 2000 and the lowest number since 1986 – the first year for which comparable statistics were compiled.
- However, within the KSI category there was a 26 per cent increase in fatalities. This followed the unusually low number reported in London and nationally during 2010 - but the 2011 total was still the second lowest on record.
- Casualties defined as 'slight' increased by 2 per cent (26,452 compared to 26,003) and overall casualties in 2011 increased by 1 per cent compared with 2010.

Table 5.1 shows casualties on London's roads both for 2010 and 2011, compared against the 2005-09 baseline.

## Table 5.1 Road collision casualties in Greater London in 2011 compared with 2005-09 average and 2010.

| Casualty severity | User group | Casualty numbers | | | Percentage change in 2011 over | |
|---|---|---|---|---|---|---|
| | | 2005-2009 average | 2010 | 2011 | 2010 | 2005-2009 average |
| **Fatal** | Pedestrians | 96.0 | 58 | 77 | *+33%* | *-20%* |
| | Pedal cyclists | 16.6 | 10 | 16 | *+60%* | *-4%* |
| | Powered two-wheeler | 43.4 | 28 | 30 | *+7%* | *-31%* |
| | Car occupants | 49.4 | 27 | 32 | *+19%* | *-35%* |
| | Bus or coach occupants | 2.4 | 0 | 1 | - | *-58%* |
| | Other vehicle occupants | 3.2 | 3 | 3 | *0%* | *-6%* |
| | **Total** | **211.0** | **126** | **159** | **+26%** | **-25%** |
| **Fatal and serious** | Pedestrians | 1,216.4 | 913 | 980 | *+7%* | *-19%* |
| | Pedal cyclists | 420.6 | 467 | 571 | *+22%* | *+36%* |
| | Powered two-wheeler | 791.2 | 615 | 599 | *-3%* | *-24%* |
| | Car occupants | 949.0 | 722 | 499 | *-31%* | *-47%* |
| | Bus or coach occupants | 139.6 | 98 | 86 | *-12%* | *-38%* |
| | Other vehicle occupants | 109.8 | 71 | 70 | *-1%* | *-36%* |
| | **Total** | **3,626.6** | **2,886** | **2,805** | **-3%** | **-23%** |
| | **Children (under 16yrs)** | **330.2** | **250** | **230** | **-8%** | **-30%** |
| **Slight** | Pedestrians | 4,214.0 | 4,478 | 4,466 | *-0%* | *+6%* |
| | Pedal cyclists | 2,718.2 | 3,540 | 3,926 | *+11%* | *+44%* |
| | Powered two-wheeler | 3,806.4 | 3,722 | 4,077 | *+10%* | *+7%* |
| | Car occupants | 12,426.8 | 11,851 | 11,293 | *-5%* | *-9%* |
| | Bus or coach occupants | 1,429.8 | 1,303 | 1,384 | *+6%* | *-3%* |
| | Other vehicle occupants | 1,004.8 | 1,109 | 1,306 | *+18%* | *+30%* |
| | **Total** | **25,600.0** | **26,003** | **26,452** | **+2%** | **+3%** |
| **All severities** | Pedestrians | 5,430.4 | 5,391 | 5,446 | *+1%* | *+0%* |
| | Pedal cyclists | 3,138.8 | 4,007 | 4,497 | *+12%* | *+43%* |
| | Powered two-wheeler | 4,597.6 | 4,337 | 4,676 | *+8%* | *+2%* |
| | Car occupants | 13,375.8 | 12,573 | 11,792 | *-6%* | *-12%* |
| | Bus or coach occupants | 1,569.4 | 1,401 | 1,470 | *+5%* | *-6%* |
| | Other vehicle occupants | 1,114.6 | 1,180 | 1,376 | *+17%* | *+23%* |
| | **Total** | **29,226.6** | **28,889** | **29,257** | **+1%** | **+0%** |

*Source: TfL Delivery Planning, Surface Transport.*
*NB. Shaded areas show the National and London casualty reduction target categories.* The government's target is for 10% reduction in the slight casualty rate per 100 million vehicle kilometres. Until guidance is received from DfT on how this should be measured, slight casualties are shown as casualty numbers rather than a casualty rate.*
*Source: TfL Delivery Planning, Surface Transport.*

In 2011 against the 2005-09 baseline:

- All KSI casualties were 23 per cent below the 2005-09 average.
- Child KSIs were 30 per cent below the 2005-09 average.
- Slight casualties were 3 per cent above the 2005-09 average.
- Pedestrian KSIs were 19 per cent below the 2005-09 average.
- Powered two-wheeler rider KSIs were 24 per cent below the 2005-09 average.

However, pedal cyclist KSIs were 36 per cent above the 2005-09 average, having increased by 22 per cent over the year.

**Cyclist and pedestrian casualties – steps being taken to improve safety in London**

Sixteen cyclists were fatally injured in 2011 and 555 cyclists were seriously injured. This should be taken in the context of the considerable increase in the number of people cycling, but is an area of concern for the Mayor and TfL, and work is under way to tackle cycle safety issues as a matter of urgency. This includes the review of around 500 junctions across London, looking at where the road network can be made safer for cyclists.

In addition, TfL has already begun to make improvements at Bow roundabout where two cyclists were killed last year. TfL is also helping to fund cycle training for thousands of children and adults in boroughs across the city, and funding a Cycle Task Force, made up of around 40 Metropolitan Police officers, to directly enforce against illegal activity and reduce conflicts at junctions.

Both TfL and Crossrail are seeking to ensure that any heavy goods vehicle (HGV) working for them is fitted with cycle safety devices, such as blind spot mirrors and side guards. TfL is also making the case for similar measures to be implemented at the European level.

The Mayor and TfL are also lobbying Government for changes to regulations. An example is to allow the trialling and use of cycle-specific traffic signals, already commonly used in Europe, to improve cycle safety on the Capital's roads. This follows a recent initiative with blind spot, or 'trixi' mirrors, which Government has now approved for use at signalised junctions, following a successful trial by TfL. These will now be rolled out more widely on the TfL road network.

**New road safety plan for London**

The Mayor has recently been out to consultation with a new draft Road Safety Action Plan for London, which sets out priority areas for action to deliver road safety improvements to 2020 across the capital. As part of this, TfL proposes to establish a new Road Safety Reference Board for London. This will include borough representatives and road safety stakeholders. The Road Safety Reference Board will steer the implementation of the draft Road Safety Action Plan as well as shape and develop future road safety policy in London.

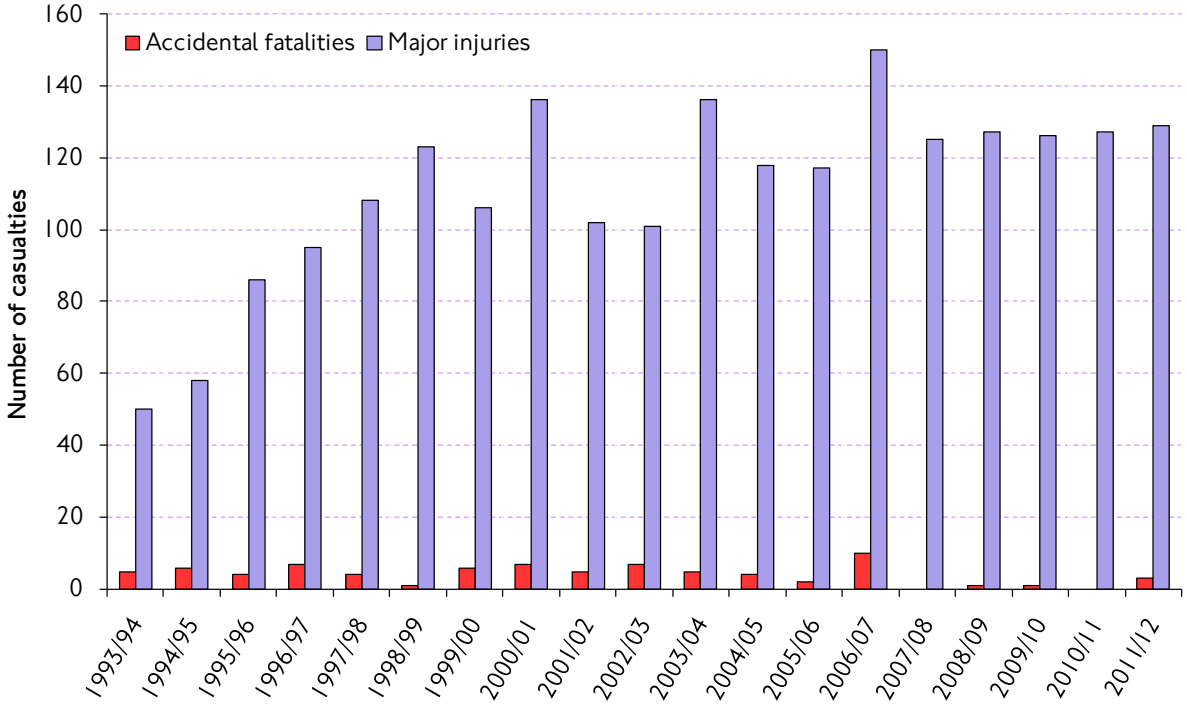
## 5.3 Passenger safety on the public transport networks

Overall, and particularly when viewed in the context of rising service levels and patronage, London's public transport networks continue to offer a safe travelling environment, with notable improvements to bus passenger safety over the past five years.

### London Underground

On the Underground, passenger injury rates in 2011/12 were similar to recent years, with three fatalities and 129 other injuries. One fatality occurred at Kentish Town when a customer fell and sustained a head injury whilst sliding down an escalator. The second fatality occurred when a customer was smoking between carriages and slipped under the train. A third involved an intoxicated passenger at Baron's Court. The trends for recent years need to be seen against a backdrop of increased Underground patronage, and therefore shows a small reduction in risk per passenger overall.

Figure 5.2 Number of people killed or injured while travelling on London Underground.

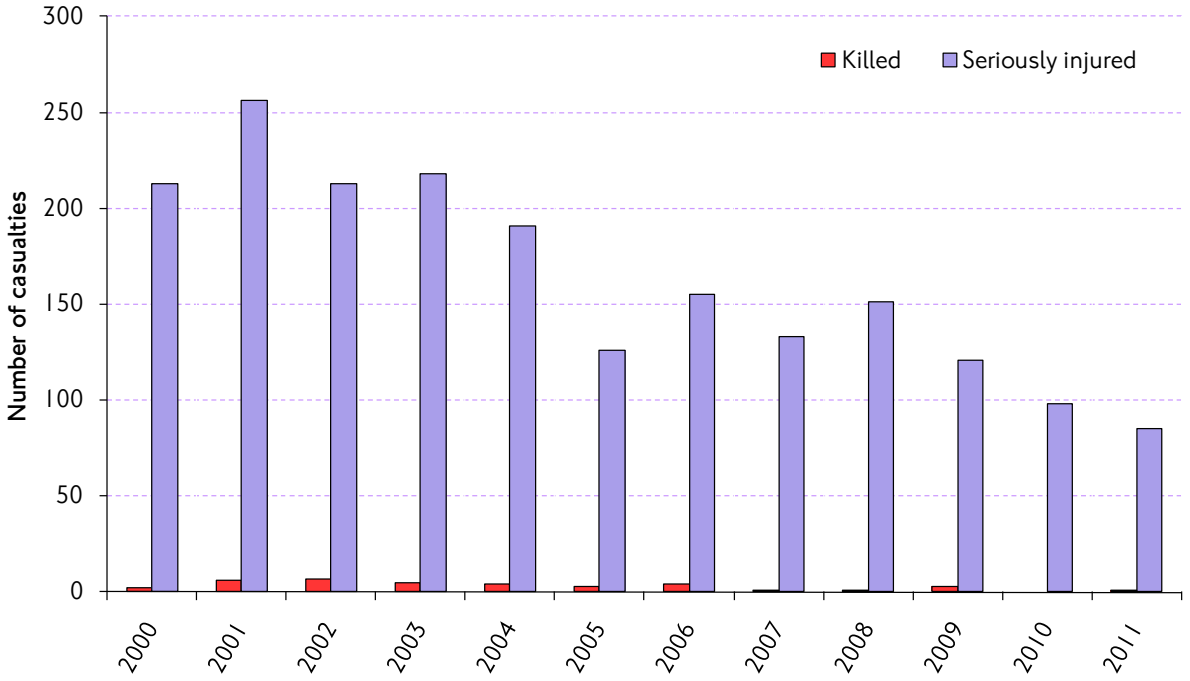



*Source: Transport for London.*
*Excludes suicides and victims of assault and terrorist activity.*

### Buses and coaches

In 2011, 85 bus users sustained major injuries in London, with one fatality. The fatality involved an older passenger falling within the vehicle. These casualty numbers exclude pedestrian and other vehicle users who might have been injured in collisions involving buses or coaches – these are included in the statistics described in section 5.2. Figure 5.3 shows a consistent trend of improvement in bus or coach passenger injuries over the last decade: the number of people killed or sustaining major injuries in 2011 standing at roughly half of the typical values at the start of the decade. This also includes an approximate 65 per cent increase in bus or coach patronage and therefore also represents a substantial reduction in risk per passenger.

Figure 5.3 Number of people killed or sustaining major injuries while travelling on buses or coaches in London.



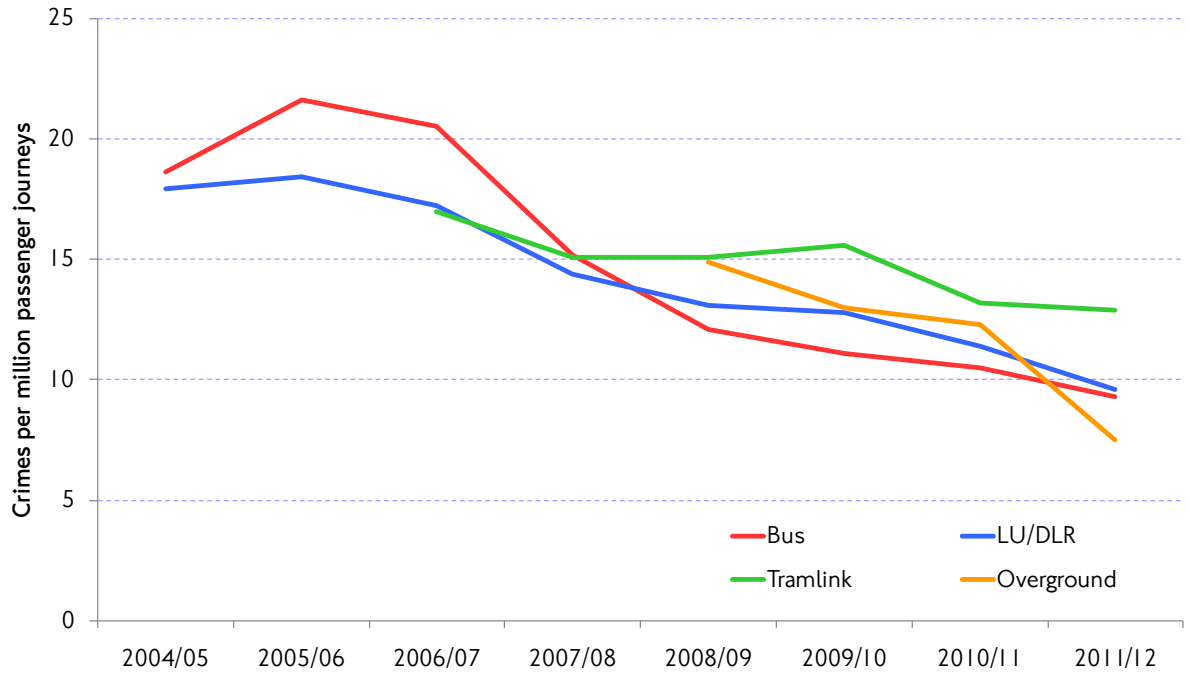

*Source: Transport for London.*

## 5.4 Crime and anti-social behaviour on the public transport networks

London's transport system offers a safe, low crime environment with crime rates on the bus, Underground and DLR networks having reduced substantially since 2005/06. Rates of reported crimes on or near the bus network have more than halved over this period, down by 57 per cent to 2011/12. And those on the Underground and DLR have reduced by almost half (48 per cent).

Progress during 2011/12 was consistent with recent trends (figure 5.4). There were 9.3 reported crimes per million customer journeys on the bus and coach network, down from 10.5 in the previous year (a reduction of 11.4 per cent), and 9.6 crimes per million customer journeys on the Underground and DLR network, down from 11.4 in the previous year (a reduction of 15.8 per cent). Rates of reported crime on both London Overground also fell, by 38.9 per cent (as journeys substantially increased) on London Overground, and by 0.2 per cent on London Tramlink.

Figure 5.4 Crime on TfL's public transport networks. Rate per million passenger journeys.




*Source: TfL Community Safety, Enforcement and Policing Directorate.*

A full breakdown of the totals shown by figure 5.4, in terms of the main categories of crime and disorder, can be found in TfL's Crime Statistics Bulletin for 2010/11 (http://www.tfl.gov.uk/corporate/about-tfl/19385.aspx).

**The Mayor's Strategy to improve transport safety and security in London**

The Mayor's strategy to improve transport safety and security in London, 'The Right Direction' (http://www.london.gov.uk/publication?right-direction), was published in February 2011. This contains an analysis of recent trends in reported crime rates, and summarises the impact of recent anti-crime and disorder initiatives, such as more visible policing and the public transport alcohol ban.

## 5.5 Perceptions of crime and anti-social behaviour on the transport networks

London residents' perception of their sense of safety and fear of crime when travelling in London during the day, and after dark, is an MTS Strategic Outcome Indicator. The indicator is derived from an annual telephone survey with a representative sample of around 1,000 residents.

In 2011, 95 per cent of London residents felt safe on the modes that they travelled on regularly (at least once a week) during the daytime hours. After dark, this proportion was 76 per cent. This is a slight decline from the results reported in 2010 when the percentages for those feeling safe were 97 and 78 per cent, a 2 and 3 per cent decrease, respectively.

The reduction in overall perception of safety is mainly down to the decline in perception of safety for walking, which saw a fall of 3 and 6 per cent for travelling during the day and after dark respectively over the most recent year.

# 6. Transport, air quality and greenhouse gas emissions

## 6.1 Introduction and content

This chapter focuses this year on the new 2010 update to the London atmospheric emissions inventories. This was a major exercise undertaken by TfL in collaboration with the GLA, and has included comprehensively updating the methodologies used to estimate emissions from mobile sources. Consequently, the new estimates for key air pollutants are not directly comparable with estimates published for previous years. This chapter summarises the results of these updates for components where comparable estimates are so far available (only). The full updated dataset will be published early in 2013.

## 6.2 Emissions of particulate matter ($PM_{10}$) from ground based transport in London

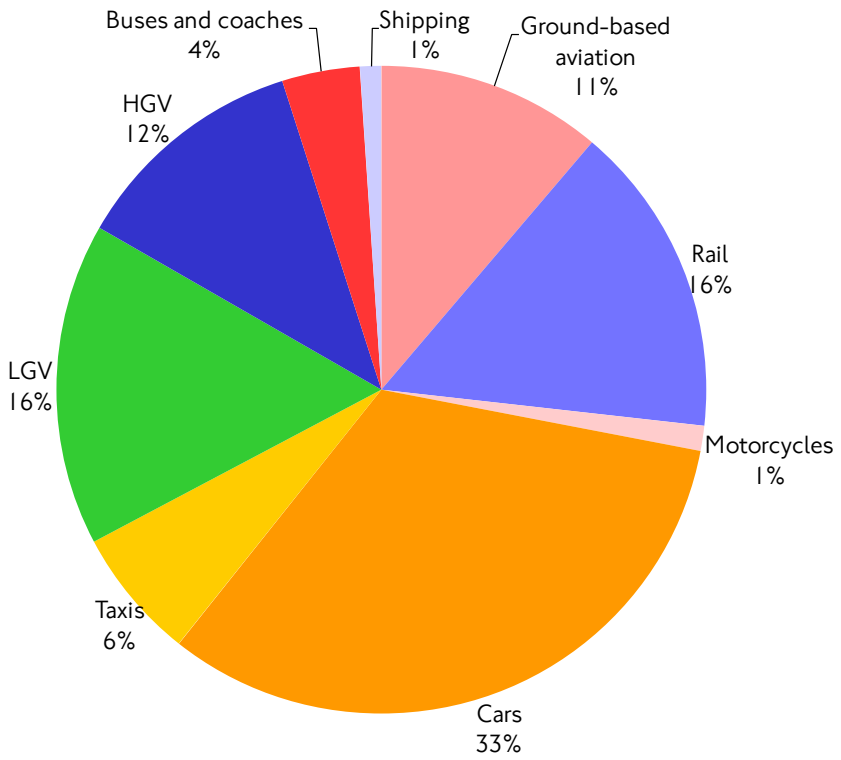
On an equivalent basis, exhaust $PM_{10}$ emissions to atmosphere from ground-based transport fell by 12.4 per cent between 2008 and 2010 – from 839 to 735 tonnes. This is a new estimate based on a revised methodology for the London Atmospheric Emissions Inventory. At present this estimate excludes particulate matter from non-exhaust sources (tyre and brake wear and re-suspension), as updated estimates are not comparable with previous estimates.

Compliance with health-based air quality limit values for concentrations of $PM_{10}$ was achieved in London in 2010 and 2011 at monitoring sites reportable to the European Union. However, it has been more challenging to remain below limit value concentrations at a small number of non-reportable sites. While concentrations of $PM_{10}$ from all sources are the determining factor for limit value compliance, for Mayor's Transport Strategy monitoring purposes it is the $PM_{10}$ emitted from ground-based transport (excluding aviation) that is of interest. Due to the significant changes in the method for calculating non-exhaust $PM_{10}$ this data, along with a full description of the revised methodology, will be published in the new year.

The estimate for 2010 is that 735 tonnes of exhaust $PM_{10}$ were emitted from these sources in London. On an equivalent basis, using the revised methodology, ground-based transport (excluding aviation) $PM_{10}$ emissions fell by 12.4 per cent between 2008 and 2010 – from 839 to 735 tonnes.

Figure 6.1 and table 6.1 show how this ground-based transport emission breaks down by principal source. Looking at table 6.1, and on a like-for-like basis, $PM_{10}$ exhaust emissions from road transport fell by 15.3 per cent between 2008 and 2010. This reflects continuing improvements to the emissions performance of the vehicle fleet and the increased adoption of later 'Euro' emissions standards for vehicles, as encouraged by schemes such as the London Low Emission Zone. Emissions from rail transport increased by 2.6 per cent, largely reflecting increased services, while that from aviation reduced by 4.6 per cent, largely reflecting cleaner aircraft.

Figure 6.1 Basic source apportionment for exhaust $PM_{10}$ emissions in London. 2010 London Atmospheric Emissions Inventory.




*Source: TfL Group Planning, Strategic Analysis.*
*This figure includes $PM_{10}$ emissions from exhaust only.*

Table 6.1 Basic source apportionment for $PM_{10}$ exhaust emissions from mobile sources in London. 2010 London Atmospheric Emissions Inventory, with back-cast to 2008.

| | **$PM_{10}$ emissions (tonnes)** | |
|---|---|---|
| | **2008** | **2010** |
| Road transport | 705 | 597 |
| Rail | 126 | 129 |
| Shipping | 8 | 9 |
| **Total Ground-based transport (excluding aviation)** | **839** | **735** |
| Aviation | 97 | 93 |
| **Total mobile sources** | **936** | **827** |

*Source: TfL Planning Strategic Analysis.*

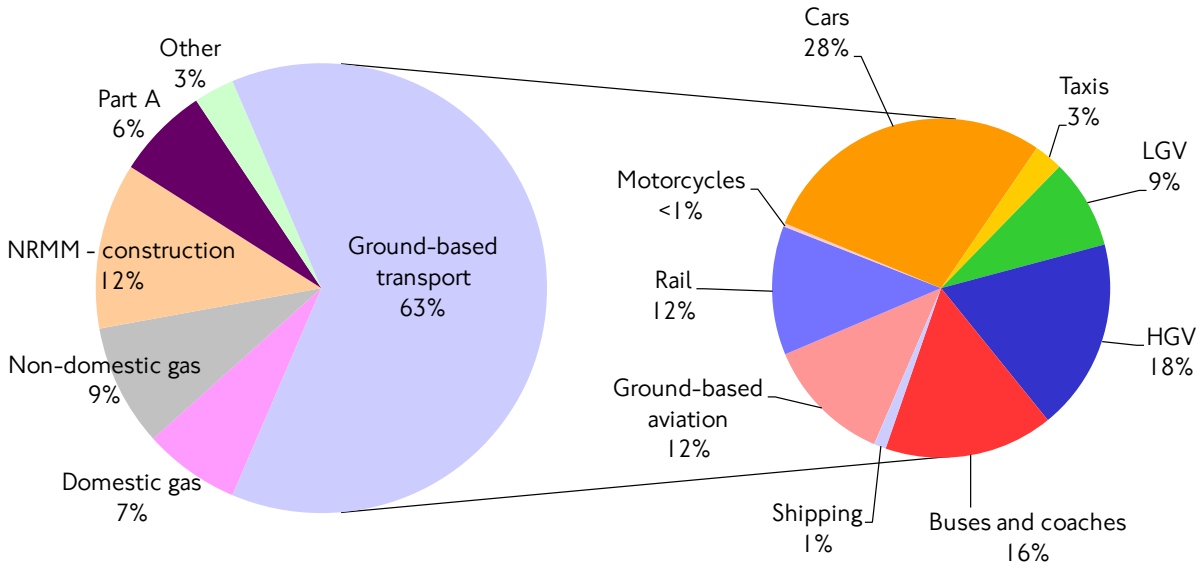
## 6.3 Emissions of nitrogen oxides ($NO_x$) from ground based transport in London

On an equivalent basis, $NO_x$ emissions to atmosphere from ground-based transport in London fell by 16.4 per cent between 2008 and 2010 – from 33,424 to 27,945 tonnes. This is a new estimate based on a revised methodology for the London Atmospheric Emissions Inventory.

All combustion processes produce oxides of nitrogen ($NO_x$). $NO_x$ primarily comprises nitric oxide (NO) and nitrogen dioxide ($NO_2$), the former readily converting to the latter through oxidation in free air. $NO_2$ is the pollutant of concern due to its impact on health. However for emissions assessment purposes it is the total $NO_x$ emitted that is of interest. Compliance with European Union limit values for $NO_2$ remains problematic in London, with concentrations close to roads in much of central and inner London continuing to exceed these limits.

The estimate for 2010 is that 27,945 tonnes of $NO_x$ were emitted from ground-based transport in London. As with $PM_{10}$, the difference from previously published data in large part reflects methodological changes to the inventory. On an equivalent basis, $NO_x$ emissions from ground-based transport fell by 16.4 per cent between 2008 and 2010. Figure 6.2 and table 6.2 show how this ground-based total emission breaks down among the principal sources.

Figure 6.2 Basic source apportionment for $NO_x$ emissions in London. 2010 London Atmospheric Emissions Inventory.




*Source: TfL Group Planning, Strategic Analysis.*
*Note 1: NRMM refers to non-road mobile machinery – such as construction plant. Part A processes are larger industrial processes regulated by the Environment Agency under Part A of the Environment Act, 1990.*

Table 6.2 Basic source apportionment for $NO_x$ emissions from mobile sources in London. 2010 London Atmospheric Emissions Inventory, with back-cast to 2008.

| | $NO_x$ emissions (tonnes) | |
|---|---|---|
| | **2008** | **2010** |
| Road transport | 29,236 | 23,657 |
| Rail | 3,825 | 3,920 |
| Shipping | 363 | 368 |
| **Total Ground-based transport (excluding aviation)** | **33,424** | **27,945** |
| Aviation | 4,163 | 3,871 |
| **Total mobile sources** | **37,587** | **31,816** |

*Source: TfL Group Planning, Strategic Analysis.*

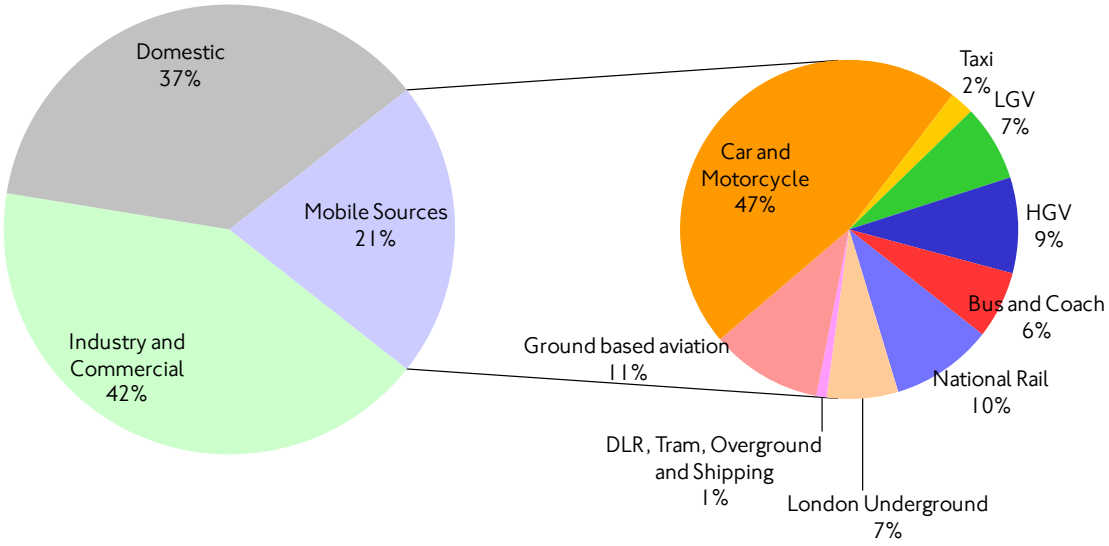
Looking at table 6.2 and on a like-for-like basis, $NO_x$ emissions from road transport fell by 19.1 per cent between 2008 and 2010, again reflecting continuing improvements to the emissions performance of the vehicle fleet. Emissions from rail transport increased by 2.5 per cent, while that from aviation fell by 7 per cent, largely reflecting increased rail services and cleaner aircraft respectively.

## 6.4 Emissions of carbon dioxide ($CO_2$) from ground based transport in London

On an equivalent basis, $CO_2$ emissions to atmosphere from ground-based transport fell by 4.2 per cent between 2008 and 2010 – from 8.79 to 8.42 million tonnes.

For Mayor's Transport Strategy monitoring purposes, the quantity of interest is $CO_2$ arising from ground-based transport, excluding ground-based aviation. The estimate for 2010 is that 8.42 million tonnes of $CO_2$ were emitted from ground-based transport (excluding aviation) in London. On an equivalent basis, emissions from ground-based transport fell by 4.2 per cent between 2008 and 2010. Figure 6.5 and table 6.3 show how the total mobile source emissions break down among the principal sources. Both of these estimates are around 3 per cent higher than those previously published, reflecting the net effect of the inventory method changes referred to above.

Figure 6.3 Basic source apportionment for $CO_2$ emissions from mobile sources in London 2010.




*Source: TfL Group Planning, Strategic Analysis. Non-mobile sources from DECC.*

Table 6.3 Basic source apportionment for $CO_2$ emissions from mobile sources in London.

| | $CO_2$ emissions (thousands tonnes) | |
|---|---|---|
| | **2008** | **2010** |
| **Road transport** | 7,180 | 6,770 |
| **Rail (including LU and other TfL rail)** | 1,590 | 1,630 |
| **Shipping** | 20 | 20 |
| **Ground-based transport (excluding aviation)** | **8,790** | **8,420** |
| **Aviation** | 1,080 | 1,000 |
| **Total mobile sources** | **9,870** | **9,420** |

*Source: TfL Group Planning, Strategic Analysis.*

Looking at table 6.3 and on a like-for-like basis, emissions from road transport reduced by 5.7 per cent between 2008 and 2010. This mainly reflected continuing improvements to the emissions performance of the vehicle fleet. Emissions from rail increased by 2.4 per cent, whilst emissions from aviation decreased by 7.1 per cent, largely reflecting increased rail services and cleaner aircraft respectively.

# 7. Transport and accessibility

## 7.1 Introduction and content

This chapter looks at physical accessibility to the transport system, focusing this year on the transport accessibility arrangements for the London 2012 Olympic and Paralympic Games.

## 7.2 Transport and physical accessibility

It is important that London's transport system is accessible to all members of the community. Efforts continue to be made to update the transport system in London to achieve this, with current plans summarised in TfL's Accessibility Implementation Plan (AIP), published in 2011: http://www.tfl.gov.uk/assets/downloads/corporate/taking-forward-the-mts-accessibility-implementation-plan-report.pdf. This includes the concepts of 'whole journeys' rather than simply focussing on the infrastructure itself.

### Summary of current accessibility provision

The state of physical accessibility to transport infrastructure at November 2012 was as follows:

### Surface transport

- 68 per cent of bus stops in London are fully accessible with vehicle stopping controls, 100mm or greater kerb heights and no boarding or alighting impediments.
- All buses (with the exception of Heritage Routemasters) have low floors and dedicated spaces for wheelchairs or baby buggies.

### Underground, DLR and London Tramlink

- 24 per cent of London Underground stations are step-free from street to platform.
- 7.8 per cent of London Underground stations are step-free from platform to train.
- All DLR stations are step-free from street to platform, as were London Tramlink stops, both networks being designed to be fully accessible.

### Surface Rail

- 24 of the 78 London Overground served stations are fully accessible with step free access to all platforms. This is an increase of four stations on last year.
- At 37 of 78 stations, London Overground platforms are either directly, or indirectly accessible from the station entrance.
- 44 of 78 stations are only partially accessible to either National Rail, London Overground or Underground services.
- 37 per cent of National Rail stations are step-free from street to platform.

### MTS Strategic Outcome Indicator: Physical accessibility to the transport system

This indicator measures the level of step-free access across the public transport and TfL Streets networks. The indicator is defined as a modal composite, weighted according to journey-stage based mode shares for each year (see also section 2.7 of this report) – taking these as the appropriate 'target' shares to be achieved by those people with a mobility impairment. The composite physical accessibility score for

2011/12 was 44 per cent. This compares to an equivalent value of 38 per cent for 2010/11. The relatively change in the most recent year mainly reflects investment in accessible bus stops, which increased from 52 to 68 per cent over the most recent period.

## 7.3 Focus topic: accessibility aspects of the London 2012 Olympic and Paralympic Games

### Introduction

The Mayor, London Organising Committee of the Olympic and Paralympics Games (LOCOG), the Olympic Delivery Authority (ODA) and TfL were committed to making the London 2012 Games the most accessible ever. Record levels of investment included major infrastructure developments such as London Underground upgrades, improving step-free access at London Overground stations, including newly-built step-free stations, the extension of the DLR and the continued improvements to London's bus network. In addition the ODA contributed £4 million to TfL for accessibility enhancements, such as Docklands Light Railway lift refurbishments and platform train interface improvements (humps) at a number of LU stations.

### The opportunity of the London 2012 Games

The London 2012 Games gave TfL the opportunity to examine in detail the impact of years of investment to open transport opportunities for all and promote independent travel for disabled Londoners.

The key strands of transport accessibility for the Games (physical infrastructure, staff helpfulness and access to information) grew out of the research and engagement that TfL undertook in the development of the MTS and the Accessibility Implementation Plan (AIP). The AIP formalised TfL's approach to accessibility as a 'whole journey approach', looking at the journey from end to end. It seeks to improve information provision, physical infrastructure and customer services in order to make it easier for disabled people to use the transport network.

The Games provided TfL with the opportunity to test the 'whole journey approach' to accessibility. TfL monitored disabled peoples' journey experience during the Games, both via social media and through other customer research methods including individual video logs completed by disabled people throughout Games time. On the whole, the data from this research demonstrated that disabled customers found that the range of accessible transport options and information available meant that travelling during the Games was easier than they had expected it to be.

### Improvements made to the transport networks ahead of the Games

#### London Underground

Ahead of the Games, 66 Tube stations were step free including important interchanges at Green Park, Blackfriars, Farringdon and Kings Cross St Pancras as well as venue stations such as Earls Court, Southfields and Stratford. All stations on the strategically important Jubilee line from Green Park to Stratford were step-free from street to train. Stratford Regional station saw improvements, including a new ticket hall which provided more lifts and level access to the trains.

Platform humps were installed at all stations (except Pimlico) on the Victoria line and manual boarding ramps were used at 16 stations where step free access was available to platform level only. The ramps proved to be very successful and are to be retained at these stations.

In addition, the rolling stock fleet on the Metropolitan Line was completely renewed. These trains feature wide doors, dedicated spaces for wheelchair users, a low-floor design for improved access between the train and the platform, and multipurpose spaces throughout. They also have advanced audible and visual information, air-conditioning, CCTV and priority seating.

### Docklands Light Railway

All stations on the DLR are step free from street to train and additional funding from the ODA enabled lift upgrades at key stations (Greenwich, Prince Regent and Tower Gateway) to increase capacity and reliability.

### London Overground

London Overground's investment in new rolling stock, platform extensions and newly built step-free stations (Imperial Wharf, Shepherds Bush, Shoreditch High Street, Hoxton, Haggerston and Dalston Junction) have added significantly to the accessibility of London's rail network. Lifts were also installed at Camden Road, Gospel Oak, Hackney Central and Wembley Central stations.

### London Buses

London Buses have been step-free since 2005, with additional improvements such as audio-visual information on every bus and improvements to bus stops. The bus network in London is the most accessible of any large city in the world. During Games time, an additional 200 buses were provided on routes serving Games' venues. Around 2,500 bus stops had upgraded countdown technology installed, providing accurate bus arrival times.

### London River Services

All piers and most boats on the Thames are step-free and during Games time the river was promoted as an enjoyable way to get around London.

### Staffing and Customer Service

A notable success of the Games was the volunteers who supported their front-line colleagues, providing assistance to customers as Travel Ambassadors. Dedicated Accessibility Assistants were deployed at key stations where demand for lift usage was high. In preparation for the Games, a detailed analysis of lift capacity was carried out across the London Underground and rail networks. This enabled mitigations to be put in place to minimise potential breakdowns and also brought alternative lifts into service at Westminster and North Greenwich, which meant that wheelchair users and others were able to exit the station quickly and safely.

### Information

Disabled people stress the importance of having the right information so they can plan their journeys. This meant being provided with advance notice of where the network would be particularly busy (hot-spots) and realistic alternative transport routes to get around London or to Games venues.

This information was developed with the involvement of disability groups such as the London Visual Impairment Forum, Whizz Kids and others, who disseminated information to their members.

The London 2012 Accessible Spectator Journey Planner allowed spectators to plot their route in advance of travelling to venues from accessible stations in Great Britain by rail, coach, bus, river or Tube. Spectators starting their journey in London were given an accessible route from door-to-door.

Ahead of the Games, a series of short films was launched on YouTube and at www.tfl.gov.uk/mobility. These showcased accessible transport in London and encouraged disabled people to use public transport to get to the Games.

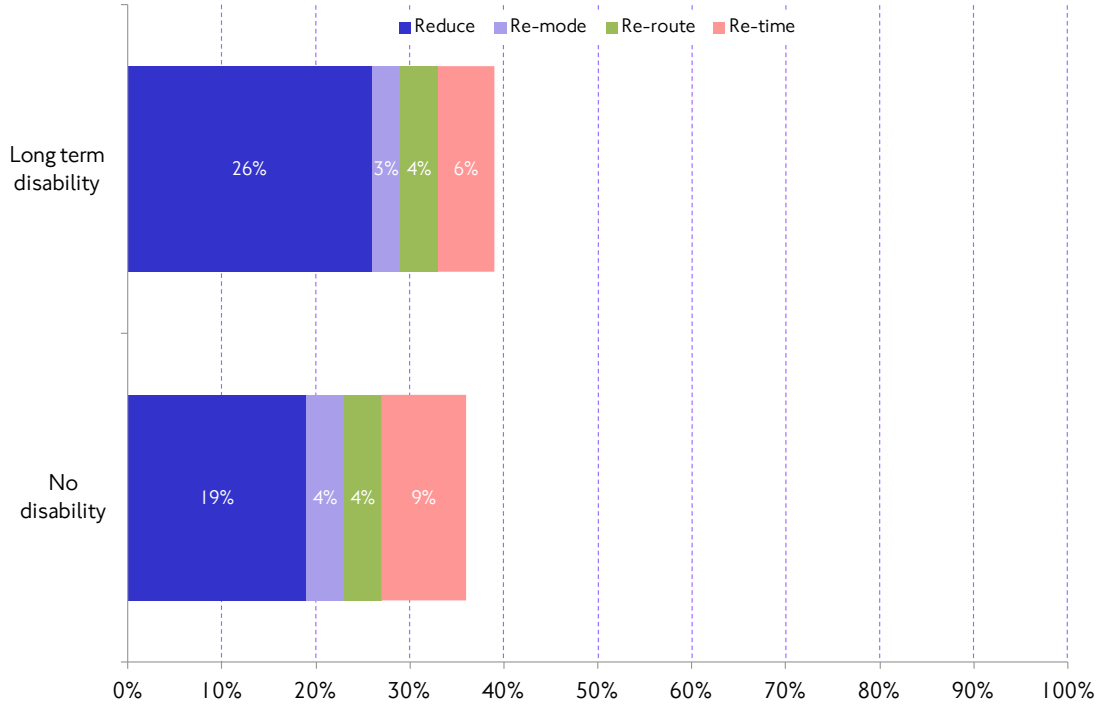
**Monitoring disabled people's journey experience during the Games**

In the run up to the Games, TfL's engagement with disabled people and their organisations showed that there was some anxiety about how the transport system would perform 'on the day'. The concerns ranged from not having enough information about how and when to travel; what to do if things went wrong; and the availability of staff to provide assistance.

These issues were fed into the preparations TfL made ahead of the Games, and also informed two specific pieces of research. The first was a series of video diaries, made by disabled people as they travelled around, either on their way to an event, or just carrying out their day to day activities. The second involved monitoring social media sites, using key word searches around accessibility and transport. In addition to these specific research projects, additional monitoring of travel demand management (TDM) included analysis comparing how disabled people planned and changed their journeys during Games time compared to non-disabled people.

The TDM analysis (figure 7.1) showed that disabled people reduced their travel to a greater extent (26 per cent for disabled people and 19 per cent for non-disabled people). This analysis also showed that disabled people reduced the hours they spent at work during the day, in order to vary their return journey time and also tended to take more holiday leave during Games time than non-disabled workers.

Figure 7.1 Overall change in 'regular travel' by whether respondent had a disability.




*Source: TfL Group Customer Research.*

The video diary project involved a small group of disabled people with a range of impairments. They undertook two journeys during Games time, using a variety of modes. In general, participants said that their journey experience was largely positive, and no more difficult than normal. The main positives cited were the helpful mix of information available, the presence of additional staff and volunteers on the network and the clear magenta Games signage. The key issues identified included the extra distances to travel at busy stations due to crowd control measures and also the long distances between public transport and the venues.

The social media monitoring project was set up to understand how disabled customers described their journey experience during the Games and compared this with a business as usual (BAU) period (February to April 2012). The majority of the content was around physical access in both of the monitored periods. Comments around the physical access of vehicles and stations increased during the Games and the sentiment was greatly improved. Other areas that saw an improvement in sentiment included staff helpfulness and availability, awareness of network changes, and signage.

Comparing the content of some of the main themes for the BAU period and Games period it can be seen that:

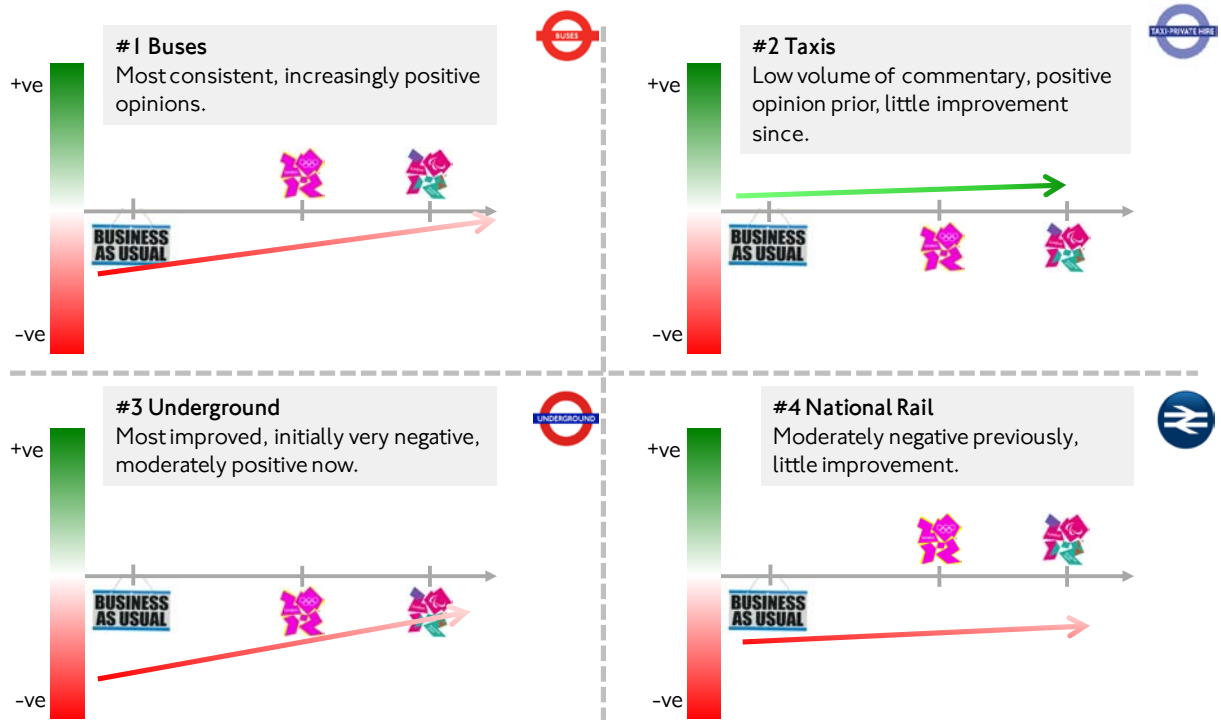
- Vehicle access – London Underground's manual boarding ramps was a focus of increasingly positive commentary during Games time. This contrasts to the bus ramps where the mood of the comment was more mixed.
- Step free improvements at stations/stops generally received positive commentary. However, comments concerning bollards and other obstructions were more negatively reported.

- Positive comments about London Underground staff helpfulness increased during Games time, but bus drivers received a greater proportion of negative comments compared to the BAU period.
- Journey planning tools had a mix of positive and negative commentary during Games time. The magenta Games signage however was seen as very useful.

Figure 7.2 Key talking points during Games time by mode.


*Source: TfL Group Customer Research.*

Figure 7.3 Attitudes during 'business as usual' compared to Games-time.




*Source: TfL Group Customer Research.*

### Delivering the accessibility Games legacy

The analysis of disabled people's journeys during the Games has given TfL useful insight into the priorities that need to be addressed and the strengths on which to build in order to deliver a lasting legacy for disabled Londoners and visitors. It has also shown that the priorities set out in the Accessibility Implementation Plan were the improvements that disabled people wanted to see. TfL will continue to focus on promoting confidence in making independent journeys, reducing the difference in journey time between step-free and non-step free journeys, and develop consistently high levels of customer service across all modes. TfL will also develop its monitoring of accessibility across the network, through engagement with disabled customers and service users, enhanced mystery traveller surveys and tracking social media data.

Enhancements such as manual boarding ramps at 16 LU stations will be retained and rolled out at other stations across the network when practicable. These additional locations would be those that maximise the number of step-free journeys. TfL is undertaking a complete review of accessibility signage and other information including the step-free Tube map.

TfL's website redevelopment will deliver simpler, clearer and more consistent access information and TfL will work with developers to produce apps for smart phones to enhance real time accessibility information suited for people with a range of impairments and for those with learning difficulties.

A detailed action plan of accessibility improvements to be delivered over the next four years will be published shortly by the Mayor, and TfL will publish yearly progress reports on these actions from October 2013.

# 8. The journey experience

## 8.1 Introduction and content

Improving the quality of Londoners' overall daily travel experience is a priority for the Mayor. This chapter looks at specific measures of customer perception and satisfaction, to assess Londoners' view of their travel experiences and therefore the impact of the Mayor's policies on their quality of life. The content of this chapter is derived from the same suite of surveys described in previous Travel in London reports (the Travel Environment Survey and the modal Customer Satisfaction Surveys), together with other ad hoc studies, although with more of a focus this year on the factors that drive people's perception of aspects of the transport system.

The perception and customer satisfaction-based Mayor's Transport Strategy indicators described in this chapter are best understood alongside quantitative measures of transport operations in London, which are described in other chapters of this report.

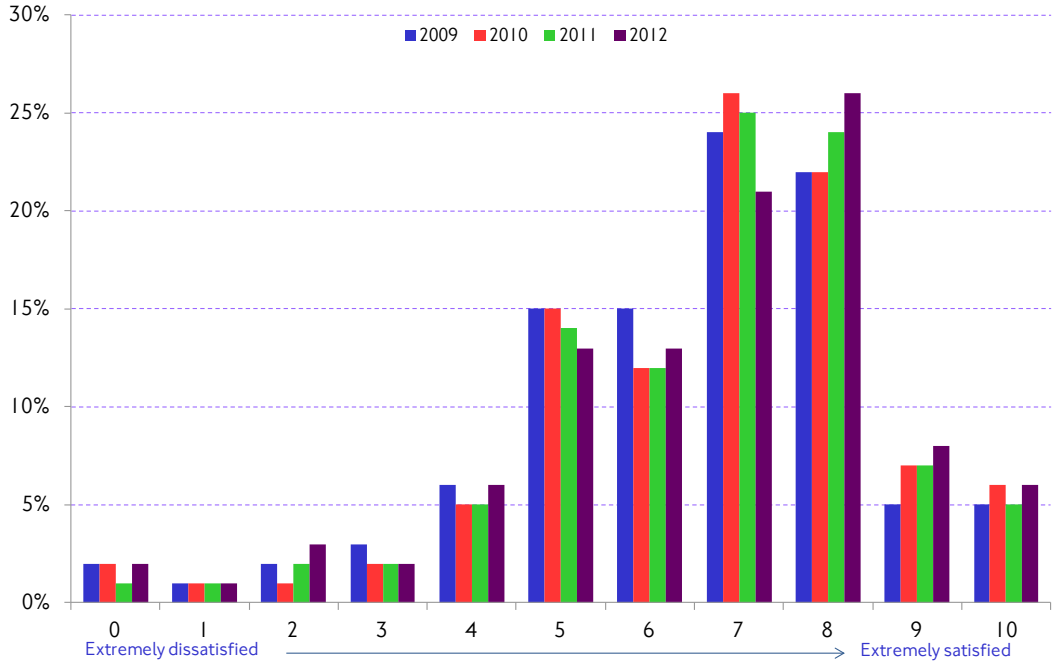
## 8.2 Trends in the perception of journey experience

Travel in London reports have described trends in the perception of journey experience for the past four years. This data is based on an annual survey that aims to understand the complex interplay of factors that influence people's satisfaction with travel in London across all of the different modes.

The survey explores London residents' perceptions of their overall journey experience. Figure 8.1 shows the distribution of satisfaction with journey experience from 2009 to 2012. It shows the distribution, as a percentage, of people giving the different satisfaction scores (on the horizontal axis).

The scores themselves (and for the other satisfaction surveys discussed in this chapter) are mean scores out of 100 (not percentages), based on a response ranking system from zero to ten, where ten represents 'extremely satisfied'.

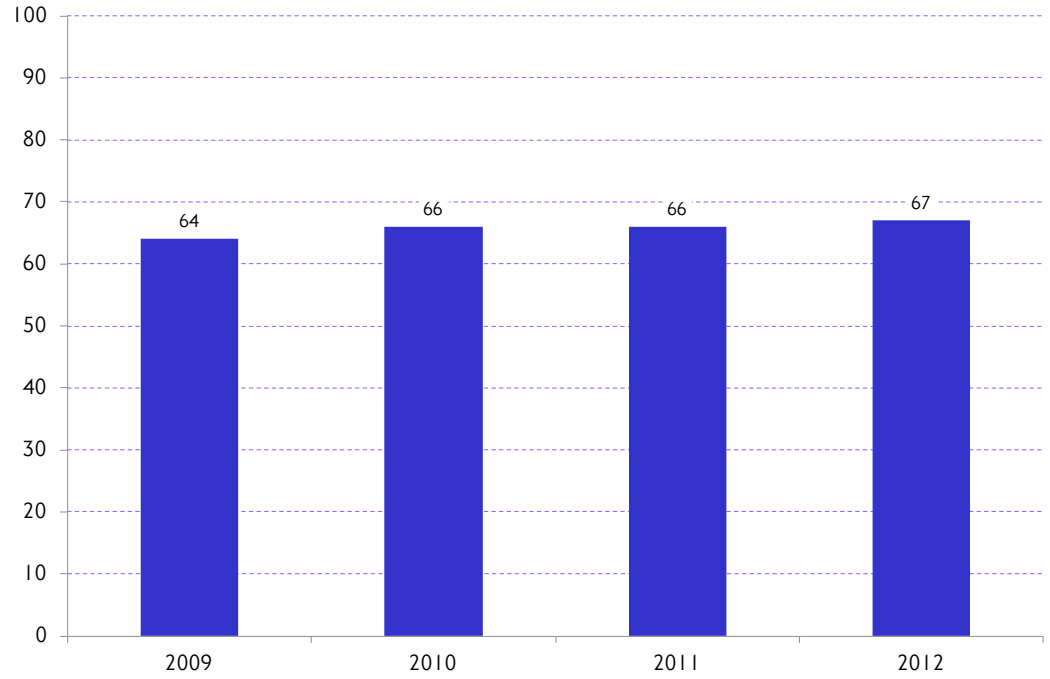
Figure 8.1 London residents' satisfaction with their journey experience when travelling in London.




*Source: TfL Perceptions of Travel Environment Survey 2009 – 2012.*

Figure 8.2 shows the same data, but converted to a mean score out of 100 for satisfaction with journey experience. It shows a small but consistent increase in satisfaction with journey experience over the last four years. In 2012, the mean score for satisfaction with journey experience was 67 out of 100, considered to be 'fair' by TfL norms, compared to 64 in 2009, which is considered to be 'fairly poor'.

Figure 8.2 London residents' perception of journey experience. Mean score out of 100.




*Source: TfL Perceptions of Travel Environment Survey 2009 – 2012.*

## 8.3 Trends in overall customer satisfaction

There are four indicators of customer satisfaction that relate directly to the Mayor's Transport Strategy Strategic Outcome Indicators:

- Public transport customer satisfaction.
- Road user customer satisfaction.
- Perception of journey experience.
- Perception of the urban realm.

Table 8.2 shows that scores for these indicators have been reasonably constant since 2008/09.

**TfL surveys of customer satisfaction and perception**

Customer satisfaction data in this section are derived from a series of established TfL surveys exploring satisfaction with public transport and the road network. In all cases, survey respondents have been asked to rate their satisfaction with the measure in question on a scale from 1 to 10, with 10 representing 'extremely satisfied'. These scores have been converted to a mean score out of 100.

TfL has carried out customer satisfaction research over many years and has developed an understanding of how to interpret these scores, albeit semi-subjective and open to different interpretation by different people. TfL's interpretation, as shown in Table 10.1, should therefore be regarded as indicative only. The main interest lies in assessing trends in the scores over time, and in comparing scores for one aspect against another.

Table 8.1 TfL's Interpretation of customer satisfaction scores.

| Score | Interpretation |
|---|---|
| Under 50 | Very poor |
| 50 to 54 | Poor |
| 55 to 64 | Fairly poor |
| 65 to 69 | Fair |
| 70 to 79 | Fairly good |
| 80 to 84 | Good |
| 85 to 89 | Very good |
| 90 or more | Excellent |

*Source: TfL Modal Customer Satisfaction surveys.*

Table 8.2 Summary of trends in perception-based MTS Strategic Outcome Indicators. Mean scores out of 100.

| Indicator | 2008/09 | 2009/10 | 2010/11 | 2011/12 | TfL's assessment |
|---|---|---|---|---|---|
| Public transport customer satisfaction | 80 | 79 | 80 | 80 | 'Good' |
| TLRN Road User customer satisfaction | n/a | n/a | 72 | 75 | 'Fairly Good' |
| Perception of journey experience | 64 | 66 | 66 | 67 | 'Fair' |
| Perception of urban realm | 63 | 64 | 66 | 65 | 'Fair' |

*Source: TfL Modal Customer Satisfaction surveys, mode share based upon journey stage estimates; TLRN users satisfaction survey; TfL Streets Management Customer Satisfaction survey; TfL Perceptions of Travel Environment survey.*

## 8.4 Summary of customer satisfaction by mode of transport

This section summarises indicators and trends in customer satisfaction scores for the different modes of transport.

### Public transport

Table 8.3 summarises satisfaction with the overall operation of the service for the major public transport modes separately and in aggregate. The table also reports data on the relative mode share, used to produce the composite score in table 8.1. As with previous years the most striking feature of the table is the general similarity of the scores across the modes, but with relatively higher scores for London Tramlink, DLR and the Overground.

Table 8.3 Summary of customer satisfaction scores and mode shares for the principal public transport modes. 2011/12.

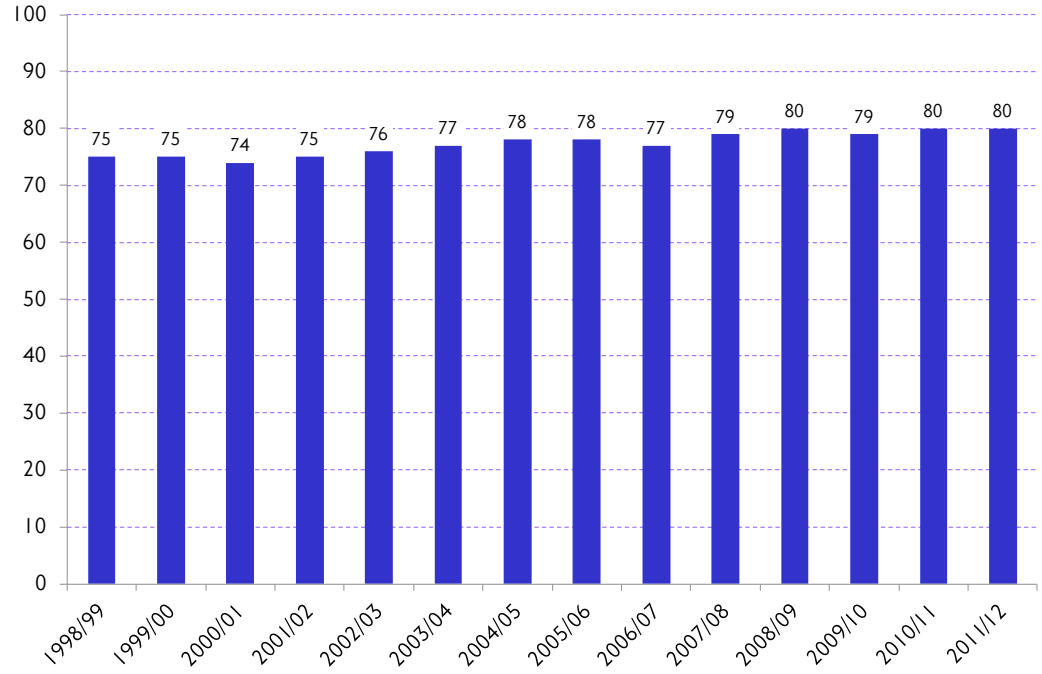
| Mode | Overall customer satisfaction score (out of 100) | Annual journey stages millions | Relative weight (per cent) |
|---|---|---|---|
| Bus | 80 | 2,147 | 61% |
| Underground | 80 | 1,152 | 33% |
| DLR | 85 | 84 | 2% |
| Overground | 85 | 103 | 3% |
| London Tramlink | 86 | 28 | 1% |
| **Total** | **80** | **3,514** | **100%** |

*Source: TfL Modal Customer Satisfaction surveys: mode share based upon journey stage estimates.*

### Customer satisfaction with London Buses services

The mean score for customer satisfaction with London Buses was 80 in 2011/12, considered to be a 'good' score according to TfL norms and consistent with the score in 2010/11. Figure 8.3 shows that customer satisfaction with London Buses has increased steadily since 1998/99. This reflects the general improvement in all aspects of the bus service, including the simultaneous increase in the scope of the network and service quality.

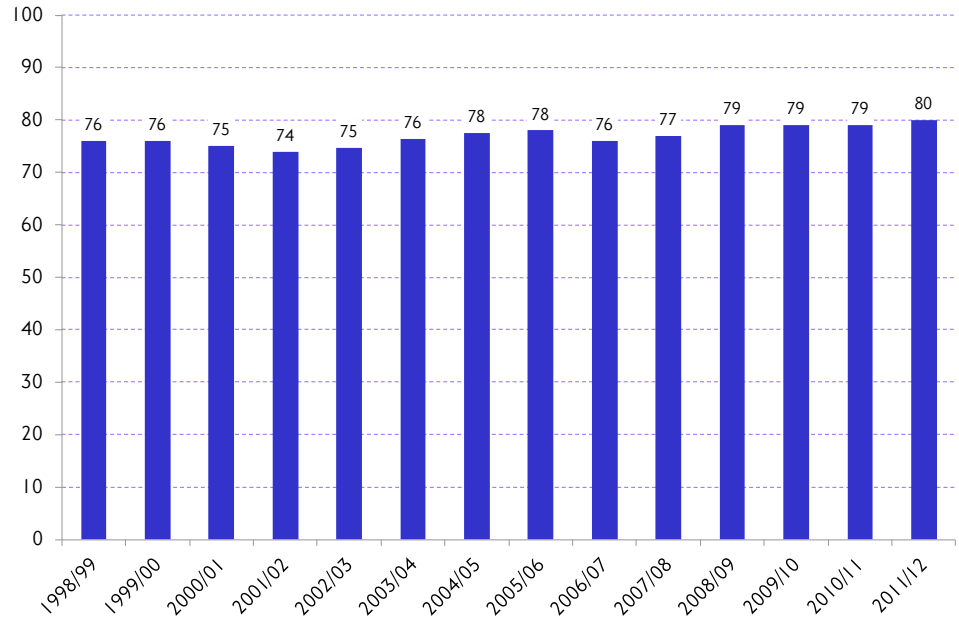
Figure 8.3 Overall satisfaction of bus passengers with their journey.




*Source: TfL London Buses Customer Satisfaction Surveys, 1998/99 to 2011/12.*

## Customer satisfaction with London Underground services

Figure 8.4 Overall satisfaction of Underground passengers with their journey.



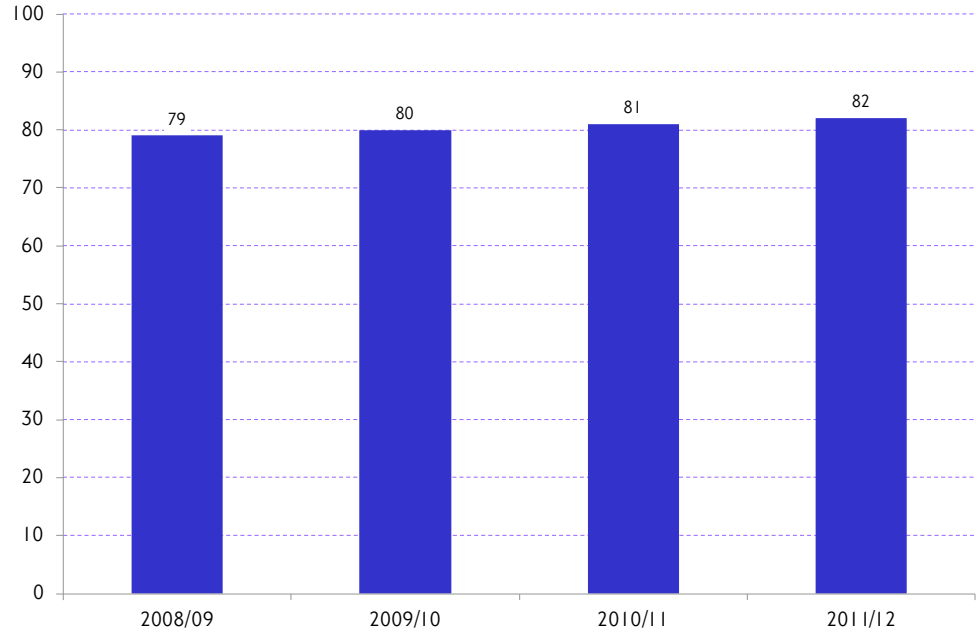

*Source: TfL London Underground Customer Satisfaction Surveys, 1998/99 to 2011/12.*

The mean score for customer satisfaction with London Underground was 80 in 2011/12, considered to be a 'good' score according to TfL norms and the best achieved to date. Figure 8.4 shows that customer satisfaction with London Underground has also increased fairly steadily since 1998/99.

### Customer satisfaction with Docklands Light Railway

The mean score for customer satisfaction with DLR was 82 in 2011/12, considered to be a 'good' score and is slightly higher than the score in 2010/11. Figure 8.5 shows that customer satisfaction with DLR has increased slightly since 2008/09, when the survey started.

Figure 8.5 Overall satisfaction of Docklands Light Railway passengers with their journey.

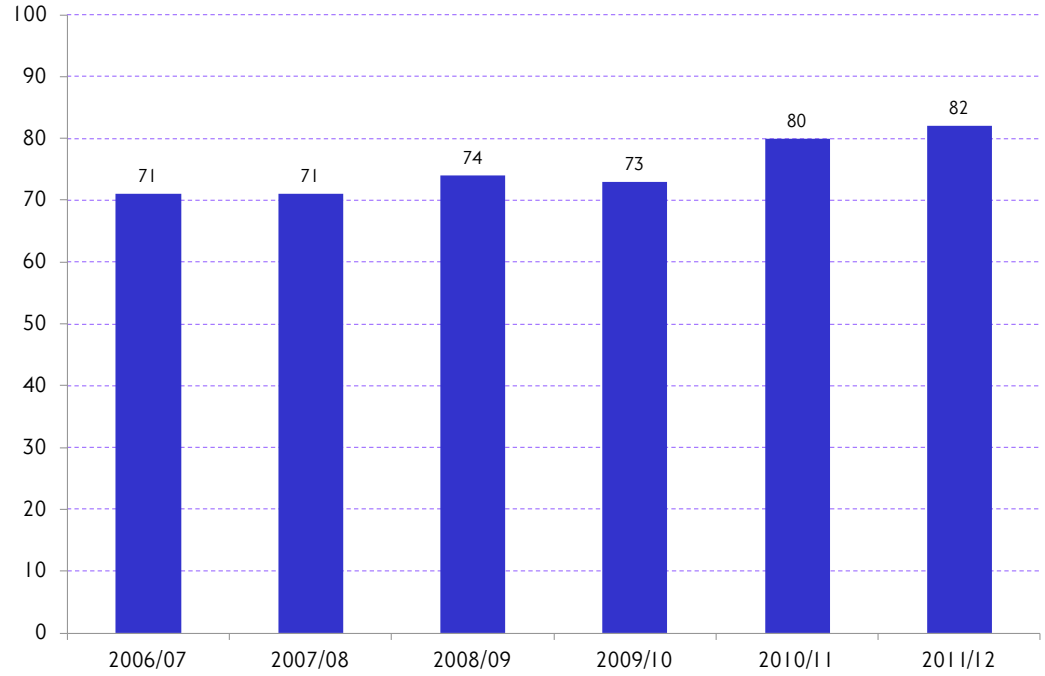



*Source: DLR Customer Satisfaction Surveys, 2008/09 to 2011/12.*

### Customer satisfaction with London Overground

Customer satisfaction scores for London Overground clearly reflect the large-scale investment in the creation of this new network. In particular, the significant enhancements to services, the opening of new lines and the wholesale replacement of the train fleet. The mean score for satisfaction with London Overground was 82 in 2011/12, an increase on the previous year (80 out of 100). Overall satisfaction with Overground journeys has consistently and markedly increased between 2006/07 (just before TfL assumed responsibility for the services) and 2011/12 (figure 8.6), with improvements in reliability and customer service being key drivers of customer satisfaction, as well as major service enhancements.

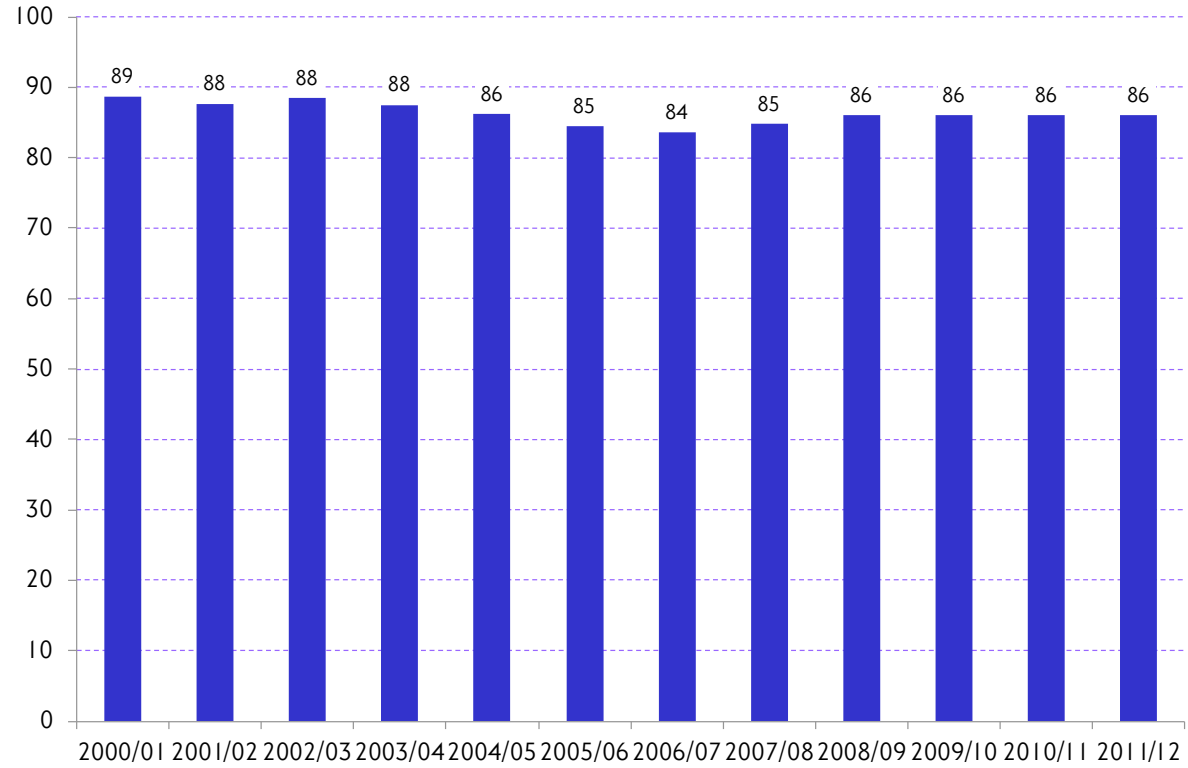
Figure 8.6 Overall satisfaction of London Overground passengers with their journey.




*Source: TfL London Overground Customer Satisfaction Surveys, 2006/07 to 2011/12.*

## Customer satisfaction with London Tramlink services

Figure 8.7 Overall satisfaction of London Tramlink passengers with their journey.




*Source: TfL London Tramlink Customer Satisfaction Survey, 2000/01 to 2011/12.*

The mean score for customer satisfaction was 86 out of 100 in 2011/12 - consistent with the score for the previous three years and considered to be 'very

good', according to TfL's norms. London Tramlink customer satisfaction is consistently high compared to other modes and has been since 2000/01 when it was a relatively new mode, with trams becoming fully operational in Croydon in May 2001. Figure 8.7 shows the overall satisfaction from 2000/01 to 2011/12 and shows that London Tramlink customer satisfaction has been consistently high over this period.

**Customer satisfaction with Barclays Cycle Hire**

The Barclays Cycle Hire scheme started operating in 2010 for members and in 2011 for casual users. The scheme was extended eastwards in March 2012, adding over 2,700 additional docking points. The customer satisfaction for members was 70 out of 100 (June 2012) and for casual users was 85 out of 100 (March 2012). There was a decline in the satisfaction of members with Barclays Cycle Hire between July 2010 (70 out of 100) and July 2011 (63 out of 100) as the 'novelty factor' wore off and tolerance of initial teething problems declined. In 2012, the score has improved which suggests that the remedial action to improve the Barclays Cycle Hire experience is taking effect. For both surveys it is too early to identify a long term trend in the scores.

## 8.5 How different aspects of service provision affect overall satisfaction

Developing an understanding of the factors which influence customer's journey experience will help to achieve the Mayoral priority to improve the journey experience of Londoners. Analysis shows that overall satisfaction with travel by mode is generally stable as is satisfaction with specific attributes of the mode. In 2011, TfL commissioned a study analysing recent customer satisfaction data to understand which factors have the greatest influence on overall customer satisfaction. The results of this research are described below.

Historically, customer satisfaction has been fairly steady with only small long term changes; this is true for both overall satisfaction and satisfaction with individual attributes that go to make up the overall score. As can be seen in the charts described above, there have been slight upward trends in satisfaction with all TfL public transport services over the period monitored.

**Example of how investment can improve customer satisfaction**

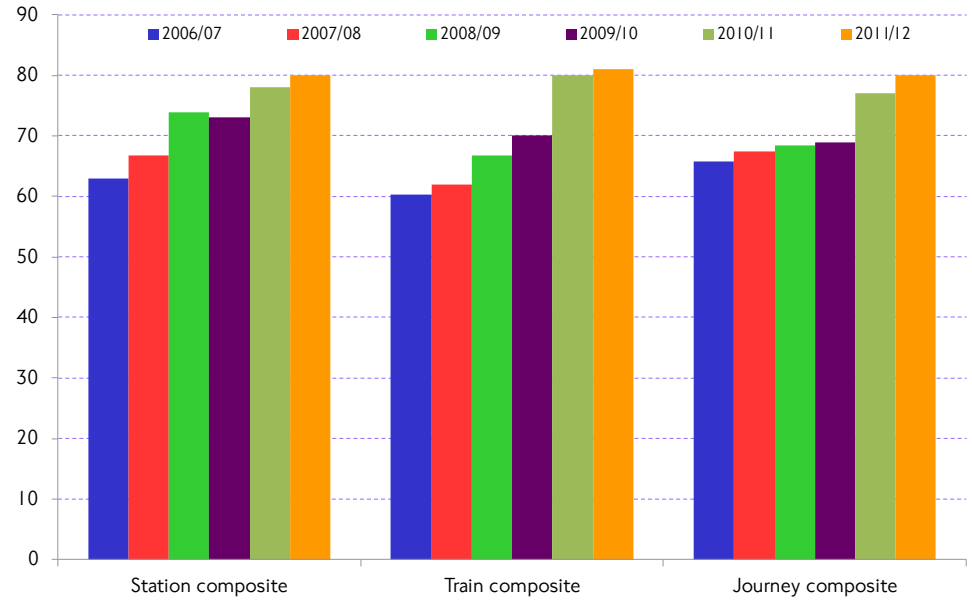
The London Overground is the only mode to see a large step change in customer satisfaction in recent years. This occurred after TfL took over responsibility for the lines and invested significantly to improve the quality of the service. The total capital expenditure on London Overground improvements was around £1.6 billion to 2010.

The overall customer satisfaction score increased by 7 percentage points between 2009/10 and 2010/11 when the East London line opened, following the gradual increase in the preceding few years (Figure 8.6).

Figure 8.8 shows the satisfaction of London Overground passengers with aspects of their journey from 2006/07 to 2011/12. There was a significant increase in satisfaction between 2009/10 and 2010/11 for the train and journey composite scores and also for the station composite score. Over this period, there was significant investment in London Overground including:

- Around £325 million on the North London Lines, delivering increased frequencies and train lengths on the Richmond to Stratford, Willesden to Clapham, Gospel Oak to Barking and Watford to Euston routes.
- Around £1 billion on the East London Line, including 14 refurbished stations and 4 brand new stations.
- Around £250 million on new trains for the whole Overground network.
- Around £30 million on various other items, including the installation of ticket gates at various stations, the improvements of ticket retailing facilities (Oyster and new ticket vending machines), station deep cleans and full station refurbishments.
- There has also been additional on-going operational expenditure for extra staffing provision and other enhancements such as improved cleaning and maintenance.

Figure 8.8 Satisfaction of London Overground passengers with aspects of their journey.




*Source: TfL London Overground Customer Satisfaction Survey 2006/07 to 2011/12.*

This gives an example of the significant change in quality of service and the volume of investment required to achieve a measureable change in customer satisfaction.

In order to understand the attributes that have the most significant impact on overall customer satisfaction, a study has been undertaken to analyse Customer Satisfaction Surveys across all modes. This analysis can explain:

- How important each measure is in terms of driving overall satisfaction.
- How much overall satisfaction may change given improvements in the service provided and therefore in the individual service attributes measured.

Generally the main priorities for customers are improving journey times and reducing crowding. These are key priorities for TfL with the Mayor's Transport Strategy and the TfL Business Plan setting out clear plans to improve these two aspects of travel on the public transport network in London, including Crossrail and London Underground upgrades. Crossrail, when completed, will provide faster

journey times, reduced crowding on the London Underground in the central area and other rail networks and a 10 per cent capacity increase on public transport as a whole. The London Underground upgrades that include new trains, upgrades to signalling and track and rebuilding some of the busiest stations on the network will provide 30 per cent additional peak capacity on London Underground.

Improving journey times and reducing crowding are also highlighted as priorities for London Overground due to rising demand which, as described above, has already seen large-scale investment significantly improving the quality of the service and high levels of satisfaction. This suggests that improving journey times and managing crowding will continue to be priorities across the public transport network even when passengers have relatively high levels of satisfaction with these aspects of their travel. It should be noted that policies and proposals related to journey time and crowd management are likely to require significant investment and possibly long term disruption during construction.

Improving safety and security was also identified as a priority for customers. Safety and security from accidents and crime on the public transport networks are at best ever levels. However, some passengers do not feel safe especially when travelling at night. TfL, working with partners, is continuing to work to improve both actual and perceived safety and security among customers travelling on the public transport network around London.

## 8.6 Satisfaction with London's roads

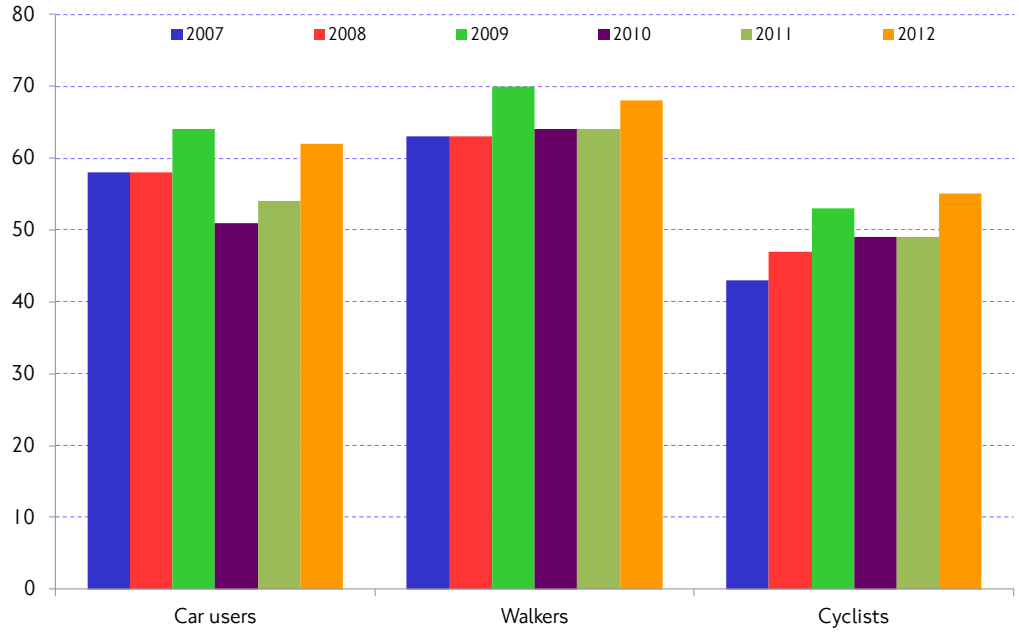
This section describes satisfaction with the operation of the road network in London by considering the satisfaction of different road users with the road network as a whole, the Transport for London Road Network (TLRN) specifically and the urban realm. The road network is used by different groups for different purposes and with different priorities in terms of the operation of the road network, and these need to be balanced. Data shown in this section are derived either from TfL's Street Management Customer Satisfaction Survey or the TLRN Customer Satisfaction Survey, as stated.

### Satisfaction with the quality of London's streets and pavements

This section considers satisfaction of London residents with the operation of the whole road network in London. The data relates to the financial year 2011/12, are derived from TfL's Street Management Customer Satisfaction Survey and represent the views of London residents only.

In 2011, 68 per cent of pedestrians surveyed were satisfied or very satisfied with streets and pavements, slightly higher than in previous years. Satisfaction among cyclists has increased since 2007, and in 2012 55 per cent were satisfied or very satisfied with streets and pavements. Car users' satisfaction with streets and pavements has risen in comparison to 2010 and 2011 but remains lower than in 2009. Figure 8.9 shows satisfaction with streets and pavements by road user type.

Figure 8.9 Proportion of people satisfied or very satisfied with streets and pavements, by road user type, London residents, 2006/07 – 2011/12.



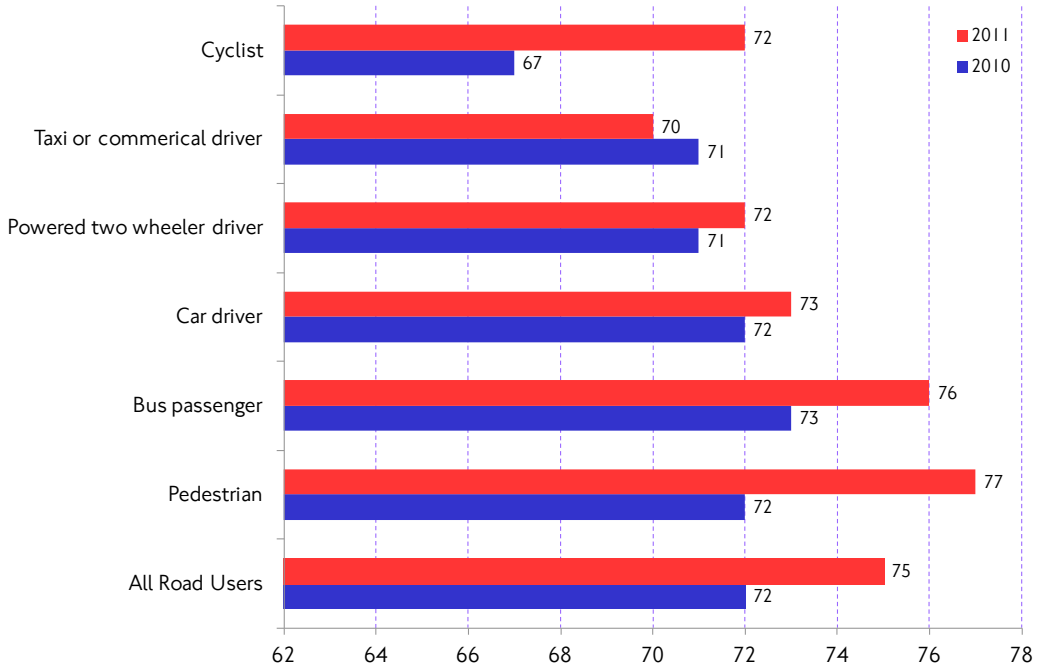

*Source: TfL Streets Management Customer Satisfaction Survey 2007 – 2012.*

### Satisfaction with the Transport for London Road Network (TLRN)

The mean score for satisfaction with the operation of the TLRN, the network of major roads in London managed directly by TfL, was 75 out of 100 in 2011. This is a significant increase from the score in 2010 of 72 out of 100. This survey includes all those travelling on the routes, covering both London residents and non-residents who have used the TLRN in the last month. Figure 8.10 shows satisfaction by mode of travel. Satisfaction levels increased for cyclists, bus passengers, pedestrians and car drivers between 2010 and 2011. This may be due to fewer disruptions on the TLRN this year compared to last year.

Aspects of the road network that road users were least satisfied with included traffic congestion, the availability and condition of cycle lanes and advanced stop lines for cyclists, and the time allowed to stop, pick up and drop off in loading bays for commercial vehicles. Satisfaction with all aspects of the road network operations has increased, except for satisfaction with the time allowed to stop, pick up and drop off in loading bays for commercial vehicles.

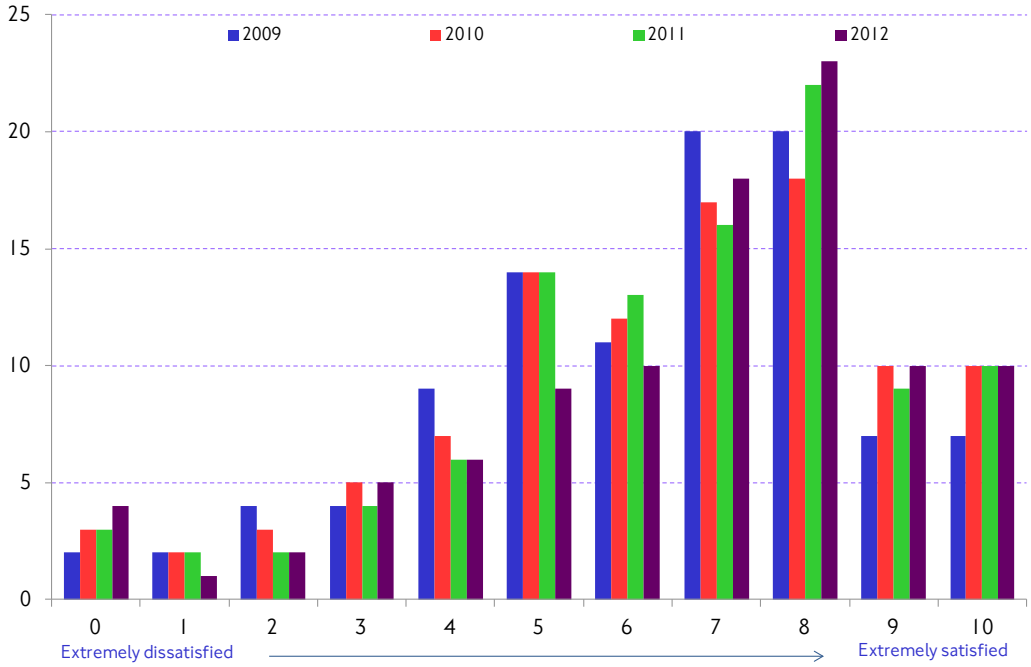
Figure 8.10 Overall satisfaction with the operation of the TLRN, by road user type, 2010-2011.




*Source: TLRN User Satisfaction Survey, 2010-2011.*

## Perception of the urban realm

Figure 8.11 London residents' perception of streets, pavements and public spaces in their local area, 2009-2012.




*Source: TfL Perceptions of the Travel Environment Survey, 2009 to 2012.*

The mean score for satisfaction with the quality of streets, pavements and public spaces was 65 out of 100 in 2012, a slight decrease on the 2011 score of 66 out of 100. Figure 8.11 shows the distribution of customer satisfaction scores with the

perception of streets, pavement and public spaces in the respondent's local area between 2009 and 2012.

**How different aspects of the road network affect overall satisfaction for different road user groups**

Road space is used by different types of user, with competing demands and requirements. The section above described the different levels of satisfaction with the operation of the road network across these groups and the rest of this chapter will consider these competing demands.

Analysis similar to that undertaken for public transport modes was also undertaken for three road user types surveyed in the TLRN Customer Satisfaction Surveys of 2010 and 2011 to understand the key aspects that affect overall satisfaction for different road users.

The main priorities to improve satisfaction for pedestrians are speed of their journey and condition and clarity of road markings. The key priorities for cyclists are availability of cycle lanes and stop lines, the condition of cycle lanes and road surfaces, amount and clarity of road signs and road markings and journey speed. The key priorities for car drivers are speed of journey, reducing traffic congestion and being able to estimate journey time as well as condition and clarity of road markings and signs.

There is some similarity between the key attributes for all road user groups including speed of journey and improving the clarity of road signs and road markings. However, these similarities do not necessarily make it easy to identify the measures required to increase satisfaction with the road network for all user groups. The focus on journey speed for the three road user groups could lead to conflicting demands for road space. For example, increasing the speed of journeys for car users in some areas of London may lead to reducing green time for pedestrians to cross a road or reducing the number of pedestrian crossings.

The Roads Task Force set up by the Mayor this year (http://www.london.gov.uk/priorities/transport/investing-transport/roads-task-force) will analyse the challenges faced by London's road network and assess possible solutions to improve the Capital's roads for all users.

## 8.7 Focus on attitudes to walking and cycling

One of the objectives of the MTS is to improve health of London residents by facilitating an increase in walking and cycling. Lack of physical activity is a major health issue for Londoners. Walking and cycling for transport is one of the best ways to improve the health outcomes of Londoners. Walking for transport is the only daily physical activity most Londoners can reliably complete. The remainder of this chapter focuses on attitudes to walking and cycling in London, bringing a greater understanding to how we can increase and improve these modes of transport.

**Attitudes to walking**

There are 6.2 million walk trips per day (i.e. a trip that was walked the whole distance) as well as a significant number of walk trips for leisure. Walking also forms a stage (see section 2.3 of this report) in a large proportion of public transport journeys and is undertaken by all sectors of the population with half of Londoners

making a walk-only journey, either going for a walk or walking as a sole means of transport, on at least five days per week. Therefore, any improvements in walking or increases in walking will impact a large sector of the population.

Londoners generally have a positive attitude to walking as a way of getting fit and as an enjoyable way to travel around London (more than 90 per cent agree). Many Londoners are also positive about walking in London at the moment, with 78 per cent agreeing that walking in London is a pleasurable experience and 73 per cent agreeing that London is a 'city for walking'. This is consistent with TLRN customer satisfaction for pedestrian users (including Londoners and non-Londoners) in which 77 out of 100, considered it to be 'quite good'. Satisfaction with the condition of the local area for walking is 68 out of 100 in 2012, considered 'reasonable'.

An understanding of the factors behind customer satisfaction will provide an indication of the aspects which if improved would support higher levels of walking in London. As described above, the key priorities to improve satisfaction for walkers are speed of their journey and the condition and clarity of road markings. Satisfaction with these aspects of the journey for Londoners and non-Londoners using the TLRN are generally good but there is room for improvement. In 2011/12, satisfaction with speed of journey for pedestrians was 78 out of 100 which is considered to be 'fairly good', while satisfaction on the condition and clarity of road markings is 77 out of 100, again considered to be 'fairly good'. This suggests that if these attributes could be improved significantly they could lead to an increase in satisfaction for pedestrians.

However, there is more that could be done to encourage increased walking in London. London residents state that they would be encouraged to walk more if they knew that walking was as quick as the bus and London Underground for short distances (79 per cent and 77 per cent respectively), if there were new and improved walks for pleasure (77 per cent) and improved safety and security (76 per cent). This is consistent with the key priorities for improving customer satisfaction of pedestrians, as discussed above, as it suggests that speed of journey is a key aspect of overall satisfaction.

Therefore, in order to encourage increased levels of walking TfL will continue to focus on improved information such as the expansion of Legible London, walking routes, and safety and security.

### Attitudes to cycling

The Mayor has set a target of increasing the number of cycle journeys in London by 400 per cent between 2001 and 2026. On an average day in 2001 there were 0.32 million cycle journey-stages in London; this has increased to 0.57 million cycle journey-stages in 2011. This substantial increase has been supported by the 'Year of Cycling' as well as large scale interventions including Barclays Cycle Hire and Barclays Cycle Superhighways.

Despite the significant investment in cycling and the large increases seen in the number of cycling trips more work is required to meet the target. This section focuses on the attitude of Londoners to cycling and of the satisfaction of cyclists with the TLRN. This will help us understand the priorities that will encourage increased levels of cycling.

Generally, cycling in London is considered positively. Eight-eight per cent of Londoners agree that cycling is getting more popular and 81 per cent agree that cycling is enjoyable. These figures have been rising steadily since 2007. However, the level of satisfaction of cyclists with the TLRN is relatively low compared to other road users (72 out of 100 in 2011).

Understanding what aspects motivate and deter Londoners from cycling is important in developing policies and interventions that will encourage increased cycling. Improving fitness and the ability to save time and money are the most common motivators for Londoners actively considering cycling, while safety concerns and the weather are most likely to deter cyclists from cycling more. Safety is a concern, both in terms of the safety of the bicycle from crime and also personal safety while cycling.

Cyclists generally feel safer on quieter roads. A survey of Londoners found that cyclists consider quiet roads to be safer than busy roads. Four-fifths consider quiet roads to be safe, compared with 49 per cent (regular cyclists) or 28 per cent (occasional cyclists) for busy roads. A recent study of current cyclists in London found that cyclists were willing to increase their journey time to travel on better, safer routes. Current London cyclists are prepared to travel further to cycle in cycle lanes, bus lanes, on residential roads and would travel three times further to cycle on off-road routes. Around half of all cyclists would change their route to travel through parks and green spaces, or to travel on a dedicated on-road cycle lane. And around 40 per cent said they would change their route in order to use a Cycle Superhighway.

The TLRN generally includes roads that carry the most traffic in London - roads that less confident cyclists will try to avoid. The main priorities to improve the overall satisfaction of cyclists on the TLRN are the amount and clarity of road signs giving route directions, journey speed and condition and clarity of road markings. This suggests that Cycle Superhighways, which provide commuter cyclists with clearly marked, safer, faster and more direct journeys into the city, will help to meet the key priorities for cyclists on the TLRN.

Cyclist's satisfaction with the availability of cycle lanes and stop lines in 2011 was 66 out of 100 - considered to be 'fair' according to TfL norms. Cyclist's satisfaction with the amount and clarity of road signs giving route directions was 72 out of 100 ('fairly good'), journey speed was 74 out of 100 ('fairly good') and condition and clarity of road markings was 71 out of 100 ('fairly good'). This suggests that if these attributes could be improved significantly they could lead to an increase in satisfaction for cycle users and support less confident cyclists in cycling on these roads. However, these changes in isolation will not be sufficient to see the behaviour change required to meet the target for increased cycling. This will require a combination of infrastructure, interventions and targeted communications.

## 8.8 Conclusions

There has been a substantial amount of investment on the public transport networks over the past decade leading to improved quality and capacity, with corresponding improvements in the levels of customer satisfaction experienced whilst travelling on TfL services. Further investment is planned and already underway, for example Crossrail and the Tube upgrades, to continue to improve the level of service experienced by all Londoners. Continued investment will, at the

very least, help to maintain customer satisfaction levels and, if a significant step change in service levels is achieved, could lead to increased customer satisfaction.

On the road network, this chapter has shown that there are similarities between the factors affecting satisfaction with the road network for different user groups. However; measures to improve satisfaction for one group may reduce the satisfaction for another group.

This chapter has focussed on understanding the key priorities for improving satisfaction by mode focusing on the practical aspects of the service. Over the next year, TfL will also review the London Underground Customer Satisfaction Survey to consider those emotional factors which may affect customer experience of TfL services, such as humanisation, stress levels and personal comfort. This will provide TfL with a greater understanding of how interventions impact satisfaction. This may lead to reviews of other Customer Satisfaction Surveys.

# 9. Summary of progress towards MTS transport goals

## 9.1 Introduction and content

This chapter updates the 24 Strategic Outcome Indicators for the Mayor's Transport Strategy and briefly interprets recent trends in these indicators in terms of progress towards MTS transport goals.

## 9.2 Strategic Outcome Indicators for monitoring the implementation of the Mayor's Transport Strategy – update for 2011 or 2011/12

The MTS Strategic Outcome Indicators provide a formal framework for monitoring progress against MTS goals. The trend in these indicators over the most recent three years is tabulated below. Section 9.3 provides a summary and brief interpretation of progress. In interpreting these indicators it should be noted that statistical 'series breaks' are relatively common, affecting the time-series comparability of these indicators. Generally these series breaks arise from methodological improvements to the processes used to quantify the indicator. These series breaks are highlighted in the brief commentary on the right-hand side of the table.

Table 9.1 The MTS Strategic Outcome Indicators – update for 2011 or 2011/12.

| MTS indicator | Brief definition | Units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | | Comment |
|---|---|---|---|---|---|---|---|
| Travel demand | Number of trips or journey stages made to, from or within London on an average day | Million | Trips: 24.8 Stages: 28.8 | Trips: 25.3 Stages: 29.3 | Trips: 25.5 Stages: 29.9 | ↑ | Steady growth, largely reflecting population increase. Note these estimates are on a consistent basis using the revised methodology described in Section 2.4 of this report. |
| Mode share[1] | Proportion of journey stages undertaken by each mode to, from or within London per calendar year. | Per cent | PT: 42% Private: 35% Walking: 21% Cycling: 2% | PT: 42% Private: 35% Walking: 21% Cycling: 2% | PT: 43% Private: 34% Walking: 21% Cycling: 2% | ↑ | Continuation of established trend of increasing mode share for public transport and decreasing mode share for private transport, in the context of growing overall travel demand. |
| People's access to jobs[2] | Number of jobs within 45 minutes travel time. | Jobs | 959,400 | 980,200 | 989,449 | ↑ | The average Londoner can typically access just under 1 million jobs within 45 minutes. |
| Smoothing traffic flow - journey time reliability | Percentage of journeys completed within five minutes of a specified typical journey time. | Per cent | 89.3 | 88.7 | 88.9 | → | Remained fairly stable with around 89 per cent of road journeys being achieved reliably. |
| Public transport reliability | Reliability indicators for each principal PT mode. | | | | | | |
| | LU excess journey time | Minutes | 6.4 | 6.5 | 5.8 | ↑ | Improving |
| | Bus excess waiting time | Minutes | 1.1 | 1.0 | 1.0 | | Improving |
| | DLR - trains on time | Per cent | 94.8 | 97.4 | 97.5 | | Improving |
| | London Tramlink - schedule operated | Per cent | 99.2 | 99.2 | 99.2 | | Stable |
| | National Rail – reliability | ORR PPM | 91.4 | 91.1 | 91.3 | | Stable |
| | Overground - reliability | ORR PPM | 93.1 | 94.9 | 96.6 | | Improving |

| MTS indicator | Brief definition | units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | | Comment |
|---|---|---|---|---|---|---|---|
| Public transport capacity | Planning capacities for the various train/tram/bus types, multiplied by kilometres operated. | Million place - kms | LU: 63,099<br>Bus: 29,311<br>DLR: 2,027<br>Tram: 544 | LU: 62,446<br>Bus: 29,751<br>DLR: 2,338<br>Tram: 564 | LU: 65,177<br>Bus: 29,804<br>DLR: 2,635<br>Tram: 566 | ↑ | Increased capacities following line upgrades.<br>Incremental increase – most since 50s.<br>Substantial increase, service extensions.<br>Stable network. |
| Operating costs per passenger kilometre[x] | Operating cost per passenger kilometre, for the principal public transport modes. | Cost per passenger km | Gross cost: 24 pence<br>Net cost: 8 pence | Gross cost: 22 pence<br>Net cost: 5 pence | Not updated this year<br>Not updated this year | →<br>→ | |
| Asset condition | Percentage of in-scope asset that is deemed to be in good condition. | Per cent | 89.1 | 89.2 | 89.4 | ↑ | Improving. |
| $NO_x$ emissions[3] | Emissions from ground-based transport in London per year. | Tonnes | (33,424) | 27.945 | Not updated this year | ↓ | Emissions of $NO_x$ fell by 16.4 per cent between 2008 and 2010. Further substantial reductions are required to meet air quality targets. |
| $PM_{10}$ emissions[3, 4] | Emissions from ground-based transport in London per year. | Tonnes | (839) | 735 | Not updated this year | ↓ | Transport exhaust emissions of $PM_{10}$ fell by 12.4 per cent between 2008 and 2010. |
| Public transport customer satisfaction | Overall satisfaction with the operation of the principal public transport modes. | Score out of 100 | 79 | 80 | 80 | → | Stable at what TfL considers to be a 'good' level of customer satisfaction. |

9. Summary of progress towards MTS Transport Goals

| MTS indicator | Brief definition | units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | | Comment |
|---|---|---|---|---|---|---|---|
| Road user customer satisfaction | Satisfaction of private road users with the maintenance/operation of the road network. | Score out of 100 | not available | 72 | 75 |  | Improving, now reflecting what TfL considers to be a 'fairly good' level of customer satisfaction. |
| Public transport crowding | Satisfaction with the level of crowding inside the vehicle, on the principal PT modes. | Score out of 100 | 76 | 76 | 77 |  | Stable |
| Perception of journey experience[3] | Perception of London residents of their overall journey experience. | Score out of 100 | 66 | 66 | 67 |  | Marginal increase, representing what TfL considers to be a 'fair' level of customer satisfaction. |
| Perception of noise | Perception of London residents of transport-related noise levels in their local area. | Score out of 100 | 70 | 71 | 72 |  | Steady improvement, reflecting what TfL considers to be a 'fairly good' level of customer satisfaction. |
| Perception of the urban realm | Perception of London residents of the quality of the urban realm (local area). | Score out of 100 | 66 | 66 | 65 |  | Stable, reflecting what TfL considers to be a 'fair' level of customer satisfaction. |
| Road traffic casualties | People killed or seriously injured in road traffic collisions in London per year. | People KSI | 3,227 | 2,886 | 2,805 |  | Continued good progress – 2.8 per cent reduction over latest year. However, increase in cyclist KSIs is area of serious concern. |
| Crime rates on public transport | Crimes per million passenger journeys by principal public transport modes. | Crimes | Bus: 11.1 LU/DLR: 12.8 | Bus: 10.5 LU/DLR: 11.4 | Bus: 9.3 LU/DLR: 9.6 |  | Continued good progress. |

| MTS indicator | Brief definition | units | 2009 or 2009/10 | 2010 or 2010/11 | 2011 or 2011/12 | | Comment |
|---|---|---|---|---|---|---|---|
| Perception of crime or safety | Perception of London residents of their sense of safety and fear of crime when travelling in the city. | Per cent feeling safe when travelling | Day-time: 95 Night: 78 | Day-time: 97 Night: 78 | Day-time: 95 Night: 76 | → | Decline in perception this latest year – mainly reflecting lower scores for perception of safety whilst walking in London. |
| Access to services[5] | Local area score of average journey time by public transport, walking and cycling to jobs and local services. | Minutes | (17.4) | n/a | n/a | → | Due to be re-benchmarked for TiL6. |
| Physical accessibility to the transport system | Level of step-free access across the public transport and TfL streets networks. | Per cent of network accessible | 37 | 38 | 44 | ↑ | Recent change mainly reflects investment in accessible bus stops over most recent year. |
| Real fares levels | Cost of fares for a representative 'basket' of trips. | Pence per km | 19.8 | 21.9 | 21.8 | → | Continuity of index affected by volatility in Retail Prices Index. |
| $CO_2$ emissions[3] | Emissions from all identifiable ground-based transport sources in London, expressed as tonnes of $CO_2$. | Million tonnes | (8.87) | 8.50 | Not updated this year | ↓ | $CO_2$ emissions from ground-based transport fell by 4.2 per cent between 2008 and 2010. |

*Important notes:*

*(1) Mode shares may not add to 100 per cent due to rounding.*
*(2) This indicator is re-benchmarked on a nominal 3-year cycle.*
*(3) Two data points – for 2008 and 2010 are available from the re-benchmarked London inventories,*
*(4) $PM_{10}$ emissions only include exhaust emissions from transport sources.*
*(5) Latest available estimate relates to 2008.*

## 9.3 Summary and interpretation of progress towards MTS goals

The overall message from Table 9.1 is that good progress has been made with the implementation of the Mayor's Transport Strategy, and that this has continued over the most recent year. The indicators collectively reflect a fast growing city, with commensurate increases in travel demand. London's public transport networks have also grown, and in recent years have offered more services, and operated with higher levels of reliability, than ever before. Londoners have responded by using public transport in ever-increasing numbers, with the change in mode share away from private to public transport continuing for the 17th successive year. Indicators of safety and security, customer experience and satisfaction and transport emissions to the atmosphere are all heading in the right direction, even if there remain specific points of concern yet to be fully addressed. In the most recent year the 2012 London Olympic and Paralympic Games were successfully delivered, with transport making a fundamental and highly-regarded contribution.

Looking across the Strategic Indicators and the other supporting information in this report, three developments in particular warrant enhanced attention going forward. The first of these is the realisation, following publication of the 2011 Census of Population, that there are more people living in London than previously recognised. More people means greater demand on the transport networks and, in the context of these new figures, it is likely that the population projections, and hence transport demand projections to 2031 in the MTS will be reached long before that. The second area of concern is the increase in cyclist casualties on the roads, reflecting increased cycling levels. A range of initiatives to address this are already in progress and the results of these will need to be closely monitored. Finally, although much progress has been made with reducing the emissions of key atmospheric and greenhouse gas pollutants from transport, the reductions achieved so far fall short of those required if targets are to be met. This particularly applies to nitrogen oxides, where concentrations of nitrogen dioxide ($NO_2$) in London's air continue to exceed limit values, and carbon dioxide ($CO_2$) where the rate of progress towards greenhouse gas reduction targets in respect of transport remain less than that required.

## 9.4 Monitoring the Olympic Legacy

An important Transport Strategy goal is facilitating and securing the longer-term legacy of the 2012 London Games. Transport is an enabler of the social and economic development that is being sought in the six 'Olympic' host boroughs, and Travel in London reports will be the means by which progress in terms of transport indicators towards these goals is communicated.

Travel in London report 4 set out a general approach to monitoring the transport aspects of the legacy, describing an overall methodology and giving examples of the indicators that will be used. The emphasis of this fifth Travel in London report is on reporting actual travel patterns during the Games (see chapter 10). A full treatment of Transport legacy indicators will appear in Travel in London 6, due towards the end of 2013.

# Spotlight topics

# 10. Spotlight on: The 2012 London Olympic and Paralympic Games

## 10.1 Introduction

This extended 'spotlight' chapter presents a comprehensive analytical overview of the transport demand and operational performance outcomes for the 2012 London Olympic and Paralympic Games. It is primarily strategic in focus, seeking firstly to understand area-wide trends and performance statistics in the context of each of the over-arching events during summer 2012 and at the Greater London level, giving consideration to more specific spatial and temporal aspects as appropriate. It does not cover the sporting or wider cultural aspects of the Games, the detailed operation of Games venues themselves, transport associated with non-London-based events or non TfL transport modes.

This spotlight chapter is one of several related initiatives covering aspects of the London 2012 Games and their transport Legacy. It is distinguished by focusing on 'what actually happened' during Games time, bringing together diverse data in a synthetic way and, so far as possible, on a comparable basis to provide a medium-term retrospective across the Capital's transport modes during summer 2012. It consolidates, and in some cases refines, previous estimates of Games time travel. It thereby provides a comprehensive and definitive new evidence base, and begins to draw out and quantify key insights and lessons for developing and embedding beneficial transport policy and operational initiatives based on the London 2012 Games time experience.

## 10.2 Structure and summary of content

This chapter takes a systematic approach to characterising travel demand patterns and operational performance by individual mode of transport, building into a comprehensive picture across all relevant modes and thereby allowing consideration of over-arching questions such as overall travel demand trends during Games time, mode shares, and the ways in which individuals and businesses adapted their travel to the unique circumstances and challenges presented by the Games. This progression forms the basic framework for the chapter, which is divided into 18 further sections.

**Section 10.3** provides essential background on the scale and scope of the London 2012 Games and the transport challenges they brought. **Section 10.4** summarises the methodological approaches used for this analysis.

The remaining sections consider each mode of transport in turn, looking at demand patterns and operational performance aspects as appropriate. Each section is prefaced by a short summary highlighting key points of interest, and these are consolidated in the Overview at the front of this report.

**Sections 10.5** through **10.8** focus on Games-time road traffic levels and the performance of the road network in London, including the Olympic and Paralympic Route Networks (the ORN and PRN) and general (non-Games related) road traffic. **Section 10.8** looks specifically at evidence for travel behavioural change for freight and servicing traffic.

**Sections 10.9** and **10.10** look at the London Underground, a fundamental part of the public transport networks supporting the Games. **Sections 10.11** and **10.12** review

demand patterns and operational performance for other TfL rail-based public transport modes. These include the Docklands Light Railway, London Overground and London Tramlink. **Section 10.13** considers at the bus network, while **section 10.14** looks briefly at other public transport modes, including National Rail in London and the newly-opened Emirates Air Line cable car across the river Thames. **Sections 10.15** and **10.16** look at strategic trends for walking and cycling during Games time - two modes that were expected to see a particular boost in popularity as a result of the Games.

**Sections 10.17 to 10.19** consolidate data from across the transport networks. **Section 10.17** brings together 'observed' travel demand data to quantify overall travel demand during Games time. This section includes estimates of total Games time travel, mode shares, and the reductions to 'background' travel demand as a result of travel demand management initiatives. **Section 10.18** looks at survey-based evidence for travel behaviour change. TfL's Games-time Travel Behaviour Research Programme is a longer-term project to more fully understand the adaptations made by travellers and businesses, and their implications for future transport policy. This section makes some initial explanatory links between this emerging data and the observed travel demand trends - as a preliminary to more in-depth work on this topic due to be published in 2013. **Section 10.19** brings together operational performance data from across the transport modes to summarise how the transport networks performed during Games time.

**Section 10.20** looks at local air quality in London across Games time - an important transport-related aspect given the potential implications of the ORN and PRN and associated traffic management arrangements for local air quality.

Finally, **section 10.21** brings together and summarises key headlines and lessons from the London 2012 Games time transport experience. The important topic of accessibility to the transport system during Games time is covered in **section 7.3** of this report.

## 10.3 Transport aspects of the London 2012 Games – background

This section gives essential background information on the nature and scale of the transport challenges presented by the London 2012 Games, and the preparations that were put in place by TfL and its transport partners to deal with them.

### The basic transport challenge

Hosting the Olympic and Paralympic Games is the largest peace-time logistical exercise a city can undertake. The over-riding objective of transport preparations for London 2012 was to fully support the operation of the Games, while at the same time keeping London and the rest of the UK moving and open for business. This meant providing an enhanced level of service in respect of travel to and from Games venues, but also taking steps to manage demand arising from regular non-Games travellers so that the exceptional numbers of travellers making their way to and from events could be accommodated. Although the Games largely took place during the school summer holiday period, which would help in this regard, further reductions to 'background' travel over and above this on certain parts of the networks would also be required. On the other hand, much of the rest of London, particularly Outer London, would not be directly affected by the Games - TfL estimated that 70 per cent of road journeys and 65 per cent of Underground stations would not be

significantly affected. Any travel demand management initiatives would therefore need to be carefully and appropriately targeted.

**Infrastructure provision and the 'Public Transport Games'**

Transport arrangements for the London 2012 Games were based on the expectation that close to 100 per cent of Games spectators in London would use public transport to reach competition venues – hence the 'public transport Games'. To help achieve this aim, almost £6.5bn was invested in transport improvements around the Olympic Park and across the Capital in the run-up to the Games. All of these were delivered within budget, well before the Games began. These improvements included line upgrades and new trains on the Tube, the extension and transformation of the London Overground network, extensions and capacity enhancements to the Docklands Light Railway (DLR), and several other rail upgrades throughout London, including the comprehensive re-modelling of Kings Cross/St Pancras Underground station. These are permanent enhancements that form a vital part of the wider 'Games legacy', and maximise public transport capacity to and from Games venues, particularly the Olympic Park at Stratford. Ticketed spectators were also issued with a special Games Travelcard (non-Oyster), which offered free travel on London's public transport network for the day in question - further encouraging the use of public transport by spectators.

**Service enhancements (public transport)**

TfL and transport partners such as National Rail undertook detailed planning to ensure that the right level of transport service was provided during Games time. Tube, DLR and London Overground services operated around one hour later than usual each evening, to coincide with the 'bump out' from events, and on many rail lines a more frequent service was operated during normal service hours. Additional steps were taken to ensure the reliability of the public transport networks, including a programme of enhanced preventative maintenance, the suspension of planned engineering works and the deployment of rapid response teams to deal quickly with any incidents that arose.

**London's road network**

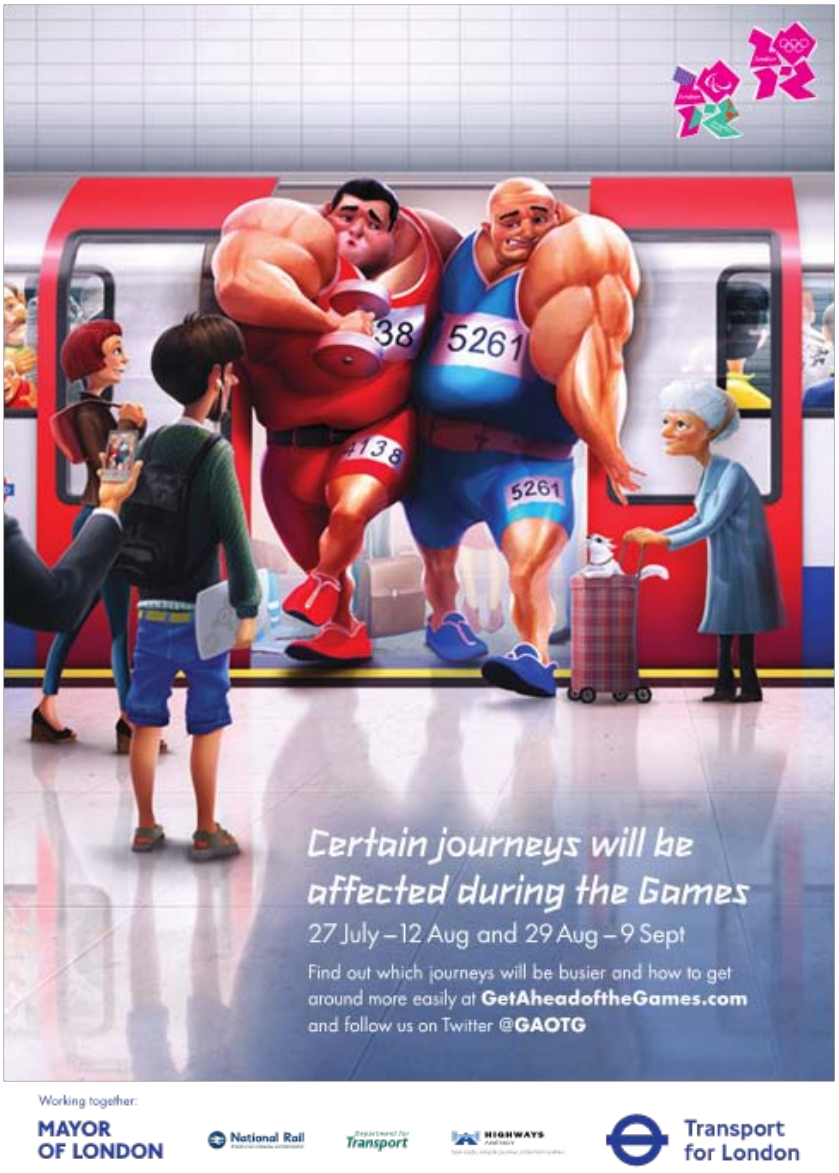
On the roads, TfL designed, implemented and operated the ORN and PRN – necessary to ensure that athletes, officials, and the world's media could reach venues reliably and meet commitments made to the International Olympic Committee. A number of physical measures, such as white lining and signage, were introduced to mark out the ORN and PRN, road works were strictly limited (brought forward or deferred) and various restrictions to parking and other vehicle movements were enforced.

A comprehensive programme of Active Traffic Management (ATM) – the largest ATM activity undertaken anywhere in the world – was implemented across the city. This involved alterations to around 1,300 traffic signals, about one-quarter of London's total, to support the effective operation of the ORN and PRN and to manage non-Games traffic in an effective way. The net effect of the ORN/PRN networks and road-based events would, however, be to reduce capacity for general road traffic – particularly in central London. It was therefore also necessary to manage this through ATM and encourage road users to reduce or otherwise adapt (eg re-time or re-route) their travel during Games time.

### Balancing travel demand during Games time

TfL recognised that enhanced services and operational performance on the networks would be insufficient on their own to deliver a successful Games transport operation. A significant change in travel behaviour by regular travellers, such as commuters, to encourage avoidance of the busiest times and places on the networks, was also needed.

Figure 10.1 Example of travel advice publicity - part of the Get Ahead of the Games travel demand management campaign.




To deliver this behavioural change a major programme of Travel Demand Management (TDM) was put in place. TfL engaged with businesses, spectators and regular travellers to advise them of the busiest times and places on the roads and public transport networks and the options available for changing their travel behaviour. This programme was supported by the high-profile 'Get Ahead of the Games' advertising campaign ('GAOTG'), jointly sponsored by TfL and London 2012, involving widespread publicity across the networks, and engagement through many different

channels (eg internet, travel planning workshops) with visitors, regular travellers and businesses.

Importantly, the scale and content of the TDM advice evolved as the Games progressed, in response to actual observed conditions on the network, and associated updated forecasts. So, for example, travel advice during the Paralympics was much more targeted around avoidance of specific travel 'hot spots'.

**'One Team Transport'**

Collaborative working among transport operators was fundamental to ensure the effective operation of the transport system. TfL worked closely with transport operators across the UK, LOCOG (the London Organising Committee for the Olympic Games) as well as the London boroughs, the Department for Transport and the Emergency Services. All collaborated successfully as 'One Team Transport', including setting up a nationwide Games Transport Board to plan and deliver transport services. This included innovative measures such as the UK's first-ever nationwide Transport Co-ordination Centre (TCC), enabling transport operators to share information, work together in response to incidents, and integrate and optimise communication to customers - based on the real-time analysis of travel trends and network conditions.

**London 2012 spectator attendance figures**

The London 2012 Olympic and Paralympic Games are widely regarded as having been a great success as sporting events. Both the Olympic and Paralympic Games saw record attendance. During the Olympic Games there were 7.4 million ticketed spectators. Some 6.2 million of these attended venues in London, including 2.8 million spectators at Olympic Park venues alone. The Paralympic Games sold out for the first time in their history, with 2.7 million total tickets sold. Record numbers also viewed road-based Games events in London and the South East, including (across both Games) over 1.2 million for road-based cycling events, 350,000 for marathon events, and around 250,000 for other road-based events such as the triathlon.

Londoners and visitors also took advantage of the wider range of events and activities available across the City during summer 2012 - part of London 2012's 'Summer of Culture'. These included 'live' sites at parks in central and Inner London, where non-ticketed spectators could view events on giant screens, while 250,000 people lined the streets of central London to celebrate the success of British Olympians and Paralympians at the end of the Games. It is estimated that a total of 12 million people attended other festivals and events in London over the period of the Games.

Impressive though these figures are, they should also be seen in context of more normal daily volumes of travel in London (see section 2 of this report). Assuming that each spectator made a return trip to a Games venue, their trips in total would add just an additional 3.1 per cent (Olympics) and 2.1 per cent (Paralympics) to normal daily volumes of travel in London across all modes (there are 25.5 million trips in London on an average day). Looking just at rail modes (the modes most likely to be used by spectators), the additional percentages are much more substantial – about 16 per cent for the Olympics and 11 per cent for the Paralympics. Furthermore, the origins and destinations for these trips were likely to be highly concentrated around specific locations, including the Olympic Park and central London.

The principal transport challenge of the Games therefore arose from the extreme concentration of spectator and other visitor travel on specific modes and at specific

locations, such as venue and other key interchange stations, and at specific times of day, such as the start and end of event sessions at Games venues. Travel demand management initiatives emphasised and highlighted these specific travel 'hot-spots'.

## 10.4 Framework for analysis

This section outlines some key principles underpinning the analysis featured in this chapter.

### Analysis periods – defining 'Summer 2012'

The focus of this chapter is necessarily somewhat wider than just the days of the Olympics and Paralympics events themselves. This is so that factors such the school summer holidays can be included in the analysis, and also to give a view of travel trends in the periods immediately before, in-between and immediately after the Games.

The period of analysis therefore runs from **Monday 9 July 2012** to **Sunday 23 September 2012** inclusive – a period of 11 whole weeks. Throughout this chapter the term '**Summer 2012'** refers specifically to this period. A similar period, '**Summer 2011'**, is defined for baseline comparison, this running from **Monday 11 July 2011** to **Sunday 25 September 2011** inclusive. This makes possible comparisons on the basis of **equivalent days** in 2012 and 2011 – for example Monday 9 July 2012 being equivalent to Monday 11 July 2011, and so on.

### Spatial and temporal resolution

Wherever possible, trends in travel demand and operational performance during summer 2012 are characterised on two levels. The first of these is a **disaggregate level**, generally and where permitted by the available data offering day-by-day resolution across the whole of the analysis period. This allows detailed representation of how travel responded to the day-by-day programme of events and other influences, and sets the Olympic and Paralympic Games in the wider context of changes to travel demand over the school summer holiday period. Where appropriate, data are examined at the sub-day or sub-area or network level, for example to look at travel demand at key Underground stations in the weekday morning peak period.

The second is a more **aggregate level** of analysis using the concept of **five normalised two-week periods** across summer 2012. This is necessary because both the Olympic and Paralympic Games were of differing durations, in particular involving a different mix of weekdays and weekend days. Normalisation accounts for this different day-mix and provides comparable 'daily average values' for comparison, for each of the two Games and the weeks either side of them. Deriving such normalised daily average values is necessary for the cross-modal synthetic analysis in Section 10.17

### Comparison baselines

To fully understand travel during summer 2012 it is necessary to compare against a range of baselines that characterise conditions during non-Games and other 'representative' periods. The preferred approach is to compare summer 2012 against equivalent values for summer 2011, either daily values or normalised averages that have been adjusted to represent what would have been expected in summer 2012 were there no Games (the 'counterfactual' case). Many transport modes in London have experienced rapid growth over recent years, particularly where new

infrastructure has been put in place to support the Games, and this needs to be accounted for in the analysis. Where this is not possible or appropriate, alternative baselines are used for comparison. Further details are given in the text as necessary.

**Other specific factors affecting the assessment of travel patterns for summer 2012**

In making comparisons across summer 2012 and with the preceding year, it is necessary to recognise several over-arching influences on travel demand, in addition to background growth. These include the opening of the large Westfield retail development adjacent to Stratford station on 13 September 2011. The effect on travel demand will be a factor in interpreting comparisons of travel at Stratford before that time. Other important factors are the temporary extension of Sunday retail trading hours during Games time and, in terms of conditions in 2011, the civil disturbances in early August, which affected particularly the bus network across London. Finally, although the weather was generally pleasant for the Games themselves, the period immediately before the Olympics and, indeed, much of the period from April to July 2012 was affected by unusually poor weather, with persistent heavy rain on many days. This will be an important factor when comparing Games time travel patterns with those over the weeks and months immediately before the Games, particularly for modes such as walking and cycling.

## 10.5 Roads and traffic: The Olympic and Paralympic Route Networks and Games Family traffic

TfL and partners worked to balance International Olympic Committee contractual requirements for Games Family traffic with 'background' traffic demand - to support the Games while keeping the rest of London's road network moving. The three key elements to this strategy were: the establishment of the Olympic and Paralympic Route Networks (the ORN and PRN); a supporting programme of Active Traffic Management, to ensure the operation of the ORN and PRN and manage other non-Games traffic, and a comprehensive Travel Demand Management strategy aimed at moderating 'background' (non-Games-related) demand during Games time.

London's roads would play an essential part in the logistical elements of the Games, including the transport of athletes, officials and other members of the 'Games Family' to, from, and between competition venues. They would also continue to provide for non-Games traffic. Various standards for Games Family transport were specified as part of London's contract with the International Olympic Committee (IOC), particularly around target journey times between venues. All of this meant that a comprehensive programme of road network and traffic management was necessary to optimise the road network for the various, potentially conflicting, demands of the Games. There were three elements to TfL's strategy.

**The Olympic and Paralympic Route Networks**

First was the establishment of the ORN and PRN – a priority network of roads optimised specifically for carrying Games Family vehicles (GFVs). They involved temporary modifications to selected road corridors to enable them to carry Games Family traffic reliably to, from and between competition venues, such that agreed resilient journey time targets could be met. These modifications increased capacity by up to 30 per cent on these networks for GFVs, The ORN involved around 1 per cent of London's road network and was 175 kilometres long, with dedicated Games lanes on 48 kilometres. The PRN involved less than 0.5 per cent of the network, being

58 kilometres in length and having 14 kilometres of Games lanes. Only authorised GFVs (and emergency vehicles under 'blue light' conditions) were permitted in Games Lanes during their times of operation, but not all of the networks were active all of the time, and the extent of each network that was active was in the event controlled reactively in response to actual traffic conditions and venue use.

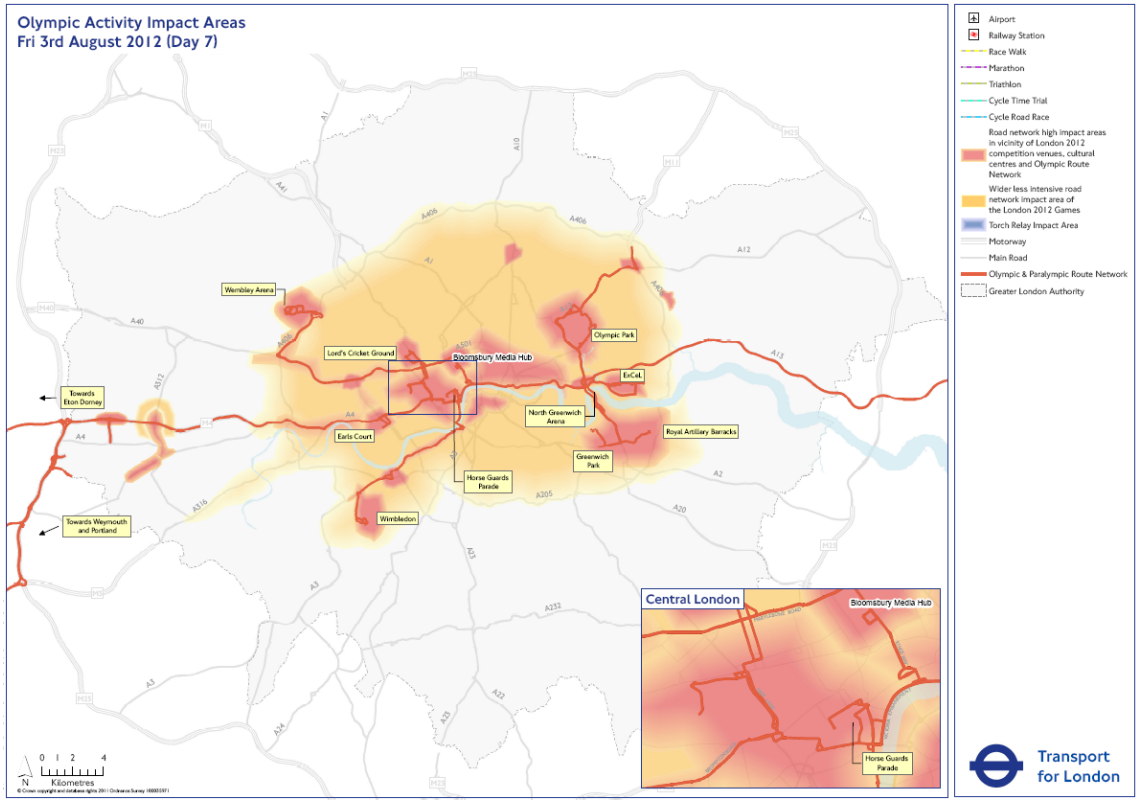
This flexibility was used to considerable effect as the Games progressed to continue to meet journey time and reliability targets for GFVs while minimising disruption to other road traffic. During the Olympics, only 40 per cent of Games Lanes were typically in operation each day. During the Paralympics only 30 per cent were typically needed. Estimates suggested that about 70 per cent of London's traffic would be wholly unaffected by the ORN and PRN, and a very much smaller percentage was likely to be significantly affected.

### Active Traffic Management (ATM)

The second element of TfL's strategy was an extensive programme of Active Traffic Management (ATM), covering much of central and Inner London, designed to support the operation of the ORN and PRN and manage non-Games traffic effectively. This involved alterations to around 1,300 traffic signals, about 25 per cent of London's total. The objective of ATM were to provide a degree of 'protection' to the ORN and PRN networks and competition venues by optimising network control to favour them and other routes (for general traffic) that did not conflict with these networks. ATM would also allow faster and better responses to emerging incidents on the network.

### Travel Demand Management for road traffic

Figure 10.2 Example of journey planning advice provided to road users – congestion 'hot-spots' map for Friday 3 August 2012.



The third element of TfL's Games time roads strategy was travel demand planning and management. Key features of the GAOTG travel demand management campaign as applied to roads included comprehensive internet-based journey planning advice, which highlighted those parts of the network that were expected to be particularly congested on each day of the Games, and provided journey planning assistance. Figure 10.2 shows an example of this advice, relating to forecast road network conditions on Friday 3 August (Day 7 of the Olympic Games), encouraging motorists to plan to avoid hot-spot locations.

**Road Freight Management Programme**

With freight and servicing traffic constituting up to 25 per cent of weekday traffic in central London, TfL undertook the Road Freight Management Programme, a major engagement exercise with businesses and vehicle operators, built around the concept of the '**four R's**': re-time; re-mode; reduce and re-route. This was intended to encourage vehicle operators and related businesses to adapt their delivery schedules to lessen traffic at critical times, particularly the morning peak and mid-day periods. An example of reducing demand would be for businesses to stockpile essential supplies ahead of the Games, whereas re-timing could involve taking advantage of quieter traffic conditions during the overnight period to make deliveries that otherwise would have been made in daytime. All of this was designed to achieve a balance between moderating 'background' demand and accommodating the specific network capacity requirements of the ORN and PRN and Games Family traffic.

Travel demand management as applied to the road network therefore constituted a mix of 'hard' and 'soft' elements. The ORN and PRN and associated measures removed road network capacity for general traffic, to help support the Games and meet commitments for Games Family travel. The operation of ATM re-enforced this, in part by using traffic management strategies to further discourage traffic from the areas directly affected by the ORN or PRN. However, effective planning and adaptation by individual motorists and businesses would also help ameliorate demand at the most critical times and locations leading, it was expected, to an effective balance between these competing demands on the road network.

**Journey times and journey time reliability for Games Family traffic**

London fulfilled its promise as host city to get athletes to where they needed to be, on time and in safety during the Games. On average the Games Family journey times that had to be achieved were 30 per cent faster than normal journey times in London. These were achieved with a 95.6 per cent level of journey time reliability during the Olympics, compared to a target of 95 per cent. The equivalent value for the Paralympics was 97.8 per cent. However, levels of demand from Games Family vehicles were lower than expected – at around one-third of pre-Games forecasts. This meant that TfL was able to optimise and minimise the extent of the ORN or PRN actually in operation on a daily basis, to maintain standards for Games Family vehicles while minimising disruption for other road users.

**What were Games Family Vehicles ?**

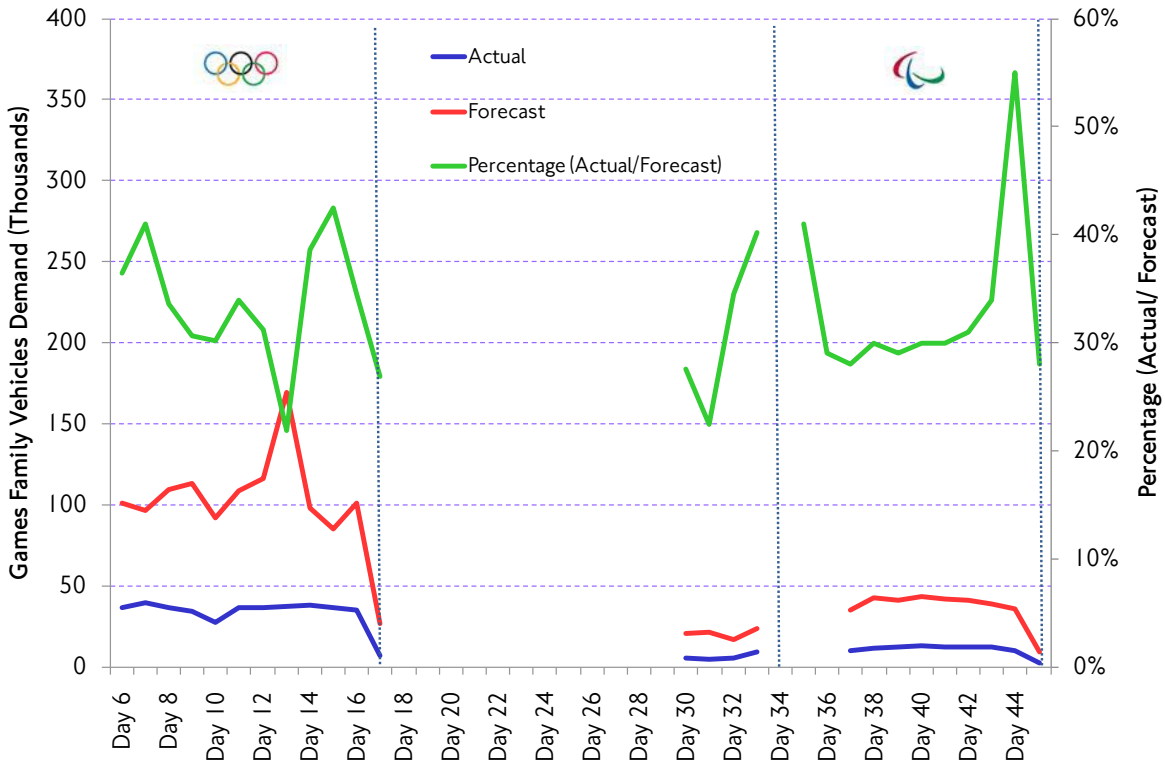
Games Family vehicles (GFVs) were designated vehicles used to transport athletes, officials and the media to and from Games venues. GFVs also included vehicles used to transport persons who had been provided with vehicle access and parking permits (VAPPs). Only GFVs (and emergency vehicles under 'blue light' conditions) were permitted to use dedicated 'Games Lanes' on the ORN or PRN networks. The

provision and management of GFVs was a LOCOG responsibility. Provision and operation of the ORN and PRN networks within London fell to TfL and, on the M4 motorway to Heathrow, the Highways Agency.

### Levels of demand from GFVs

Actual levels of demand from GFVs were consistently lower than expected. Figure 10.3 compares actual GFV demand with LOCOG forecasts, with average actual demand being 33 per cent of forecast during the Olympics, and 33 per cent of forecast during the Paralympics. In the event, the numbers of vehicles with VAPPs was much lower than expected. Furthermore, some client groups were able to use technology more than in past Games, or choose to make use of public transport. However, pre-Games forecasts clearly needed to be based on maximum assumptions, and were robust within the pre-Games assumptions that were available. The net effect of these factors was that demand by GFVs was well below the forecast, and TfL responded to this by reducing the extent and hours of operation of the ORN and PRN to minimise disruption for general traffic as soon as actual levels of demand became clear, including the use of large numbers of variable message signs to provide an even greater level of dynamic management than previously envisaged.

Figure 10.3 Games Family Vehicles. Vehicles per day observed passing monitoring cameras on ORN and PRN.




*Source: TfL Surface Transport.*
*Notes: Demand numbers relate to observations of GFVs by monitoring cameras. Each individual unique vehicle could be observed several times by cameras during the course of its journey. The values therefore do not reflect the actual number of GFVs in circulation. Technical issues with the monitoring cameras mean that consistent data is not available for the first six days of the Olympic Games.*

### Games Family Vehicles: journey times and journey time reliability

London's contract with the IOC included commitments to meet journey time targets for GFVs between Games venues. A target to achieve 95 per cent journey time

reliability for GFVs was also agreed. Journey time targets comprised a range of venue-to-venue (absolute) travel times, whilst journey time reliability was measured using the method described in Travel in London report 4 which is the conventional journey time reliability measure for general traffic in London. GFV journey time reliability was 95.6 per cent for the Olympics, and 97.8 per cent for the Paralympics, both exceeding the 95 per cent target.

**Summary – the ORN and PRN and Games Family traffic**

By effectively managing the road network, London fulfilled its promise as host city to get athletes to where they needed to be, on time and in safety during the Games. Although the ORN and PRN and associated ATM removed some capacity for other road traffic, the proportion of all journeys in London that were directly affected was small, and disruption to other road users was minimised as knowledge of actual levels of GFVs became clear. The extent to which athletes and other Games Family members used London's extensive public transport in preference to road was unprecedented in Games history and was highly commended by IOC and International Paralympic Committee (IPC) officials.

## 10.6 Roads and traffic: general road traffic volumes and travel by car in London during summer 2012.

Road users in London successfully adjusted their travel patterns during Games time, enabling TfL to accommodate the specific requirements of Games Family traffic and to keep the rest of London's roads moving. At the Greater London scale, traffic levels over summer 2012 were in fact closely comparable to that expected during a normal non-Games summer – traffic volumes reducing in line with established patterns over the school summer holiday period. Additional traffic reductions were however seen in central and Inner London, reflecting the measures to support the ORN and PRN, and road-based events, and adaptive travel behaviour by motorists and businesses. This suggests that a good balance was achieved between providing support for Games Family traffic and keeping the rest of London's roads open for business.

**Data sources and baselines – traffic volumes**

General traffic volumes in London during Games time were monitored using a combination of permanent automatic traffic counters and radar-based vehicle detectors. The units of measurement used are average vehicle flows across all monitored road links.

Actual traffic flows during summer 2012 are compared against two baselines:

- average traffic for each day-type (weekday, Saturday and Sunday) during July 2011;
- average traffic for each day-type in August 2011.

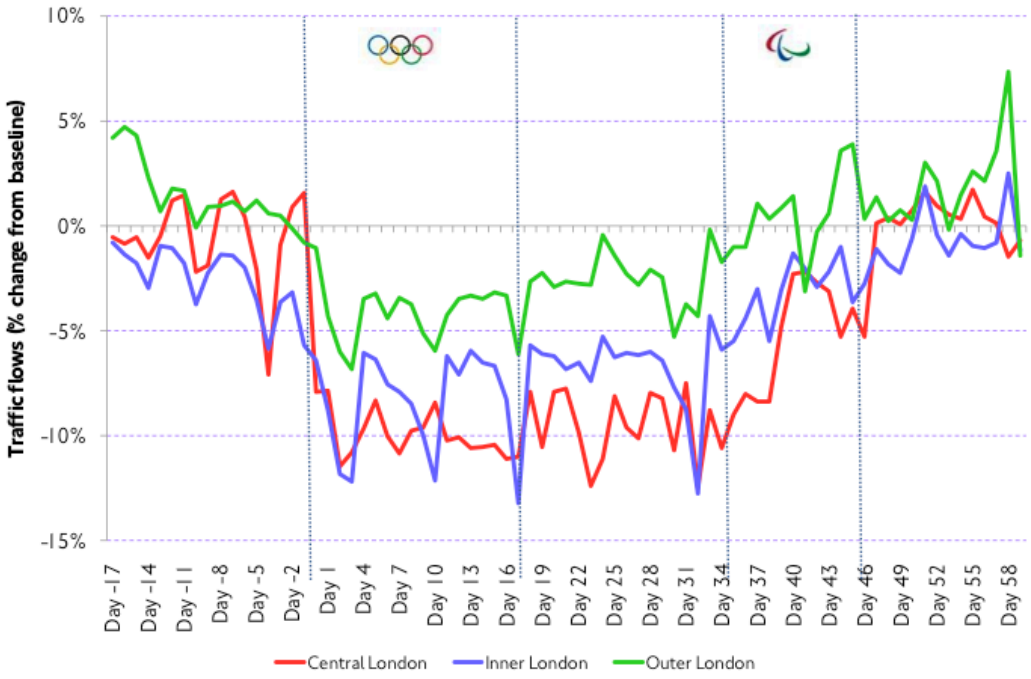
'Background' traffic volume change between 2011 and 2012 in London has been provisionally assessed as just a marginal increase of about 1 per cent, across a comparable set of counters, and these summer 2011 flows can therefore be taken to represent traffic flows that would have been 'expected' were there no Games in summer 2012 (ie the 'counterfactual' case).

**General traffic volumes: Central, Inner and Outer London**

Figures 10.4 and 10.5 show average daily traffic flows on all monitored road links in central, Inner and Outer London. The graphs show the percentage difference between

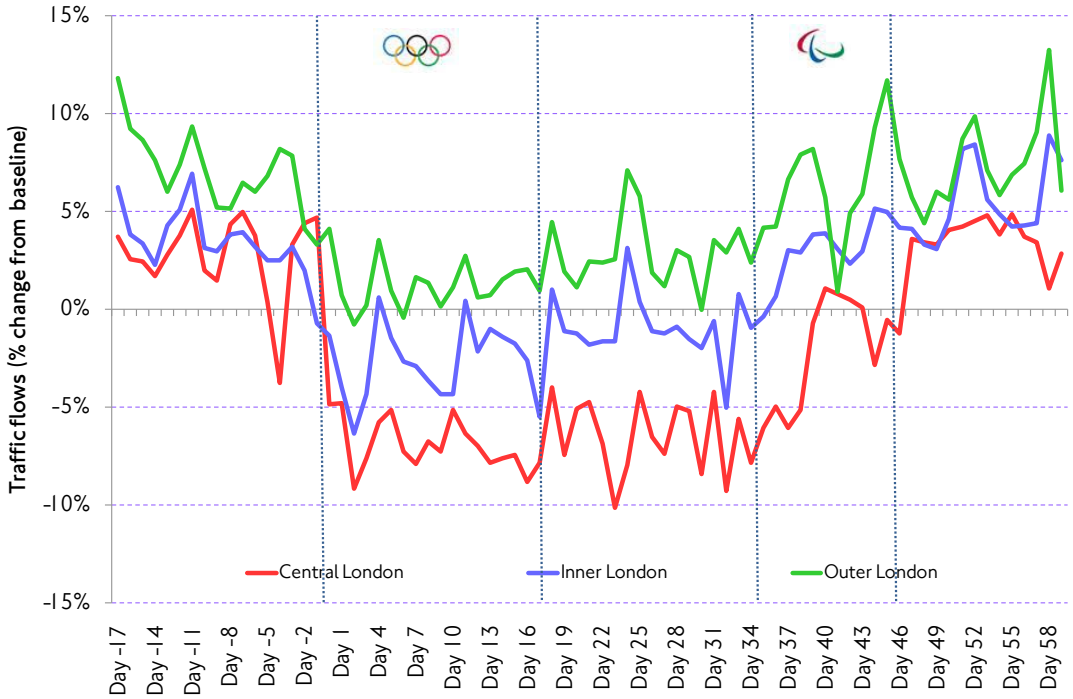
the actual observed summer 2012 flows and the July 2012 representative baseline (figure 10.4), and the August 2012 representative baseline (figure 10.5).

Figure 10.4 Average daily traffic flows on monitored roads in central, Inner and Outer London. Summer 2012 compared with July 2012 non-Games-equivalent flows. Percentage difference.




*Source: TfL Surface Transport.*

Figure 10.5 Average daily traffic flows on monitored roads in central, Inner and Outer London. Summer 2012 compared with August 2012 non-Games-equivalent flows. Percentage difference.




*Source: TfL Surface Transport.*

As might have been expected given the location of the ORN and PRN, road-based Games events and related traffic management arrangements, the highest proportionate traffic reductions are seen in central London.

Traffic reductions against the respective baselines are visible corresponding to the Olympics and Transition periods, but are less evident in other periods, especially the Paralympic period, although it should be borne in mind that this was largely in September, when background traffic flows would normally be higher than either July or August.

Table 10.1 summarises these changes and gives estimates of traffic change at the Greater London level, weighting the area-specific flow changes by the proportion of total traffic (vehicle kilometres) occurring in each area. Note that the large majority (just under 70 per cent) of traffic in Greater London occurs in Outer London, and therefore the observed change in this area heavily influences the overall Greater London traffic change figure, as well as the average traffic speed values considered in the next section.

Table 10.1 Summary of traffic change over summer 2012. Percentage changes against stated baseline.

| | Pre Games | Olympics | Transition | Paralympics | Post Games |
|---|---|---|---|---|---|
| **Against July baseline** | | | | | |
| Central London | -1 | -10 | -9 | -6 | 0 |
| Inner London | -2 | -8 | -7 | -3 | -1 |
| Outer London | +2 | -4 | -3 | 0 | +2 |
| Greater London | +1 | -5 | -4 | -1 | +1 |
| **Against August baseline** | | | | | |
| Central London | +3 | -7 | -6 | -3 | +3 |
| Inner London | +4 | -3 | -1 | +3 | +5 |
| Outer London | +7 | +1 | +3 | +6 | +7 |
| Greater London | +6 | 0 | +2 | +4 | +5 |

*Source: TfL Surface Transport.*

Looking at figure 10.4 measuring against a July 2012 representative baseline, traffic reductions of between 10 and 15 per cent are seen in central London across both the Olympics and Transition periods (largely August)). Typical reductions during these periods in Inner London were around 7-8 per cent, with corresponding reductions of about 3-4 per cent in Outer London. These equate to overall traffic reductions at the Greater London level of between 4 and 5 per cent against the July baseline. Given that July is a mix of normal working time and the school summer holidays, observed values for the Olympics (late July/August) and Transition (wholly August) periods are more properly assessed against the August baseline.

Here (figure 10.5), observed traffic reductions in central London are typically between 6 and 7 per cent, with corresponding reductions of between 1 and 3 per cent in Inner London, and increases of between 1 and 3 per cent in Outer London. These equate to effectively 'no overall change' in measured traffic volumes against the August 2012 representative non-Games baseline at the Greater London scale during the Olympic period, and a relative increase in traffic of 2 per cent in the Transition period.

It is important to note that:

- these area-wide traffic volume changes do not include the ORN and PRN themselves;
- volumes of traffic during August 2012 were slightly higher in Outer London than would otherwise have been expected;
- the observed reductions in inner and, particularly, central London appear to be relatively modest when viewed in the context of the Games time network changes and other disincentives to travel, but were crucial to delivering the flexibility required to operate the network effectively;
- these aggregate London-scale effects subsume much greater variations in traffic volumes at the more local scale.

Traffic levels during the Paralympic period showed little change against the July 2012 baseline (taken as a proxy for September), but were up by 4 per cent overall against the August 2012 baseline. This is not surprising, given that the Paralympics spanned the return to school period, but it does suggest that, even in central London, traffic conditions were very close to 'business as usual' at this time.

Relative changes in traffic for the pre- and post-Games periods are similarly intuitive, being closely comparable overall to July conditions, and up against August values by an amount broadly corresponding to the reductions that would usually be expected over the school summer holiday period.

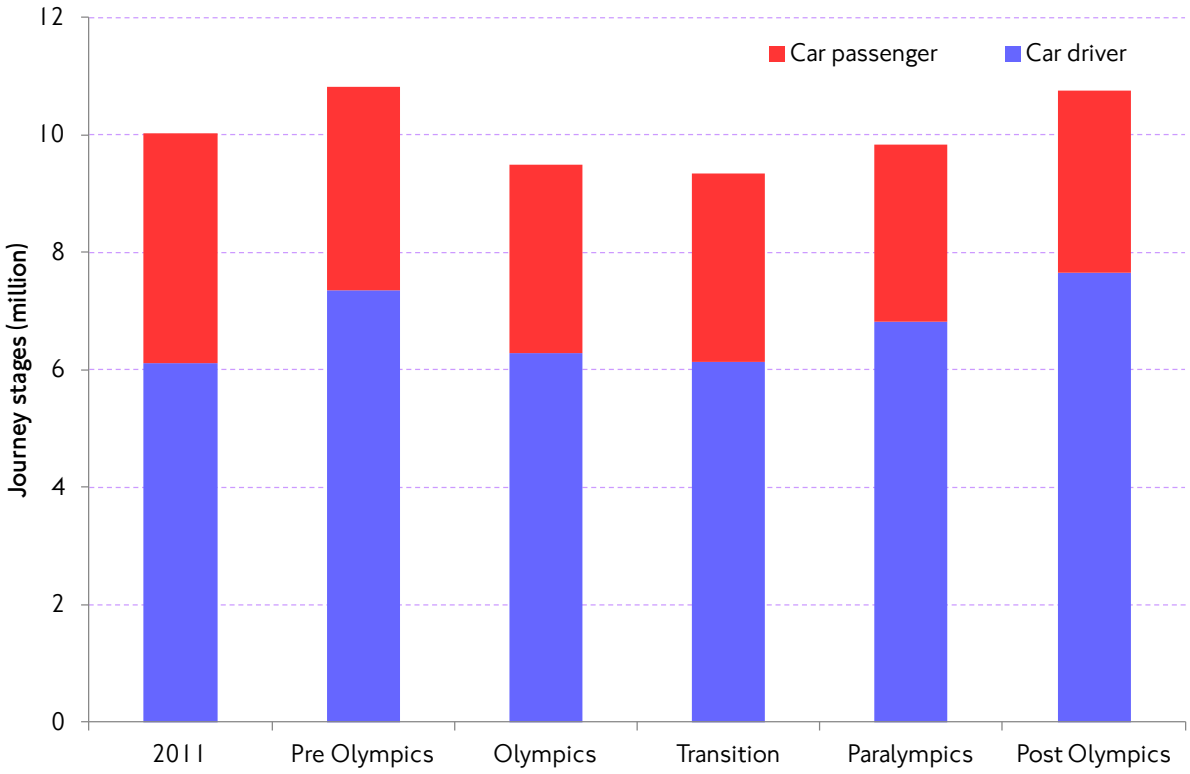
**Traffic change in the area directly affected by Active Traffic Management (the ATM Zone)**

The area directly affected by ATM broadly corresponded to Inner London, although the area was slightly larger and included parts of outer northeast and northwest London to encompass the Olympic Park and related venues. The change in traffic demand at ATM sites varied location by location, with the more intense sites holding back up to half of traffic whilst others required lower levels of constraint.

**Personal travel by road during summer 2012**

A key output of this review is estimates of personal travel during summer 2012 across all modes of transport that are comparable with 'annualised' estimates of travel described in chapter 2 of this report. As a contributor to this, figure 10.9 shows estimates of car-based journey stages over summer 2012. These have been derived by relating the observed variation in both car kilometres (from the traffic flow data above) and vehicle occupancy (from special Games time surveys of occupancy) to TfL's annualised estimates of road-based journey stages for 2011.

Figure 10.6 Estimates of car-based journey stages in Greater London during summer 2012.




*Source: TfL Group Planning Strategic Analysis.*

The overall pattern of car-based person trip making is reflective of what would normally be expected over a typical summer. The number of car-based person-stages reduces in rough proportion to the traffic levels, as shown by figures 10.4 and 10.5, and picks up again in the post-Games period. As with traffic flows, there is little distinction at the Greater London level to be made between observed Olympic and Paralympic travel and the normal seasonal pattern. Average car vehicle occupancies did, however, show a slight tendency to increase over Games time, as shown by table 10.2, slightly offsetting the reduction in vehicles over Games time in terms of this measure.

Table 10.2 Results from Games time vehicle occupancy surveys. Average persons per private car, including driver.

| Area | Pre Games | Olympics | Transition | Paralympics | Post Games |
|---|---|---|---|---|---|
| Central | 1.37 | 1.45 | 1.45 | 1.42 | 1.38 |
| Inner | 1.42 | 1.47 | 1.48 | 1.42 | 1.42 |
| Outer | 1.49 | 1.53 | 1.55 | 1.45 | 1.41 |
| Greater London | 1.47 | 1.51 | 1.52 | 1.44 | 1.41 |

*Source: TfL vehicle occupancy surveys, Surface Transport.*

### Temporal change ('time-shifting') for general road traffic

Motorists and businesses successfully adjusted the times at which they travelled to avoid the busiest times and places on the road network. Across Greater London there was proportionately less traffic during the morning peak and mid-day periods, balanced with more traffic in the late evening and overnight periods. Although relatively small in magnitude for general traffic, this change was crucial in relieving pressure at the most critical points on the road network, particularly in central and Inner London where it also combined with reductions in the absolute volume of traffic.

The extent to which traffic volumes changed at different times of the day can shed light on behavioural adaptation by drivers to Games time conditions. Looking at general traffic at the Greater London level, table 10.3 summarises the observed changes to traffic volumes by time of day, corresponding to the aggregate trends described in figures 10.4 and 10.5. Data are compared against the August 2012 non-Games baseline (this representing typical 'summer holiday' behaviour in terms of time of day patterns).

Common to all parts of London is a relative increase in the proportions of daily traffic in the overnight hours, and relative reductions during daytime. Central London sees the most intense effects of this kind. For example, during the Olympics in central London there was 13 per cent more traffic in the period from midnight to 07:00, although in Outer London there was 16 per cent more. Morning peak (07:00-10:00) traffic in central London during the Olympics was 13 per cent below the non-Games baseline, with inter-peak traffic 12 per cent down and evening peak traffic down by 11 per cent. Although traffic volumes during the Paralympics show similar features, the effects are less intense. Interestingly, increased night-time proportions of traffic are strong features of both the pre- and post Games periods as well.

Table 10.3 Summary of traffic flow change by time period. Average flows on monitored roads compared with average flows for August 2011. Index values, August 2011 = 1.00. Comparison based on absolute volumes of traffic.

| | Pre Games | Olympics | Transition | Paralympics | Post Games |
|---|---|---|---|---|---|
| **Central London** | | | | | |
| Night (00.00-07.00) | 1.11 | 1.13 | 1.07 | 1.09 | 1.11 |
| AM Peak (07.00-10.00) | 0.99 | 0.87 | 0.87 | 0.91 | 0.99 |
| Inter Peak (10.00-16.00) | 1.00 | 0.88 | 0.91 | 0.94 | 1.00 |
| PM Peak (16.00-19.00) | 1.01 | 0.89 | 0.93 | 0.96 | 1.03 |
| Evening (19.00-22.00) | 1.02 | 0.89 | 0.92 | 0.98 | 1.04 |
| Late evening (22.00-00.00) | 1.05 | 0.97 | 0.96 | 0.99 | 1.03 |
| **Inner London** | | | | | |
| Night (00.00-07.00) | 1.08 | 1.10 | 1.03 | 1.02 | 1.02 |
| AM Peak (07.00-10.00) | 1.08 | 0.97 | 1.01 | 1.06 | 1.14 |
| Inter Peak (10.00-16.00) | 1.02 | 0.95 | 0.99 | 1.02 | 1.05 |
| PM Peak (16.00-19.00) | 1.01 | 0.95 | 0.98 | 1.02 | 1.06 |
| Evening (19.00-22.00) | 1.03 | 0.94 | 0.99 | 1.04 | 1.05 |
| Late evening (22.00-00.00) | 1.04 | 0.99 | 0.98 | 0.98 | 0.97 |

**Outer London**

| | | | | | |
|---|---|---|---|---|---|
| Night (00.00-07.00) | 1.14 | 1.16 | 1.10 | 1.08 | 1.10 |
| AM Peak (07.00-10.00) | 1.12 | 1.02 | 1.05 | 1.11 | 1.16 |
| Inter Peak (10.00-16.00) | 1.06 | 0.99 | 1.02 | 1.04 | 1.06 |
| PM Peak (16.00-19.00) | 1.05 | 0.99 | 1.01 | 1.05 | 1.07 |
| Evening (19.00-22.00) | 1.07 | 0.98 | 1.02 | 1.06 | 1.06 |
| Late evening (22.00-00.00) | 1.06 | 1.02 | 1.02 | 0.99 | 0.96 |

*Source: TfL Surface Transport.*

## 10.7 Roads and traffic: Performance of the road network

As well as successfully delivering journey time and reliability targets for Games Family traffic, TfL and partners kept the rest of London's roads moving and open for business. Average traffic speeds at the Greater London level during the Olympics, Transition and Paralympics period were close to what would otherwise have been expected given prevailing levels of traffic demand, and allowing for a degree of capacity removal from Games time traffic management measures. The same applies to journey time reliability for general traffic, with over 91 per cent of non-Games journeys completed reliably during the Olympics, and over 89 per cent during the Paralympics (compared to normal values of between 89 and 90 per cent). However, there is evidence of more significant disruption locally and on the days immediately before the Olympics, as the various traffic management measures and driver responses bedded in.

TfL's management of the road network during Game time successfully delivered journey time and reliability targets for GFV – the over-riding operational consideration at the time. This section looks at the level of service provided, in terms of average traffic speeds and journey time reliability, for general (non-Games) traffic in London during summer 2012.

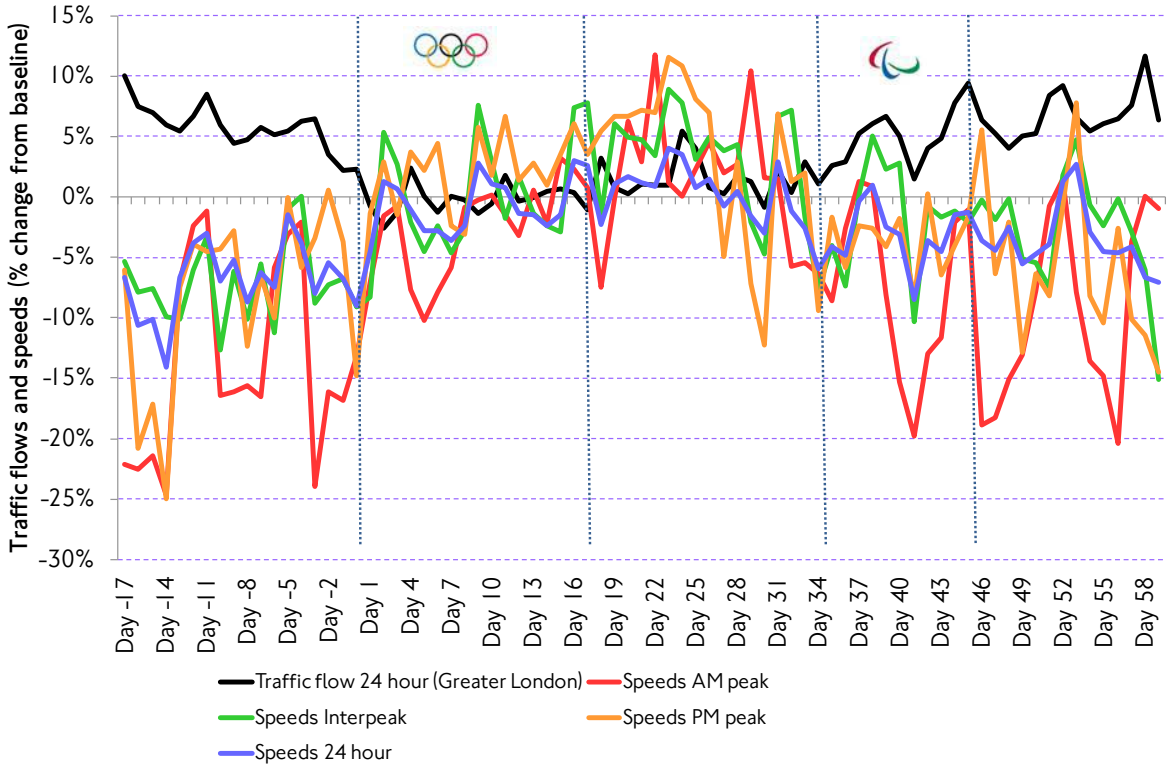
### Average speeds for general traffic

Proxy data for average traffic speeds over summer 2012 are available from camera-based measurements on the MTS Strategic Road Corridors (see Travel in London report 2). These give a good view of average traffic speeds on major roads (largely the TLRN) in London. The comparison baseline used is measured average traffic speeds in August 2011 – these being a representative proxy for traffic speeds that would be 'expected' during summer 2012 had there been no Games. Note that the baseline is in terms of average values over the month of August for each day-type (weekdays, Saturdays and Sundays) separately. Figure 10.17 shows observed traffic speeds for Greater London as an index value against the baseline. Separate indices are given for the AM peak, inter-peak, PM peak and 24-hour periods (this distinction is also applied to weekends). The figure also shows the equivalent index value for traffic volumes (black line, also against a representative August 2012 non-Games baseline).

Looking first at the speeds, the general picture is for speeds to be lowest in the pre- and post-Games periods, and highest in the Olympics and Transition periods. Because the comparison baseline is representative of August 2012 with no Games, it is interesting to note that average speeds during both the Olympics and Transition period (nominally no Games activity) are fairly close to what would be 'expected' at these times. However, Paralympic period speeds are approximately 3 per cent lower overall, and post-Games speeds reflect the return of traffic following the school

summer holidays. Notable from the figure however are speeds in the pre-Games period, on certain days these being up to 25 per cent slower during the peaks than would otherwise have been expected (although it is important to recognise that these days were in July, and the comparison baseline is for August). This is thought to reflect the 'bedding in' of the various traffic management measures and driver responses to them in the Pre-Games period. Table 10.4 summarises these comparisons.

Figure 10.7 Average traffic speeds on major roads in Greater London during Summer 2012. Index value against average (by day type) for August 2011 baseline. Equivalent trend for traffic volumes also shown.




*Source: TfL Surface Transport.*

To properly interpret these trends it is necessary to consider traffic volumes and the amount of effective network capacity taken up by the ORN/PRN and associated ATM measures. This is because, all other thing being equal, there are known relationships between traffic volumes and network average speeds. As traffic volumes increase, or available road capacity is decreased, average traffic speeds for an equivalent level of demand will be slower. Broadly, observations support an elasticity of -0.8 for this relationship at the Greater London level. In other words, for every 1 per cent decrease in traffic, speeds should increase by 0.8 per cent (and vice-versa). It is possible to use this relationship to interpret the speed trends shown by the figure.

Working from left-to-right, during the pre-Games period, falling traffic levels, in accordance with the established seasonal pattern, were generally accompanied by rising traffic speeds.

Table 10.4 Summary of average traffic speeds during summer 2012 and comparison with baselines (August 2011). Kilometres per hour.

| | | Pre-Games | Olympics | Transition | Paralympics | Post-Games |
|---|---|---|---|---|---|---|
| Greater London | AM peak | 36 | 39 | 41 | 37 | 37 |
| | Inter peak | 35 | 37 | 39 | 36 | 36 |
| | PM peak | 31 | 35 | 36 | 33 | 32 |
| | 24 hour | 39 | 42 | 43 | 41 | 41 |
| | AM peak base | 40 | 40 | 40 | 40 | 40 |
| | Inter peak base | 37 | 37 | 37 | 37 | 37 |
| | PM peak base | 34 | 34 | 34 | 34 | 34 |
| | 24 hour base | 42 | 42 | 42 | 42 | 42 |
| | AM peak % diff | -12% | -2% | 3% | -7% | -8% |
| | Inter peak % diff | -7% | 0% | 4% | -2% | -3% |
| | PM peak % diff | -9% | 2% | 4% | -4% | -7% |
| | 24 hour % diff | -7% | -1% | 1% | -3% | -4% |

*Source: TfL Surface Transport.*

Looking at the Olympic period, and bearing in mind that this took place wholly within the school holiday period (and therefore 'expected' speeds would have been very close to the August baseline), traffic speeds were generally down, by about 1 per cent, over what would otherwise have been expected. This marginal decrease suggests that demand management was successful in offsetting the reduced capacity for general traffic, arising from the ORN, PRN and ATM and road-based events over this period.

Trends over the Transition period were generally up, by about 1 per cent, reflecting the relaxation of capacity constraints. Whilst there was no ORN and PRN in operation, or road-based events at this time, a baseline level of ATM measures did remain in place (see figure 10.8), suggesting demand remained marginally suppressed.

During the Paralympics traffic levels began to increase, as would be expected as schools returned, and speeds correspondingly decrease. Looking at the rates of change, however, it is clear that speeds reduce at a faster rate than implied by the elasticity (-0.8). This probably reflects the reinstatement of the PRN and related ATM measures. In the post-Games period, a more stable relationship is present, with gentle increases in traffic flows corresponding to gentle further reductions in average traffic speeds.

This analysis is at the Greater London level and the available traffic speed data is not as comprehensive as would have been ideal. There is evidence that more significant traffic delays occurred locally in connection with the ORN and ATM on some days during the Games, although this cannot be quantified directly.

**Other factors affecting road network capacity during summer 2012**

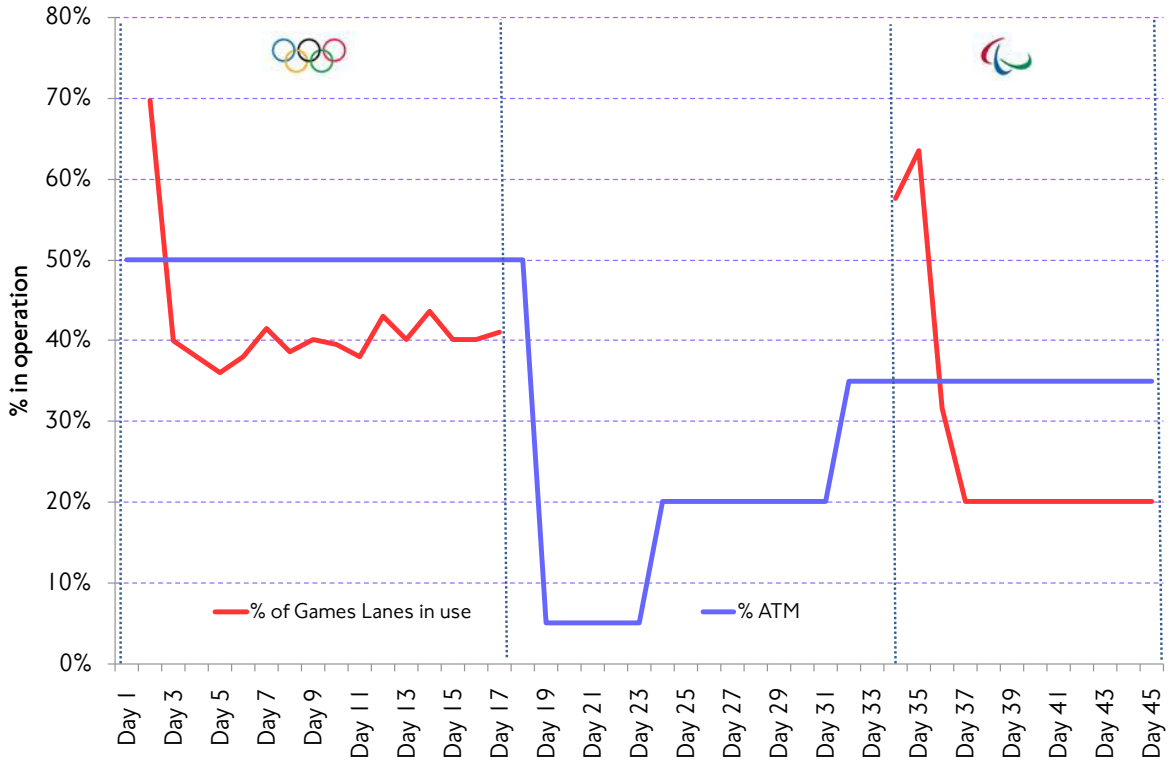
Apart from traffic flows there were several other factors affecting the performance of the road network during summer 2012. Working to reduce the road network capacity for general traffic were the ORN and PRN themselves, and the associated ATM. This of course reflected the key operational objective of supporting Games Family travel. Working to increase effective

capacity, however, was a dramatic reduction in the scale of disruption from incidents, reflecting both Games time restrictions on road works, and enhanced responses to incidents that did occur.

Figure 10.8 shows the actual intensity of operation of the ORN and PRN (Games Lanes only, these being on about one-third of the ORN and PRN) over Games time (red line), together with the scale of application of ATM strategies (blue line). After near 100 per cent operation of Games Lanes in the early days of the Olympics, it soon became apparent that actual demand from Games Family vehicles meant that many of them could be relaxed at certain times of the day. By Day 3 of the Olympics, therefore, the extent of operation had settled down to around 40 per cent. A similar trend is seen for the Paralympics, with typical operation after the first few days being just 20 per cent. It should be noted that the PRN was less extensive than the ORN, and the extent of Games Lanes was also correspondingly smaller.

Figure 10.8 also shows ATM operation as a percentage, this reflecting the intensity with which traffic management strategies were applied to 'protect' the operation of the ORN and PRN. In simple terms, these measures would have the effect of discouraging general traffic – primarily using traffic signal control - from following routes that conflicted with the ORN and PRN, and favouring alternative (eg orbital) routes. According to the figure, therefore, ATM was applied at between 20 and 50 per cent levels of intensity, dependent on day and time of day, during the Olympics. It was retained at a minimal level during the Transition period, and ramped up again ahead of the Paralympics – through which time it was applied again at between 20 and 50 per cent levels of intensity.

Figure 10.8 Relative levels of Active Traffic Management and Games Lane operation. Summer 2012.



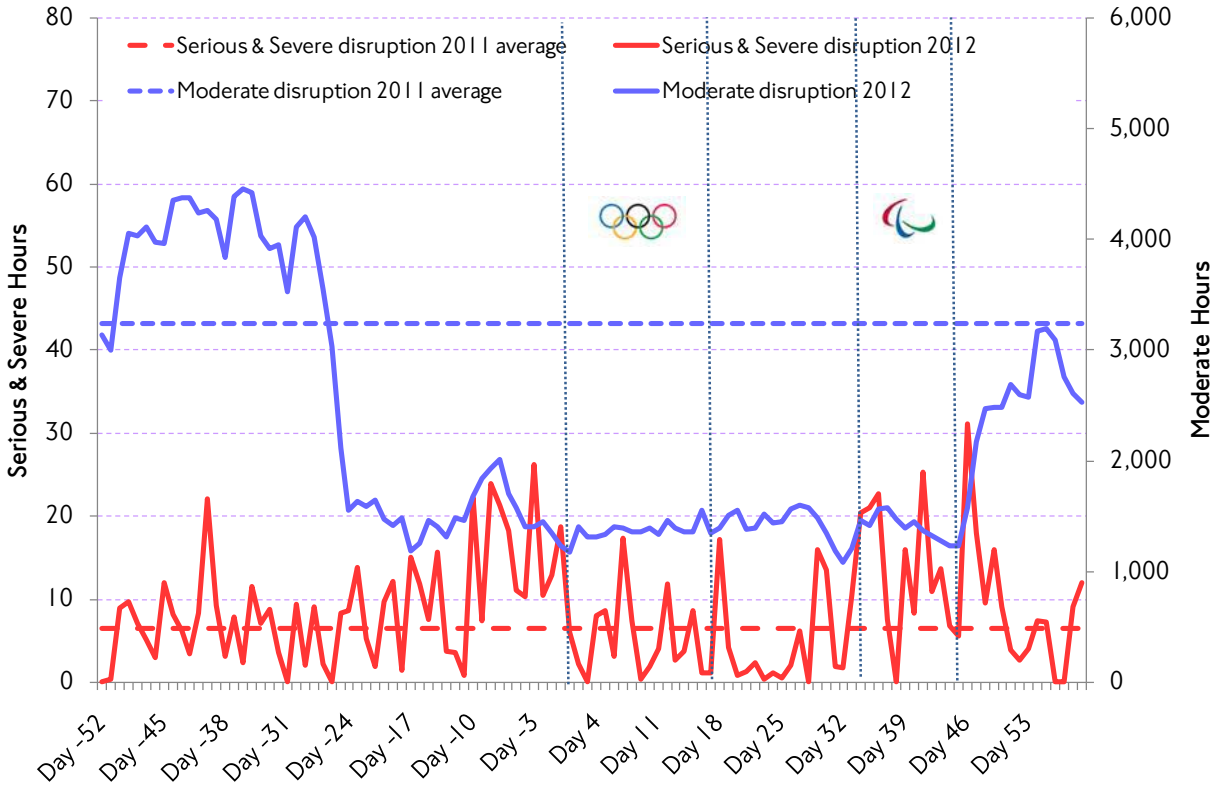

*Source: TfL Surface Transport.*

Figure 10.9 shows the extent of the various categories of disruption to the road network across summer 2012, in terms of measured levels of 'serious', 'severe' and

'moderate' disruption on the network during summer 2012 (see Travel in London report 3, Section 4.7 for definitions of these).

The impact of the special measures put in place for Games time can be clearly seen. Levels of moderate disruption fell by more than 50 per cent relative to typical annual averages over both the Olympic and Paralympic periods. This type of disruption mainly reflects that caused by planned works. Levels of serious and severe disruption reduced less dramatically, especially during the Olympics, although were not obviously below the annual average comparison baseline during the Paralympics. This type of disruption however mainly reflects that caused by unplanned incidents, such as collisions, which cannot be controlled for to any meaningful degree (but whose impact can be minimised by rapid and effective responses).

Figure 10.9 Levels of disruption on London's road network. Summer 2012 compared with Summer 2011.




*Source: TfL Surface Transport.*

### Journey time reliability for general traffic

Journey time reliability for general traffic during Games time was measured in the same way as that described for the MTS journey time reliability indicator in previous Travel in London reports. TfL's working target is for 89.2 per cent of road journeys (normalised to 30 minutes) to be completed within 5 minutes of this time. Table 10.5 shows the values for Games time, from which it is clear that the Games, and associated traffic management measures, had little perceptible effect on journey time reliability for general traffic (ie not including Games Family traffic). 'Typical' values for London are between 89 and 90 per cent (see section 4.10 of this report). The observed summer 2012 values are closely comparable to those of equivalent periods in 2011, and between themselves. The higher values (relative to typical annual average

values) recorded during the Olympics and Transition periods reflect the generally lower levels of traffic demand at this time – both in 2011 and 2012.

Table 10.5 Journey time reliability for general traffic. Percentage of normalised journey segments completed within 5 minutes of a nominal average time.

| | Olympics | Transition | Paralympics |
|---|---|---|---|
| 2011 equivalent | 91.2% | 91.8% | 89.2% |
| 2012 | 91.1% | 92.0% | 89.5% |

*Source: TfL Surface Transport.*

## 10.8 Freight and servicing vehicles

Freight operators were ready for the Games and responded in a sophisticated way to the traffic challenges they presented. The plans that they put in place helped minimize the impact of the Games on their operations, and also contributed to the smooth operation of the road network. Fifty-seven per cent of freight operators made adaptations for Games time. The most popular were to 'Reduce' their transport activity and 'Re-time' deliveries (47 and 41 per cent of operators respectively), with similar proportions recorded for general businesses that receive deliveries. Traffic-survey-based evidence shows reductions in both the absolute numbers of freight vehicles circulating during Games time, and also clear and substantial increases in the proportions of daily freight traffic occurring in the overnight period relative to the rest of the day. These changes were greatest for heavier goods vehicles and during the Olympics, and provided the right level of relief to enable the road network to function effectively.

This section looks at how freight and servicing businesses responded to the road traffic challenges of the Games. It firstly looks at survey-based evidence that quantifies the type and range of adaptations made by freight, servicing and related businesses that operated in locations likely to be significantly impacted by the Games. It then looks at evidence from traffic surveys that shows how the numbers of goods and servicing vehicles on the roads changed across summer 2012 – particularly in terms of how the proportions of daily traffic changed at different times of the day (ie 'time-shifting').

### Survey-based evidence of behavioural change for freight and servicing businesses and other businesses dependent upon them

As part of the Olympic Legacy Monitoring Programme a large scale survey with businesses and freight operators was undertaken in London in order to establish the impact the Games had on business activity, the effectiveness of their plans to minimise disruption, and any long term impacts. The survey was by telephone with 1,000 general businesses located in the areas most likely to be affected by the Games; in Central London, on the ORN/PRN and around Games venues and with 1,000 freight operators who did business in London (but not necessarily based in London). This section reports results from the first two waves of this survey - the first wave was undertaken in May 2012 while the second was completed in the Transition period between the Olympic and Paralympic Games. In the first, pre-Games wave the focus was on the expected impact and preparation plans while the second, Games-time wave, concentrated on the actual changes businesses and freight operators made during the Olympic Games.

### Planning for the Games

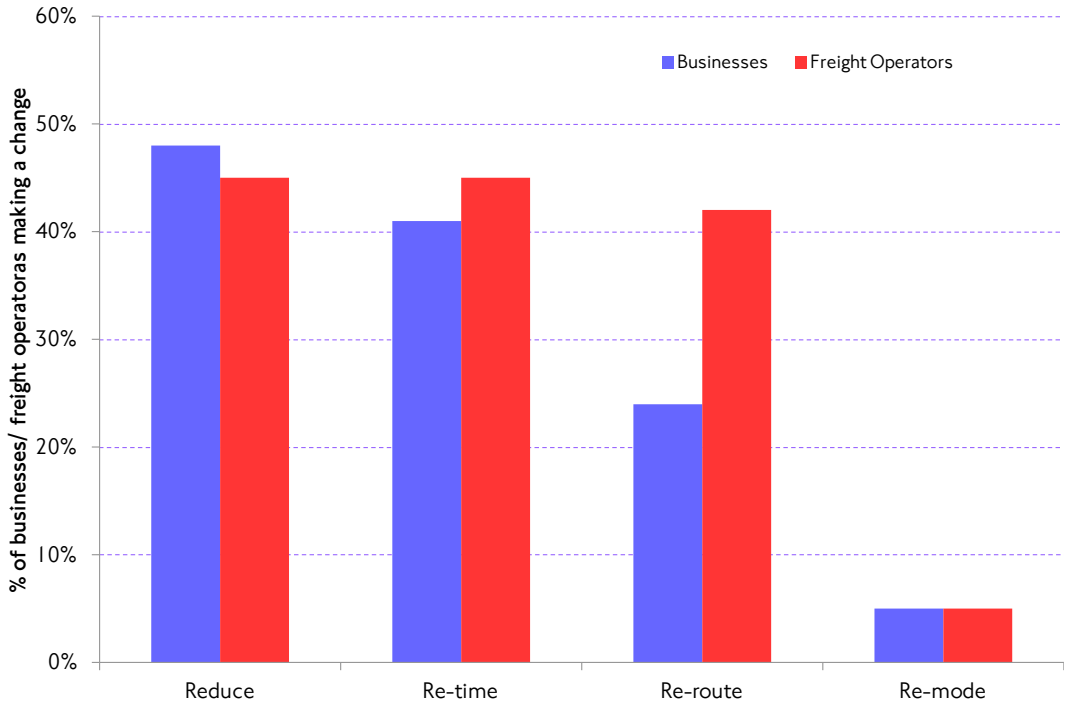
London's businesses and freight operators were ready for the Games and the plans they had put in place helped them minimise the impact of the Games on their operations. Ninety one per cent of businesses and 85 per cent of freight operators said that they were ready for the Games. This compares with 70 per cent of businesses and 77 per cent of freight operators who said they were ready in the pre-Games wave in May 2012 - indicating that some of the planning took place in the final weeks leading up to the Games.

Two thirds of businesses and freight operators had made plans in order to minimise the impact of the Games and around three in ten of these had tested their plans prior to the Games. Of those who did plan, nearly 9 in 10 businesses and freight operators said that their plans were successful in minimising the impact of the Games on their operations.

### Freight and businesses - measures adopted during Games: the '4 Rs'

The changes adopted by businesses and freight operators are assessed against the '4 Rs', the principles developed by the ODA and TfL in order to help communicate the behavioural change messages. These were: Reduce, Re-Time, Re-Route and Re-Mode.

Figure 10.10 Proportion of businesses and freight operators who said that they made a change against each of the 4 Rs.




*Base: 1000 (All Freight operators), 1002 (All Businesses).*
*Source: Olympic Business & Freight Survey, Games Time Wave, TfL 2012.*

Fifty eight per cent of freight operators and 57 per cent of businesses made some sort of change to their operations. Larger businesses were more likely to have changed with 72 per cent of businesses with a turnover over £10m having made a change compared with 54 per cent of those with under £10m turnover. Within freight operators, medium sized businesses with 10-100 vehicles were the most likely to have implemented any changes at all (6 in 10). Fifty eight per cent of operators with

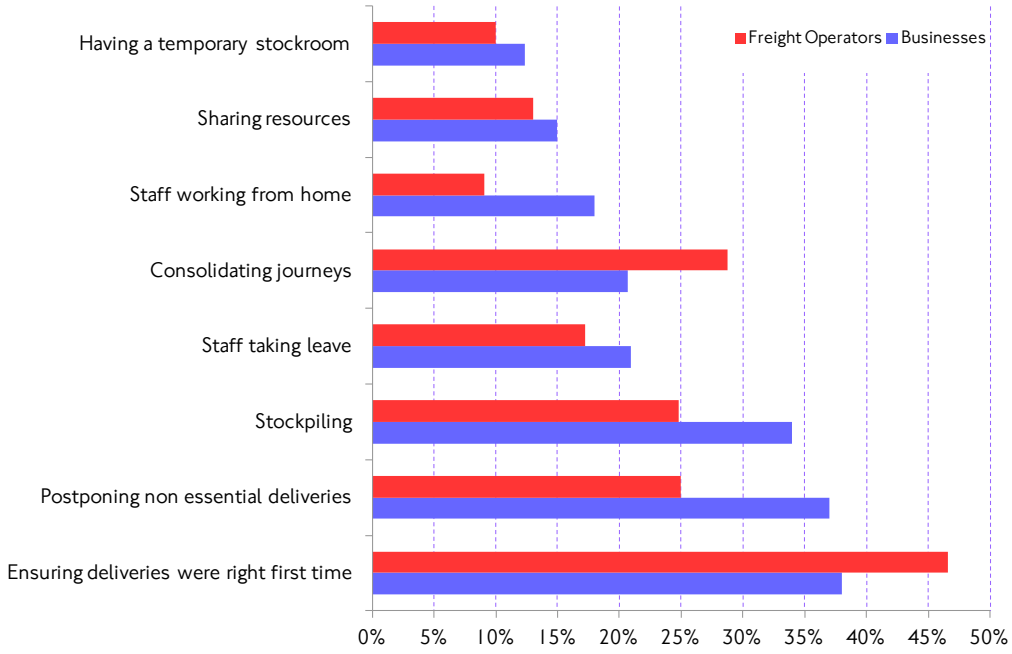
up to 10 vehicles implemented changes while the larger operators, those with over 100 vehicles, were slightly less likely to have made changes (44 per cent).

Figure 10.10 shows the percentage of businesses and freight operators who adopted a change against the 4 Rs. The most popular were the 'Reduce' and 'Re-time' options while the least popular were options around revising the mode of transport with only 5 per cent of businesses and freight operators changing the mode used for transporting goods and servicing.

### Reduce

The most popular measures adopted to reduce the number of journeys included ensuring that deliveries were right the first time, adopted by 38 per cent of businesses and 47 per cent of freight operators, postponing non essential deliveries, adopted by 37 per cent of businesses and 25 per cent of freight operators and stockpiling, adopted by 34 per cent of businesses and 25 per cent of freight operators. Other popular measures included consolidating journeys, staff taking leave, sharing resources, staff working from home and having a temporary stockroom.

Figure 10.11 Proportion of businesses and freight operators who adopted 'Reduce' measures.

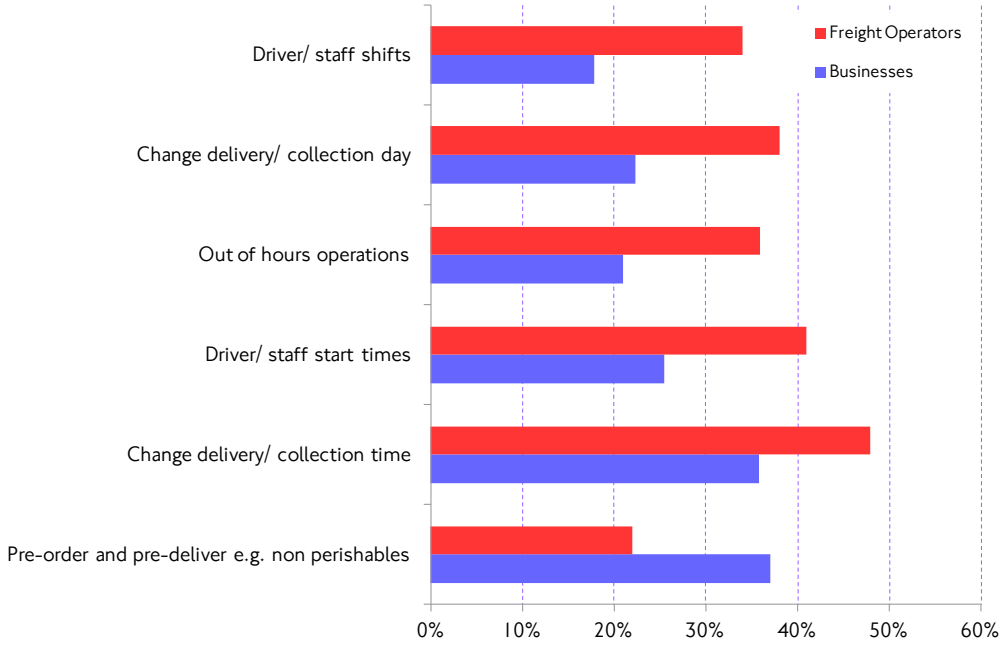



*Base: 674 (Freight operators who made a change), 674 (Businesses who made a change).*
*Source: Olympic Business & Freight Survey, Games Time Wave, TfL 2012.*

### Re time

Pre-ordering and pre-delivery and changing delivery and collection times were the most popular re-timing measures for businesses - adopted by more than a third. The change of delivery and collection time was the most popular measure amongst freight operators with nearly half of the sample adopting it. Conducting operations out of hours was another popular option, more so for freight operators, with 36 per cent saying they implemented it. Just over a fifth of businesses also said they adopted out of hours operations during the Games (Figure 10.12).

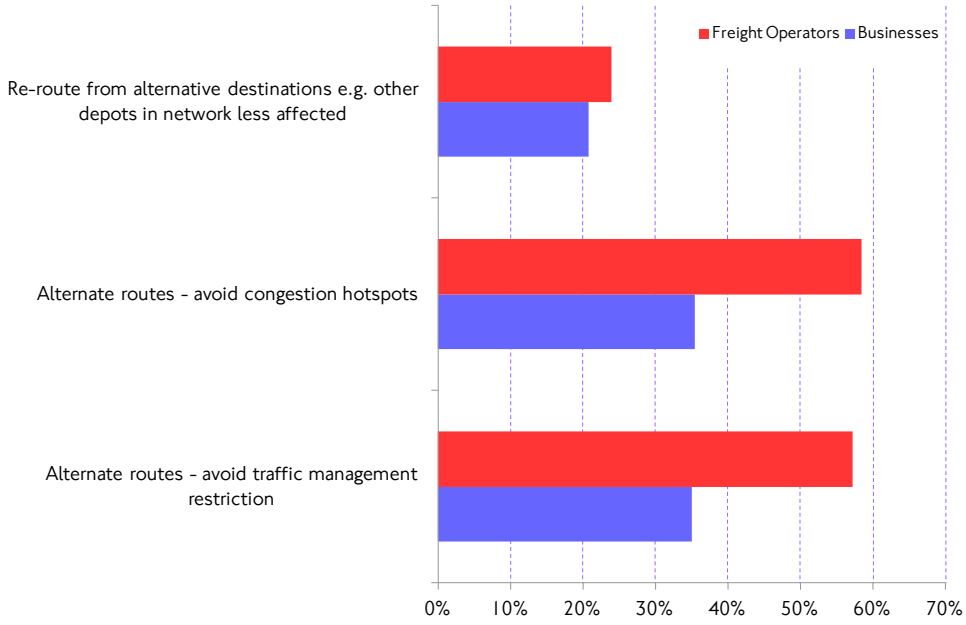
Figure 10.12 Proportion of businesses and freight operators who adopted 'Re-time' measures.




*Base: 674 (Freight operators who made a change), 674 (Businesses who made a change).*
*Source: Olympic Business & Freight Survey, Games Time Wave, TfL 2012.*

## Re route

Figure 10.13 Proportion of businesses and freight operators who adopted 'Re-route' measures.




*Base: 674 (Freight operators who made a change), 674 (Businesses who made a change)*
*Source: Olympic Business & Freight Survey, Games Time Wave, TfL 2012*

Thirty five per cent of businesses and almost 6 in 10 freight operators said that they used alternative routes in order to avoid congestion hotspots and to avoid traffic management restrictions. The use of alternative locations, such as depots outside the

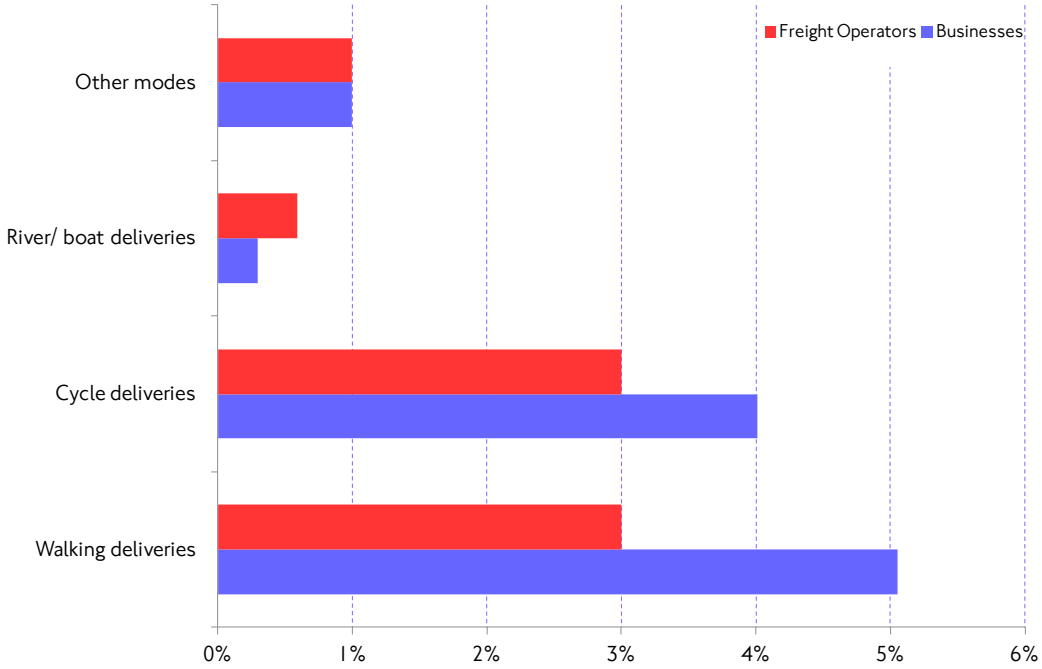
affected areas, was another popular measure that led to the use of different routes (Figure 10.13).

### Re mode

Walking and cycling deliveries were the most popular measures for revising the mode of transport used, adopted in some measure by up to 5 per cent of businesses/operators (figure 10.14).

The extent to which these adaptations persisted after the Games will be examined and reported by TfL as part of the wider Olympics Legacy study.

Figure 10.14 Proportion of businesses and freight operators who adopted 'Re-mode' measures.




*Base: 674 (Freight operators who made a change), 674 (Businesses who made a change).*
*Source: Olympic Business & Freight Survey, Games Time Wave, TfL 2012.*

### Traffic survey based evidence of Games time change for freight and servicing traffic

The analysis described in section 10.6 for general traffic can be extended to measure aggregate travel behaviour adaptation by freight and servicing businesses and vehicles. These adaptations were particularly encouraged through TfL's Road Freight Management Programme. This section reviews the available indicators for summer 2012.

### Absolute traffic levels – vans and lorries

Only limited and indicative data are available for assessing change in the absolute numbers of freight vehicles 'on the roads' during Games time. The available data suggests indicative reductions (against levels that would otherwise be expected) of about 10 per cent in volumes of longer vehicles (those greater than 5.2 meters in length) during the Olympic period (no data are available for the Paralympics). This is broadly consistent with other estimates of aggregate traffic volume change.

### Temporal change for van and lorry traffic: Greater London

Table 10.6 shows, at the Greater London level, relative shifts in the proportion of daily van and lorry traffic that occurred at different times of day. For vans, there is evidence of a relative shift towards a greater proportion of journeys being made in the overnight period, particularly during the Olympics. However, there is little evidence of relative reductions in van traffic in the key morning peak period. Small relative reductions in the proportion of daily van traffic characterise the afternoon peak period.

Table 10.6 Van and lorry flows in Greater London. Percentage of total daily flow by time period. ANPR camera data (normalised).

| | 2011 Summer | 2012 Pre Games | 2012 Olympics | 2012 Transition | 2012 Paralympics | 2012 Post Games |
|---|---|---|---|---|---|---|
| **Vans: Greater London** | | | | | | |
| Night (00.00-06.00) | 6.2 | 7.1 | 7.7 | 6.5 | 6.5 | 6.0 |
| AM shoulder (06.00-07.00) | 5.7 | 6.0 | 6.1 | 6.0 | 5.9 | 5.9 |
| AMP (07.00-10.00) | 21.8 | 21.1 | 21.5 | 22.3 | 22.4 | 22.2 |
| IP (10.00-16.00 | 39.7 | 39.2 | 38.9 | 39.6 | 40.0 | 40.2 |
| PMP (16.00-18.00) | 12.0 | 11.9 | 11.6 | 11.8 | 11.3 | 11.6 |
| PM shoulder (18.00-20.00) | 7.6 | 7.6 | 7.2 | 7.2 | 7.2 | 7.6 |
| Evening (20.00-22.00) | 4.3 | 4.4 | 4.2 | 4.2 | 4.2 | 4.1 |
| Late eve (22.00-24.00) | 2.5 | 2.8 | 2.7 | 2.5 | 2.5 | 2.3 |
| **All day** | **100** | **100** | **100** | **100** | **100** | **100** |
| **Lorries: Greater London** | | | | | | |
| Night (00.00-06.00) | 11.4 | 12.4 | 15.6 | 12.6 | 13.5 | 11.4 |
| AM shoulder (06.00-07.00) | 5.9 | 5.8 | 6.2 | 6.1 | 6.1 | 6.2 |
| AMP (07.00-10.00) | 23.3 | 22.6 | 22.7 | 23.6 | 23.1 | 23.3 |
| IP (10.00-16.00 | 42.3 | 41.7 | 38.7 | 40.9 | 41.0 | 42.5 |
| PMP (16.00-18.00) | 6.5 | 6.5 | 5.7 | 6.1 | 5.7 | 6.1 |
| PM shoulder (18.00-20.00) | 4.0 | 4.2 | 3.6 | 3.8 | 3.6 | 4.0 |
| Evening (20.00-22.00) | 3.5 | 3.6 | 3.5 | 3.4 | 3.3 | 3.4 |
| Late eve (22.00-24.00) | 3.1 | 3.3 | 3.9 | 3.5 | 3.6 | 3.1 |
| **All day** | **100** | **100** | **100** | **100** | **100** | **100** |

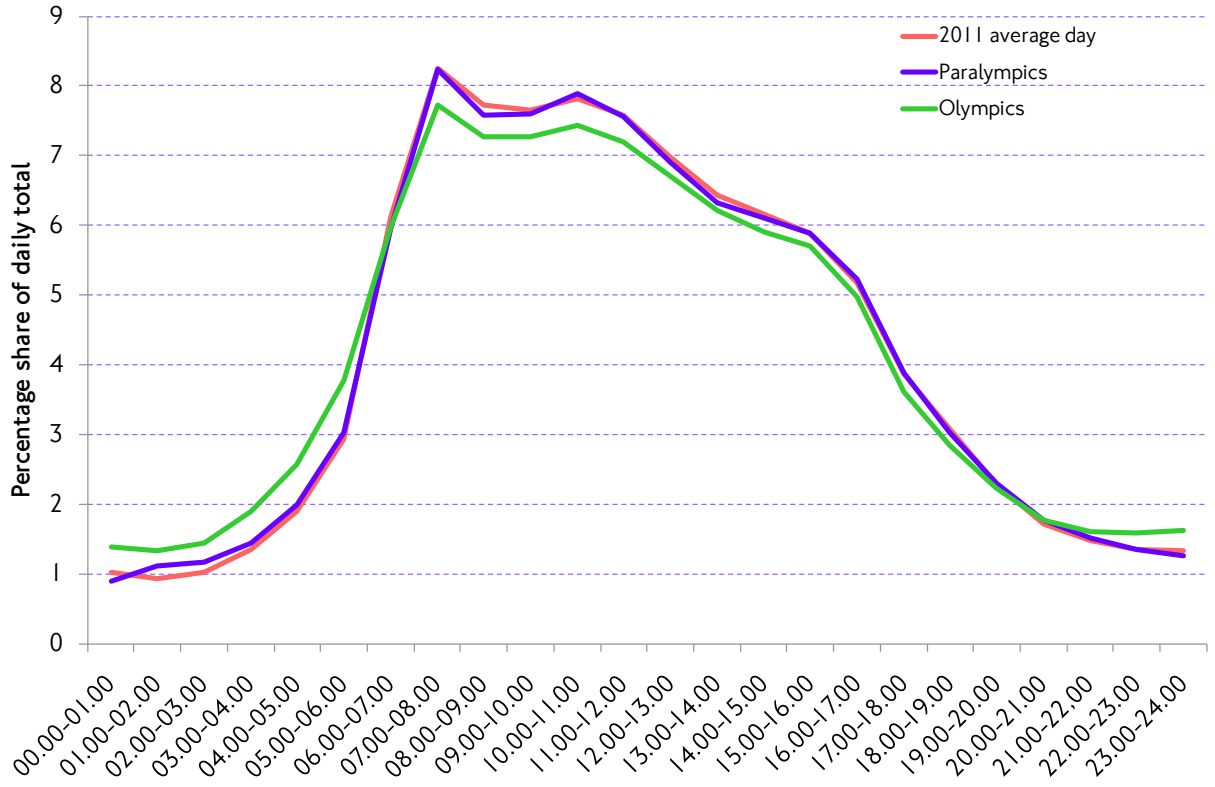
*Source: TfL Group Planning Strategic Analysis.*

Lorries (all vehicles with a gross weight over 3.5 tonnes) however show substantial relative proportionate increases in the overnight period. There is also more consistent evidence of significant reductions in the proportion of lorry traffic across the working day. So, for example, 15.6 per cent of all daily lorry traffic occurred in the overnight hours (midnight to 06:00) during the Olympics, compared to (typically) between 11 and 12 per cent at other times. The proportion of daily traffic taking place in the mid-day inter peak period (10:00 to 16:00) fell to 38.7 per cent during the Olympics compared to the, typically, between 40 and 42 per cent more usually expected. Similar relative shifts are seen during the Paralympics - but on a smaller scale.

### Temporal change for van and lorry traffic: Central London

Data for the central London Congestion Charging Zone allow more detailed examination by individual hour of the day. Measurements relate to the numbers if vehicles either entering or leaving the 'cordon' formed by the Central London Congestion Charging Zone, expressed as a proportion of total observed daily flow.

Figure 10.15 Vans entering and leaving the Central London Congestion Charging Zone. Percentage of total daily flow by time period. ANPR camera data (normalised).




*Source: TfL Group Planning Strategic Analysis.*
*Note: Each line sums to 100 per cent = 100% of daily traffic.*

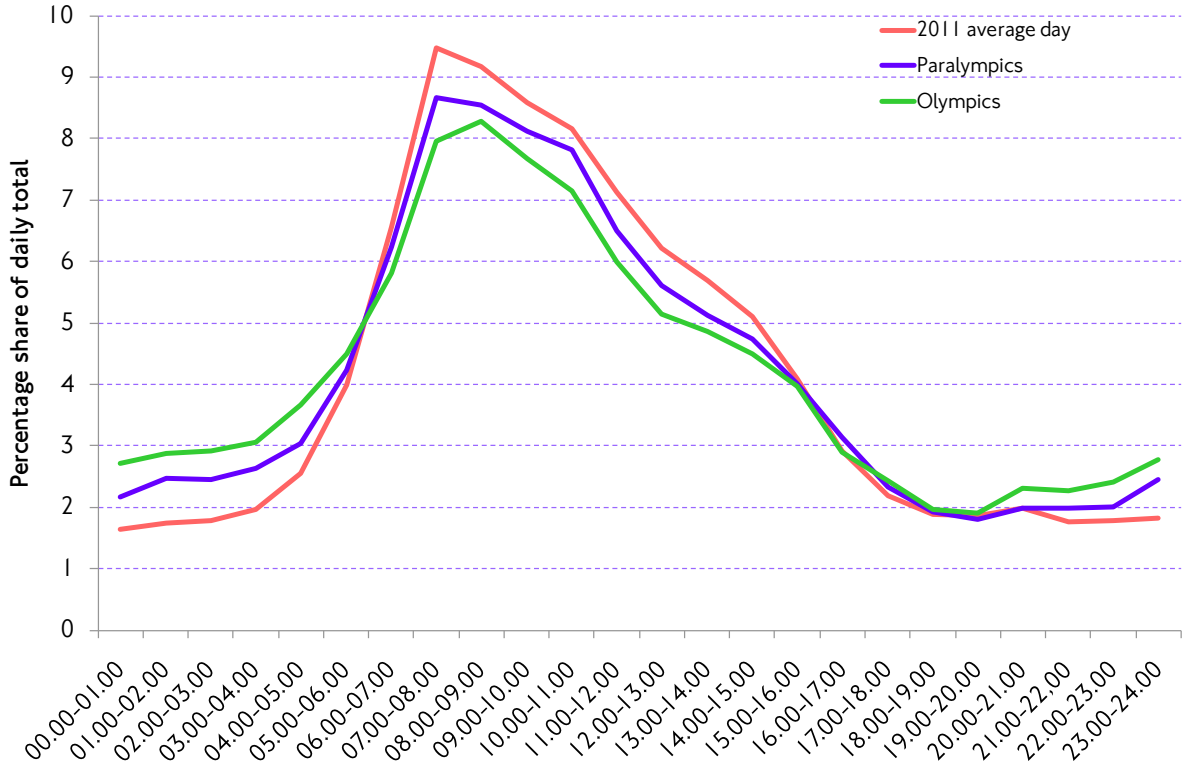
Figure 10.15, for vans, compares Olympic and Paralympic period daily profiles with those for summer 2011 (ie a full non-Games summer). The profile for the Olympic period (green line) stands out as being higher during the night-time, and lower during the day time, than the 2011 profile (red line). This is consistent with a greater proportion of van journeys being made at quieter times of day. The figure also shows that the Paralympic profile was very similar to that of summer 2011 – only very marginal increases to the proportion of daily van traffic in the overnight period being seen in 2012.

### Temporal change for lorry traffic: Central London

Figure 10.16 shows much clearer evidence of time-shifting behaviour for lorry journeys and, in contrast to vans, also reveals a distinct change during the Paralympic period. Relative flows are substantially higher during the overnight hours for both the Olympic and Paralympic periods. The reverse pattern is seen for the whole of the 'working day'. Table 10.7 summarises these changes, with the proportion of total

daily lorry flows occurring in the 'overnight' period increasing by 44 per cent (Olympics) and 39 per cent (Paralympics). Equivalent changes for the 'late evening' period were 24 and 25 per cent respectively, although the absolute volumes of vehicles involved remain small when compared to typical daytime levels (generally less than one-third).

Figure 10.16 Lorries entering and leaving the Central London Congestion Charging Zone. Percentage of total daily flow by time period. ANPR data (normalised).




*Source: TfL Group Planning Strategic Analysis.*
*Note: Each line sums to 100 per cent = 100% of daily traffic.*

Table 10.7 Lorry flows entering and leaving the central London Congestion Charging Zone. Average change in percentage of total daily flow by time period. ANPR camera data (normalised).

| | 2011 Summer (base percentage) | 2012 Pre Games | 2012 Olympics | 2012 Transition | 2012 Paralympics | 2012 Post Games |
|---|---|---|---|---|---|---|
| Night (00.00-06.00) | 13.7 | 14.9 | 19.7 | 17.2 | 17.0 | 14.3 |
| AM shoulder (06.00-07.00) | 6.6 | 6.3 | 5.8 | 6.2 | 6.2 | 6.3 |
| AM Peak (07.00-10.00) | 27.2 | 27.7 | 23.9 | 26.1 | 25.3 | 26.2 |
| Inter Peak (10.00-16.00 | 36.4 | 35.9 | 31.6 | 33.6 | 33.8 | 36.6 |
| PM Peak (16.00-18.00) | 5.1 | 5.4 | 5.3 | 5.0 | 5.5 | 5.4 |
| PM shoulder (18.00-20.00) | 3.7 | 4.0 | 3.9 | 3.7 | 3.7 | 3.9 |
| Evening (20.00-22.00) | 3.8 | 4.0 | 4.6 | 3.9 | 4.0 | 3.7 |
| Late evening (22.00-24.00) | 3.6 | 3.8 | 5.2 | 4.4 | 4.5 | 3.5 |
| **All day** | **100** | **100** | **100** | **100** | **100** | **100** |

*Source: TfL Group Planning Strategic Analysis.*

### Summary

Re-timing of journeys by road was a pragmatic adaptation that was encouraged by TfL, so that journeys could still be made, but at times when the road network was expected to be less busy. This option was particularly suitable for the more 'essential' journeys, such as with freight and servicing traffic, where keeping London stocked and supplied with goods was an essential aspect of being 'open for business'.

Among freight and servicing vehicles there is evidence of distinct change, particularly among heavier goods vehicles. The proportion of daily lorry traffic entering and leaving the Central London Congestion Charging Zone during the overnight hours (between 22:00 and 06:00 was 24.9 per cent during the Olympics and 21.5 per cent during the Paralympics, compared with 17.3 per cent during the equivalent period in 2011. During the morning peak period (07:00 to 10:00), the proportion fell from 27.7 per cent (2011) to 23.9 per cent (Olympics) and 25.3 per cent (Paralympics). Similar but less intense time-shifting behaviour was also seen for van traffic.

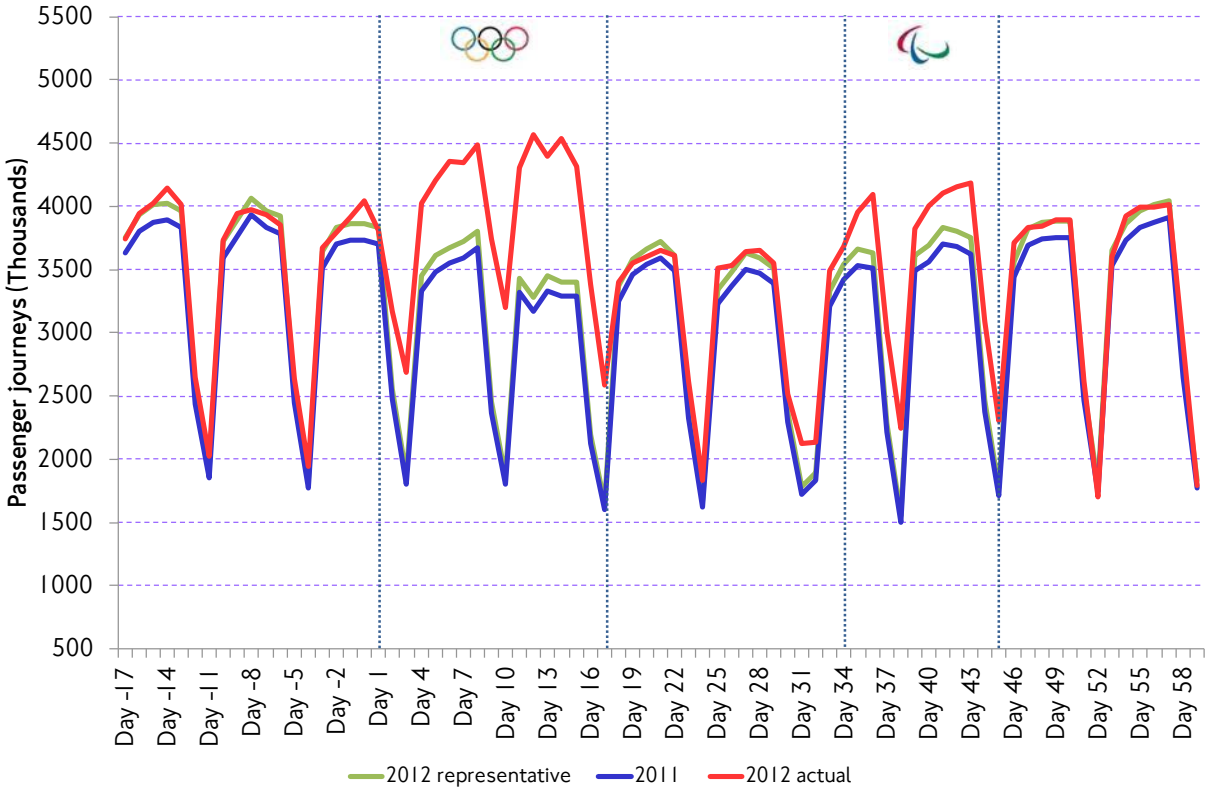
## 10.9 London Underground – demand patterns

Public transport usage set new records during Games time for patronage and levels of service and, as expected, the Underground carried the lion's share of Games traffic. During the Olympics and Paralympics over 101 million journeys were made on the Tube – up 28 per cent in comparison with the equivalent period in 2011. Tuesday 7th August was the busiest day in the Tube's history, with 4.57 million passengers carried. The Underground handled this exceptional demand by running more trains during normal service hours, particularly in the evening and late into the night to cope with returning spectators. Off-setting Games related travel however was a significant reduction in 'background' travel demand. Whilst parts of the network were extremely busy, others were quieter than usual. The evidence shows that a good and precise balance was achieved across different parts of the network between reduced 'background' travel and that related to the Games.

### Overall Underground travel demand

Figure 10.17 shows the estimated total number of journeys made on the Underground for each day over summer 2012 (red line). Similar values are given for equivalent days in 2011 (blue line). Representative values for summer 2012 without the Games, taking account of year-on-year growth (reckoned at 3.5 per cent and applied to 2011 values), is shown as a green line. Journey estimates are derived from transactions at ticket gate lines, using factors to correct for occasions when, for crowd management purposes, gate lines were held open (this particularly affecting Stratford Regional station during the Games).

Figure 10.17 Number of daily journeys on London Underground. Summer 2012 vs. summer 2011.

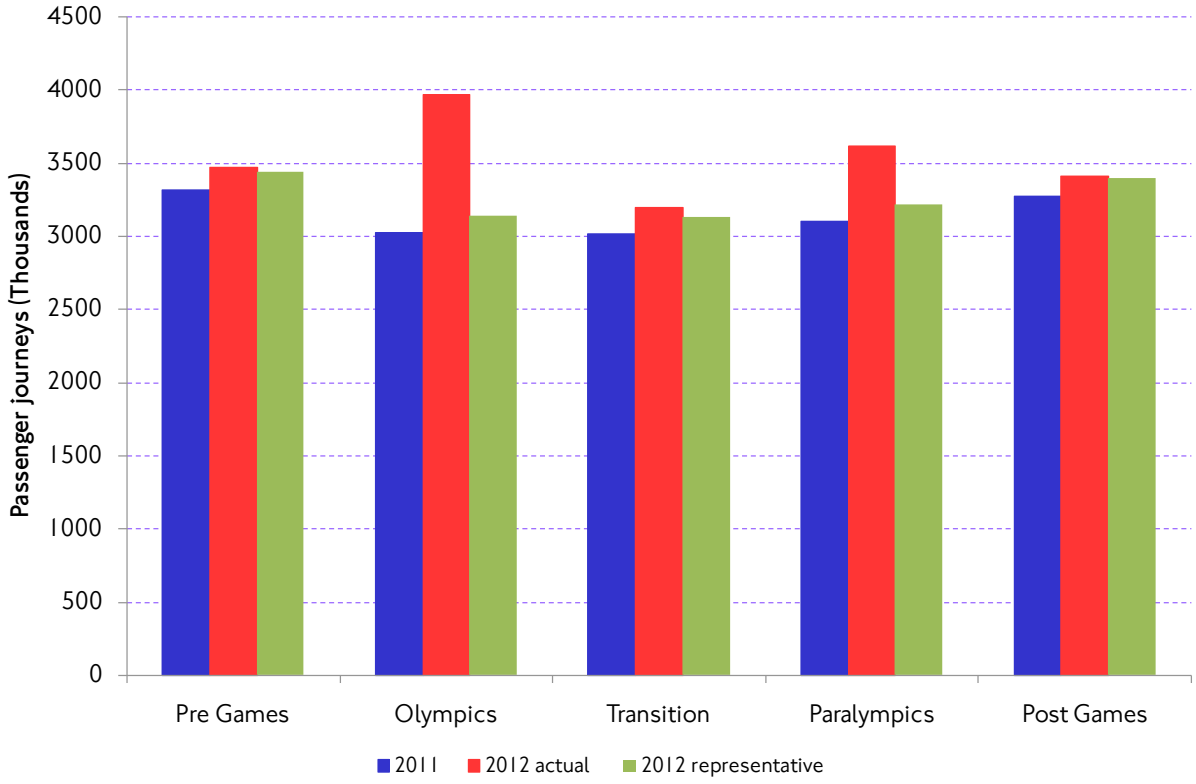



*Source: TfL Customer Experience.*

The figure clearly shows elevated total demand corresponding to the Olympic and, to a lesser extent, Paralympic periods. During the Olympic Games, over 62 million journeys were made on the London Underground. Tuesday 7 August was the busiest day in the Underground's history, with 4.57 million passengers, while Sunday 5 August saw 78 per cent more passengers than a typical Sunday in summer 2011. The Paralympic Games saw a total of 39 million tube journeys – up by 18 per cent on the same period last year. There were 10 days over the Olympic period when more than 4 million customers were carried on the Underground, and five days over the Paralympic period, compared to typical weekday summer demand of between 3.5 and 3.6 million journeys.

Figure 10.18 shows normalised average daily Underground demand, which takes account of the differing lengths and day-composition of both Games, and places both Games in the context of wider trends over summer 2012. Here, average daily demand during the Olympics was up by 31 per cent against 2011 equivalent levels (normalised), and up by an average of 16.5 per cent during the Paralympics. Values for the pre- and post Games periods were not dissimilar to those which would be 'expected' at these times, given year-on-year growth (they were up by 4.5 and 4.0 per cent respectively against 2011), whilst the Transition period saw, on average, 6.0 per cent more journeys than the equivalent period in 2011.

Figure 10.18 Number of daily journeys on London Underground. Summer 2012 vs. summer 2011. Normalised daily average values.



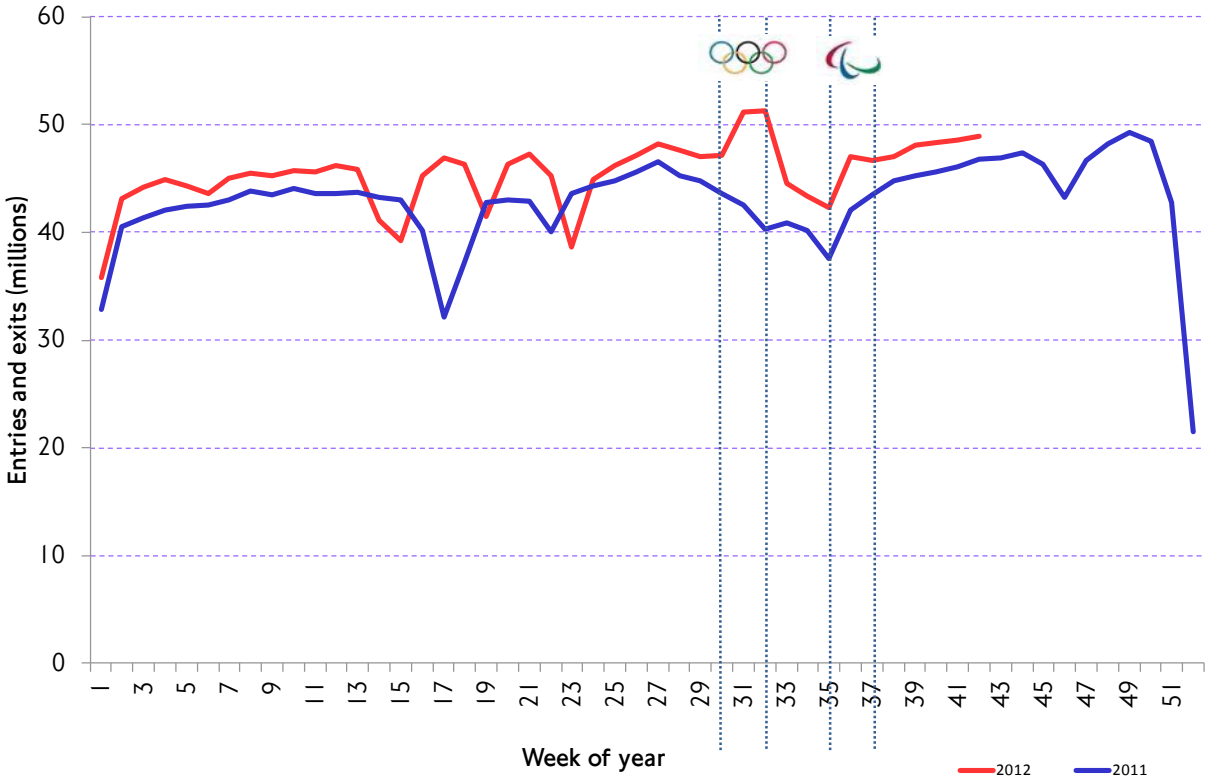

*Source: TfL Customer Experience.*

### Games time Underground demand in context

Underground demand over Games time was clearly exceptional. It was met by running more trains across a greater part of the day (overall between 10 and 11 per cent more capacity was provided across the network – see section 10.10). However, summer 2012 took place against the backdrop of year-on-year growth in Underground travel, which was about 3.5 per cent in the year before the Games.

Normal working weekday demand on the Underground is close to capacity and, on certain parts of the network such as the central area in the weekday peak periods, there is little or no 'spare' capacity. Figure 10.19 places summer 2012 in the context of growing Underground demand across 2011 and 2012 (although note the dip at week 17 in 2011 – reflecting the Royal Wedding and two Bank Holidays). If growth continues at the current rate, levels of normal total weekday demand will approach Games time levels within a few years. However, Games demand was concentrated spatially and was spread differently across the hours of the day, presenting an entirely different and quite exceptional set of demand management challenges. These important aspects are explored in the following sections.

Figure 10.19 Background trend in Underground demand 2011-2012. Total transactions (entries and exists) through LU operated gate lines.




*Source: TfL Customer Experience.*

**Patterns of demand at representative 'indicator' groups of stations**

Games time Underground travel was focused on venue stations – these being very busy, as were key interchange stations in central London. Average Olympic daily demand at venue stations was 83.9 per cent higher than would normally be expected, whilst Paralympic demand was on average 40 per cent higher. The periods before and between the Games also saw patronage at venue stations up by some 30 per cent, On the other hand, demand at 'commuter' stations was slightly down on what would normally have been expected over the school summer holidays, reflecting changed behaviour by commuters in response to TfL's travel demand management advice. Although stations in the West End saw slightly lower levels of demand in the two weeks immediately before the Games, Olympic-time demand at these stations was up by an average of 14.2 per cent. This 'Olympic boost' was not however sustained into the Paralympic period, demand at this time being very close to what would normally be expected at West End stations.

The overall Underground demand numbers for summer 2012 described above conceal a mix of important more localised effects. This section looks at demand at four 'indicator groups' of Underground stations, chosen so as to illustrate different demand patterns affecting different parts of the network over Games time. The four groups of stations are:

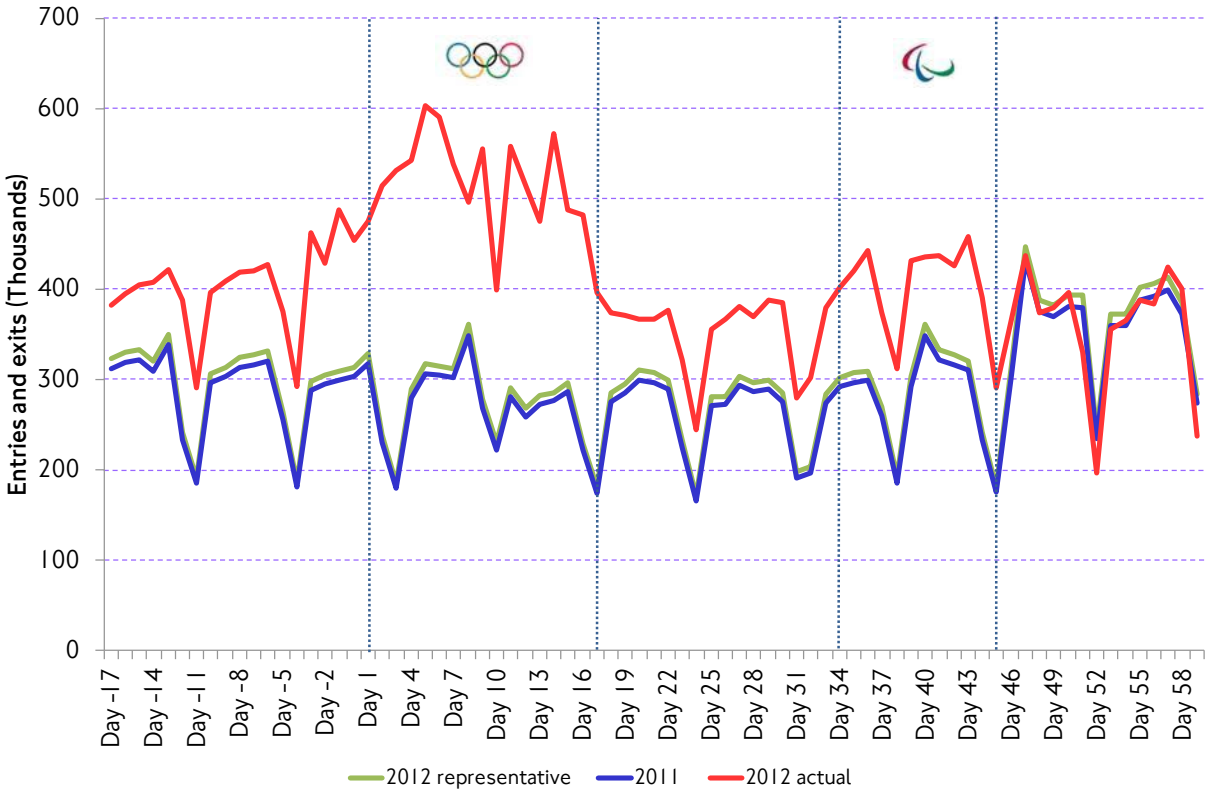
- **Venue stations**, to be representative of travel to and from Games venues.
- **National Rail terminal stations** in central London (LU gate lines only), representing a mix of commuter and visitor traffic.

- **West End stations**, reflecting general shopping/leisure activity in this part of central London.
- **City plus Canary Wharf** representing, so far as possible, commuter-related demand patterns.

Data are in terms of the total number of entries and exits (ticket barrier transactions) per day at all of the stations in each group, as factors for estimating journeys are not available at the individual station level. Nevertheless, the combination of entries and exits will give a good indication of change in relative demand at these groups of stations. A day-by-day comparison against the equivalent day in 2011 (blue line) and 2012 expectation (2011 daily patronage plus year-on-year growth – green line) is given in each case.

### Games venue stations

Figure 10.20 Number of daily journeys (entries and exits combined) on London Underground. Summer 2012 vs. summer 2011. Games venue stations.



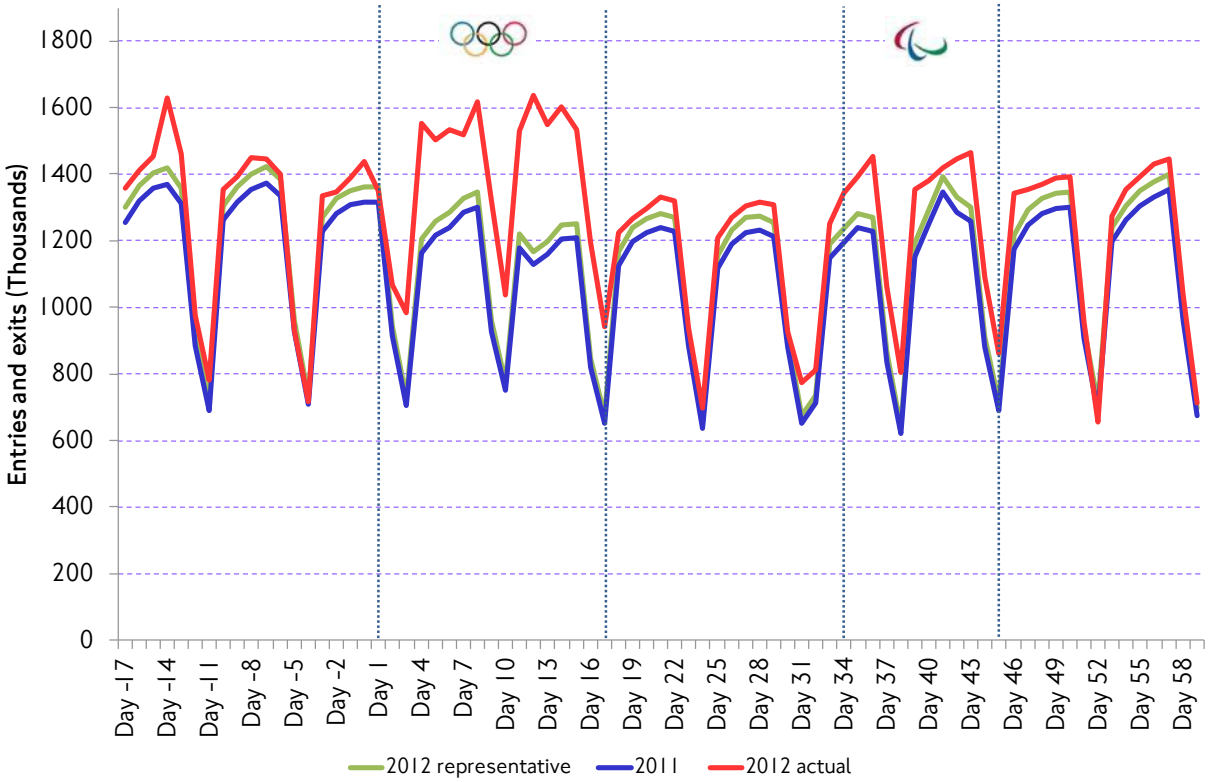

*Source: TfL Customer Experience.*

Unsurprisingly, a clear Games time impact is visible at venue stations. Olympic period demand at these stations was 83.9 per cent above what would be 'expected' for summer 2012. Paralympic demand was 40.0 per cent higher. Interestingly, demand during the pre-Games period at these stations was 31.0 per cent higher, and 28.6 per cent higher during the Transition, this presumably associated with preparations from the Games and Games visitor traffic not specifically associated with competitions. The post Games period is also notable for the extent and speed to which demand at these stations reverts to levels that are effectively indistinguishable from normal (down by 3.2 per cent against 2012 expectation and very close to 2011 values).

### National Rail terminal stations

Looking next at National Rail terminal stations (LU gate lines only), figure 10.21 also shows a clear Games time impact. Olympic period demand was 24.3 per cent higher, and Paralympic period demand 11.7 per cent higher than 2012 expectation. Demand during the pre- post Games and Transition periods was typically between 3 and 4 per cent above 2012 expectation, indicating a slightly higher level of 'background' travel activity at these times. Of interest from this graphic is the characteristic 'commuter' pattern of demand progressively increasing through the working week until Thursday, falling again for Friday and into the week end. However, it is not possible to examine the extent to which this occurred during Games time because such relatively small changes were obscured by the larger increase in overall demand.

Figure 10.21 Number of daily journeys on London Underground. Summer 2012 vs. summer 2011. National Rail terminal stations.




*Source: TfL Customer Experience.*

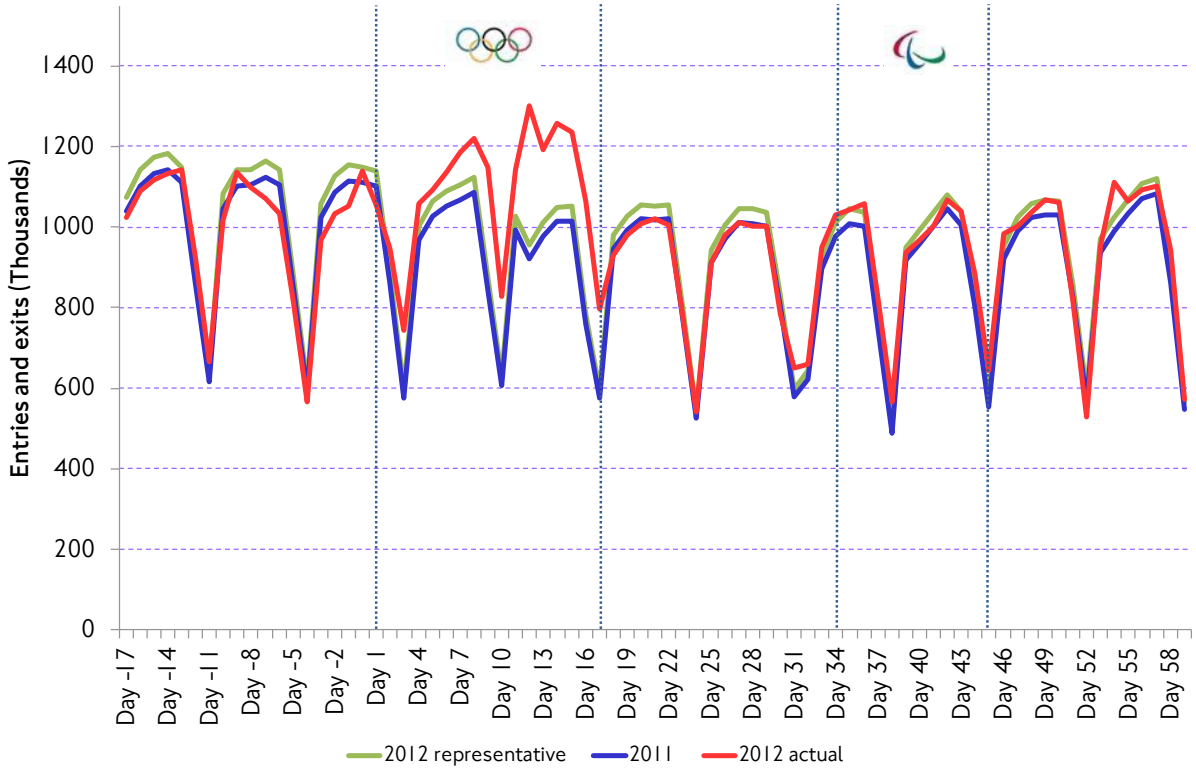
### West End stations

Figure 10.22 does not measure retail or wider economic activity directly, but it does give a good indication of the number of people in the West End summer 2012.

The pattern shown is an interesting one. In the pre-Games period, traffic was down on what would be 'expected' for that time in 2012, by -4.1 per cent (excluding the week of the Torch Relay). During the Transition period traffic was also less than would have been expected, by -3.1 per cent. There is however evidence of an 'Olympic boost', demand on average being 14.2 per cent higher during this period, but the Paralympics were not associated with a similar impact – demand being just 1.3 per cent higher than would have otherwise been expected. In connection with Olympic period demand, it should be noted that the August 2011 civil disturbances will have

affected demand in the second week of the 2011 comparison period, although the graph suggests that any such effects were minor.

Figure 10.22 Number of daily journeys on London Underground. Summer 2012 vs. summer 2011. West End stations.



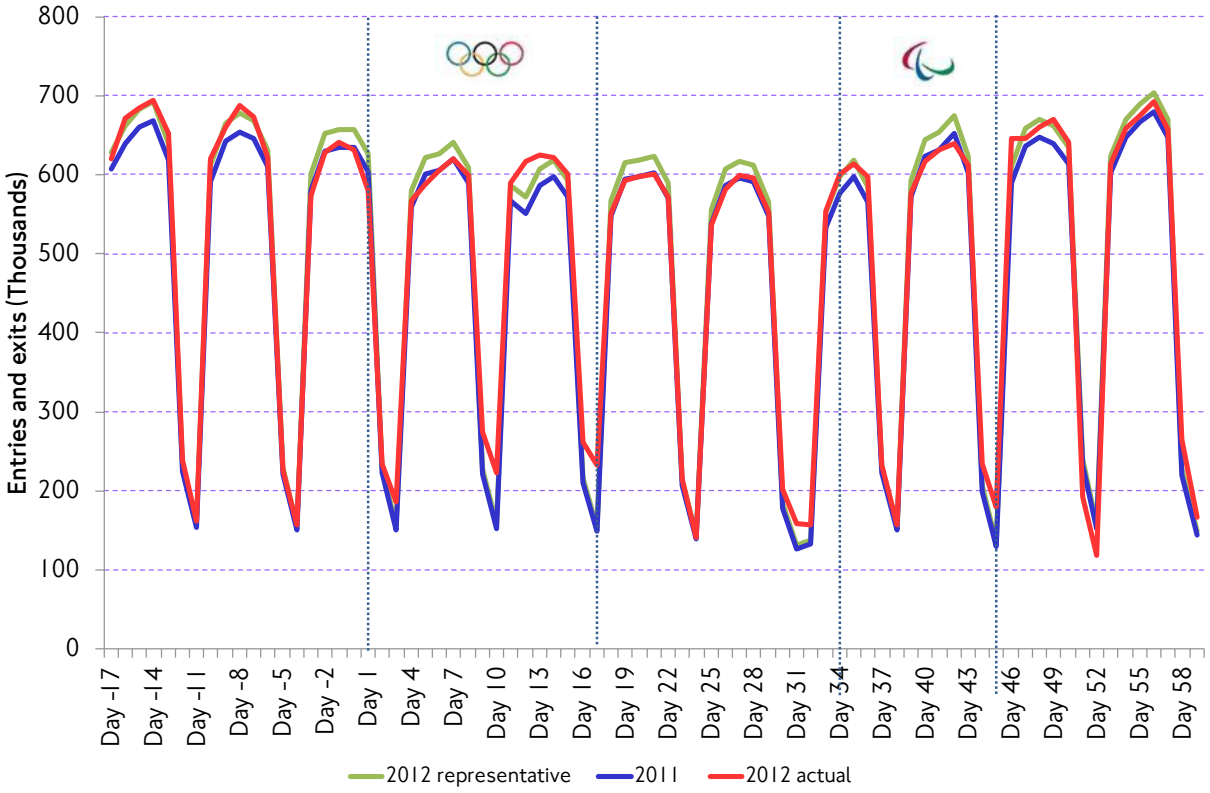

*Source: TfL Customer Experience.*

In interpreting graphs such as this, it is also important to recognise that they show the net impact of a variety of different factors. To the extent that regular travellers 'stayed away', visitors in London specifically for the Games will have taken their place. Achieving a good balance between the two was the primary objective of Games time travel demand management.

**'Commuter' stations (City plus Canary Wharf)**

Finally, figure 10.23 looks at a selection of 'primarily commuter' stations in the city of London (with Canary Wharf). The pattern shows large differences between weekday and weekend demand, as would be expected at these stations, and is quite different to that seen at the other station groups. Overall, it is barely possible to distinguish a Games time impact in terms of aggregate demand. Looking a little deeper however reveals several features of interest.

Figure 10.23 Number of daily journeys on London Underground. Summer 2012 vs. summer 2011. 'Commuter' stations.




*Source: TfL Customer Experience.*

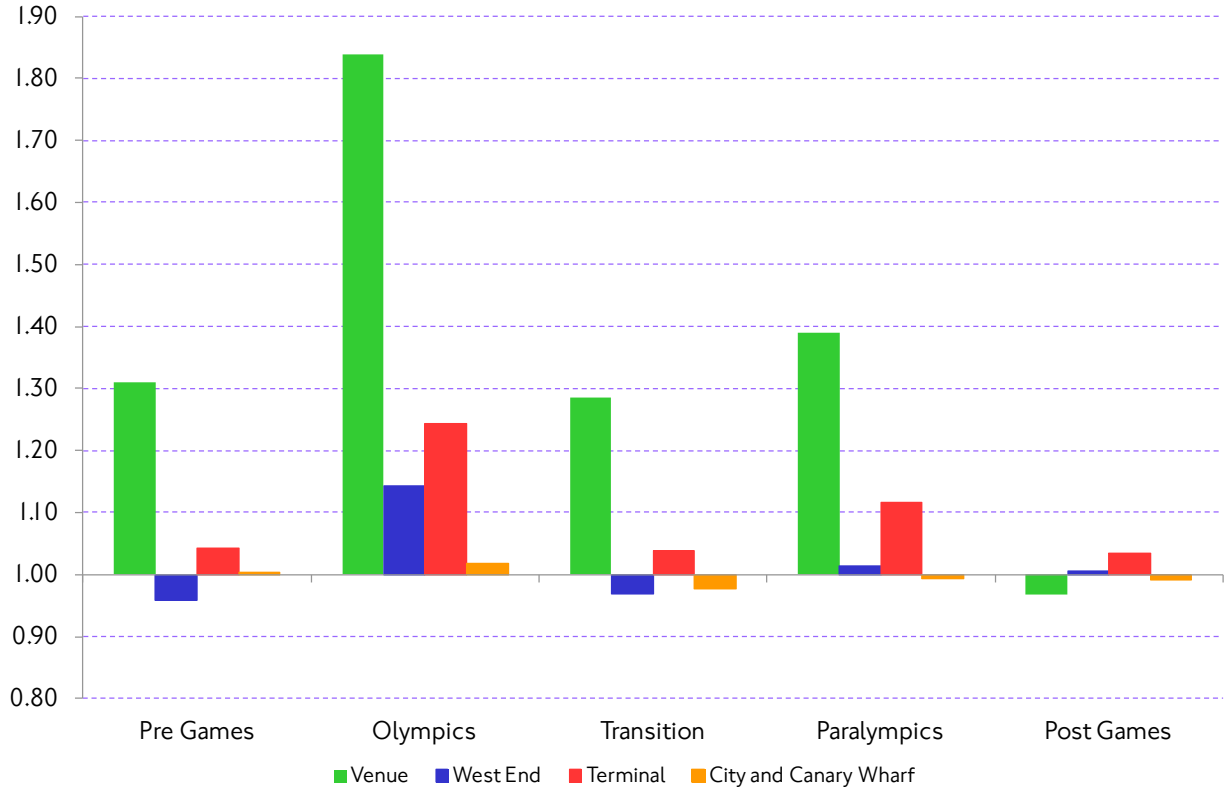
First, actual demand was almost identical to 2012 expectation in the first two weeks of the summer 2012 analysis period (down by 0.4 per cent), demand in both years of course being similarly affected by the school holiday period. Over the week of the Torch Relay and the first week of the Olympics themselves, demand at these stations was down by typically 3-4 per cent against 2012 expectation. The comparison for the second week of the Olympics was affected by the 2011 riots and is therefore not entirely representative – the important point is that absolute demand in 2012 for this week (the second week of the Olympics) was virtually identical to that of the first, at about 2 per cent lower than 2012 expectation. Demand at these stations during the Transition period was also marginally below expectation, by 2.3 per cent, as was Paralympic period demand (down by 0.7 per cent overall).

The fact that it is not readily possible to distinguish a clear 'Games effect' at these stations is not necessarily surprising. Stations in this group were chosen specifically as to minimise the extent to which they would be affected by Games-specific traffic. On the other hand, it would be expected that the proportion of commuters who stayed away (took leave specifically at this time or worked from home) would be visible in the data. It is of course not possible to completely separate out Games time effects, and some 'Games increment' at these stations may have been expected, as with the rest of the network. It is therefore likely that there was a degree of 'substitution' at these stations, particularly at Canary Wharf, with higher numbers of regular travellers not making journeys across Games time than is suggested by the aggregate comparisons. This is examined further below, in terms of time-shifting of journeys over Games time.

### Summary of changes at indicator groups of stations

Figure 10.24 summarises these changes, in terms of the normalised demand change for each of the five summer 2012 analysis periods. Demand at venue-related stations was clearly much higher than normal. An Olympic and smaller Paralympic effect can be seen at National Rail terminal and West End stations, but aggregate demand on other parts of the network were not dissimilar to what would have been expected in a non-Games summer.

Figure 10.24 Summary of changes in demand at indicator groups of stations over summer 2012. Difference to 2012 expectation (normalised daily average percentages).




*Source: TfL Customer Experience.*

### Underground journeys – variations by time of day

As well as changes to the volumes of background travel, more subtle and targeted adjustments to the times at which people made journeys were an important contribution to managing total Underground demand. Looking across four groups of stations representative of different types of travel, the biggest Games time effects of this kind are seen at commuter-related stations. At Canary Wharf, where TfL worked closely with the Canary Wharf Group to encourage and facilitate travel behaviour changes during Games time, 27 per cent fewer morning peak journeys were made by Oystercard holders (a proxy for 'regular travellers') during the Olympics, and 23 per cent during the Paralympics than in June 2012 just prior to the Games. This reflects both a normal school holiday effect and a specific additional Games time effect. Across the network as a whole, however, changes to aggregate travel behaviour by Oystercard holders were relatively modest compared to the changes normally to be expected during the school Summer holiday period, suggesting that Games time change to travel behaviour by 'regular' travellers was highly and effectively targeted at 'hotspot' locations.

### Oystercards and the analysis of travel behaviour

This section looks specifically at Underground travel by Oystercard holders (all types of Oystercard as a group, including concessions and 'pay-as-you-go'). Oystercards provide a means, albeit a relatively imprecise one, of differentiating 'regular' travellers from Games spectators, as spectators were issued with a special paper-based (magnetic) Games Travelcard valid across the network on the day for which tickets were held (although not all will have used this for their travel to/from events or for trips before or afterwards). It is thus possible to examine features such as changes to time-of-day patterns by 'non-spectators' – the subject of this section.

The data in this section relate to average weekdays only. The baseline comparison period is the last two weeks in June 2012 – before the Games and reflecting 'summer working' patterns of travel. As with the aggregate demand patterns described above, the analysis is based on four 'indicator groups' of stations. This feature is also explored at the whole-LU network level, and at Canary Wharf station specifically, as employers at this key interchange station worked closely with TfL to encourage and facilitate workers to change their travel patterns during Games time, given the role of this station as a key interchange in the Games 'River Zone'.

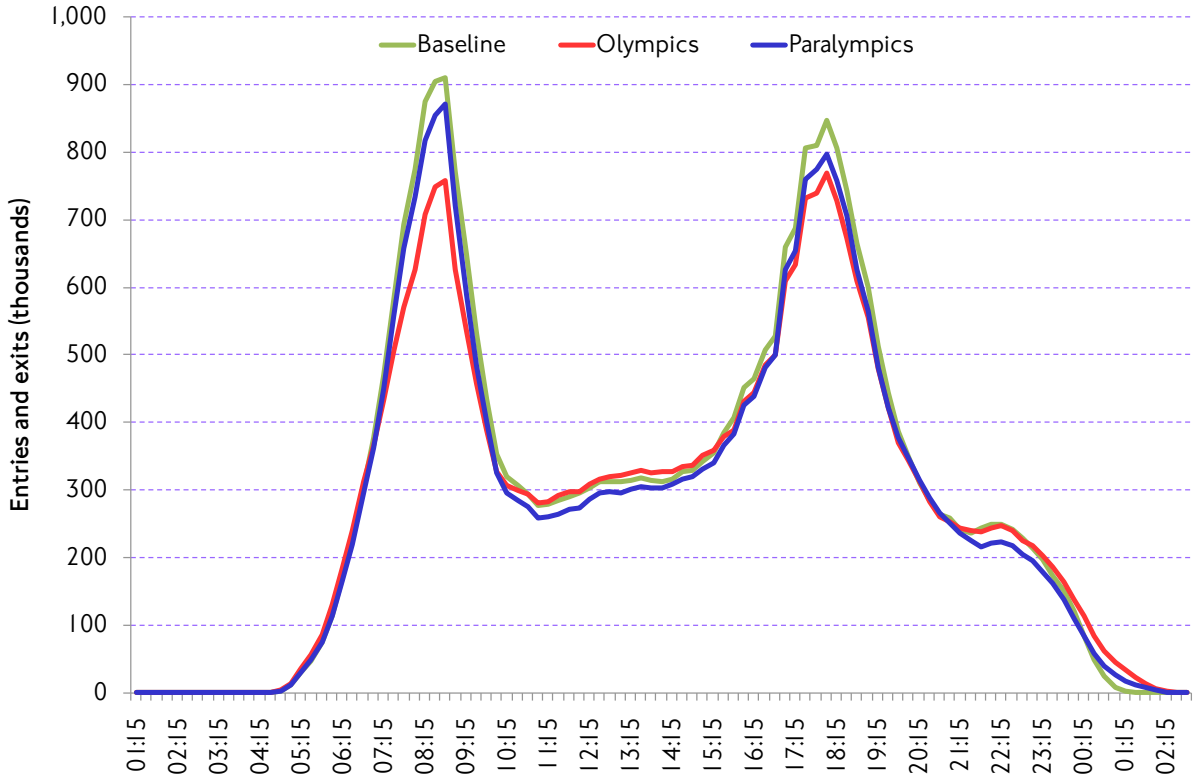
### Time of day profiles for Oystercard holders: whole Underground network

Looking first at the whole LU network level (all stations), figure 10.25 shows the following principal features:

- Lower overall patronage during both the Olympics and Paralympics - 5.3 per cent less Oystercard journeys were made during the Olympics, and 5.1 per cent less during the Paralympics, than during the June 2012 comparison period. An aggregate reduction of this scale would be 'expected', irrespective of the Games, from the school summer holidays, although it should be recognised that the Games would have stimulated additional travel by Oystercard holders, and this net effect therefore understates the degree of reduction to 'background' levels of travel.
- Reduced height of the peaks – particularly during the Olympics. In June 2012, 22.8 per cent of total daily trips were made in the morning peak period (07:00 to 09:30), compared to 20.2 per cent during the Olympics.
- Changes to the relative scale and balance of off-peak and evening travel, although the scale of the changes for Oystercard travel is quite small overall.

All of these features are examined in more detail for each of the four indicator groups of stations below.

Figure 10.25 Time of day profile – whole London Underground network. All Oystercard entries and exits.



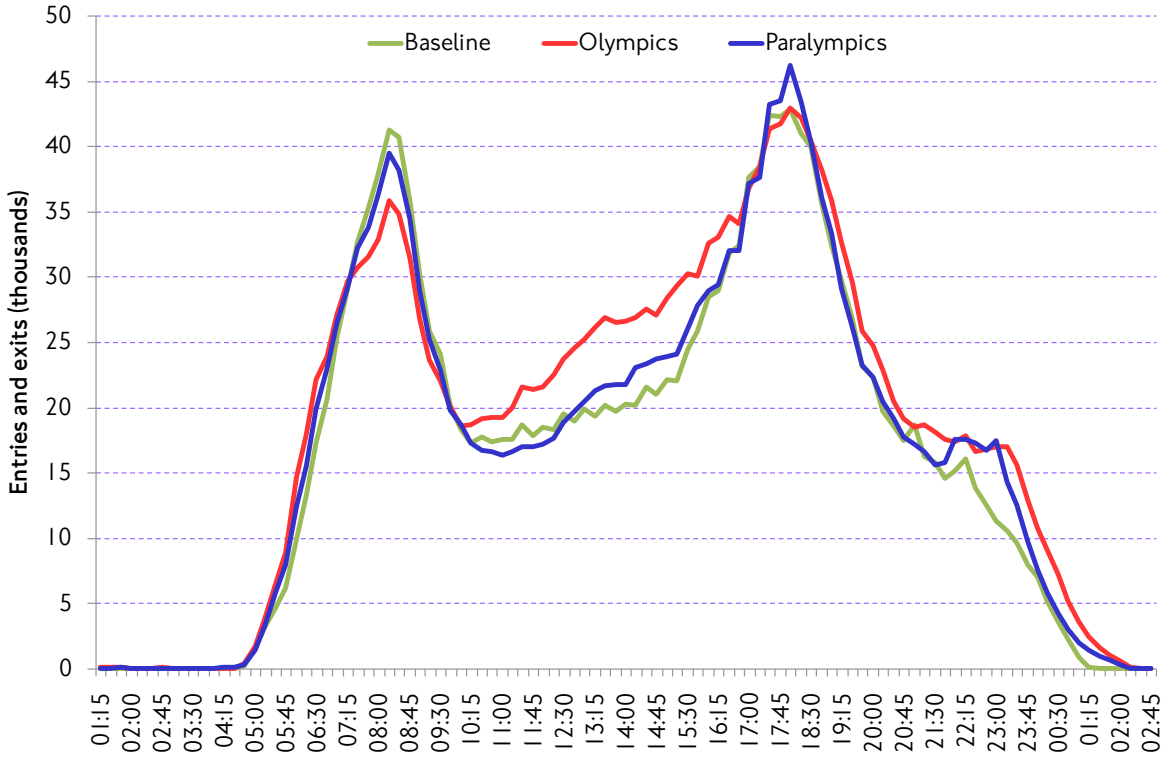

*Source: TfL Customer Experience.*

### Time of day profiles for Oystercard holders: Games venue stations only

Looking at Games venue stations (figure 10.26), and bearing in mind that travel by spectators on non-Oyster tickets is not captured by these comparisons, the most noticeable feature is increased inter-peak and evening travel compared to June 2012. During the Olympics, 32.1 per cent of total daily trips at these stations were made during the inter-peak period (09:30-16:00), compared to 29.7 per cent in June 2012 and 29.5 per cent during the Paralympics. This suggests that a proportion of 'Games related' travel to these stations was made using Oystercards as opposed to the paper-based Games Travelcard.

This is not particularly surprising – as many Games spectators would also hold 'capped' Oystercard tickets such as seasons and would not therefore incur additional costs. Second, not all travel to venue stations was by spectators – workers and other non-spectators associated with the Games would also be included in these comparisons. This 'additional Oystercard based travel' to these stations can be broadly estimated at 100,000 journeys per day (individual entries or exits) in the mid-day period for the Olympics, and 40,000 journeys in the mid-day period for the Paralympics. For the evening period the equivalent figures are 35,000 (Olympics) and 30,000 Paralympics.

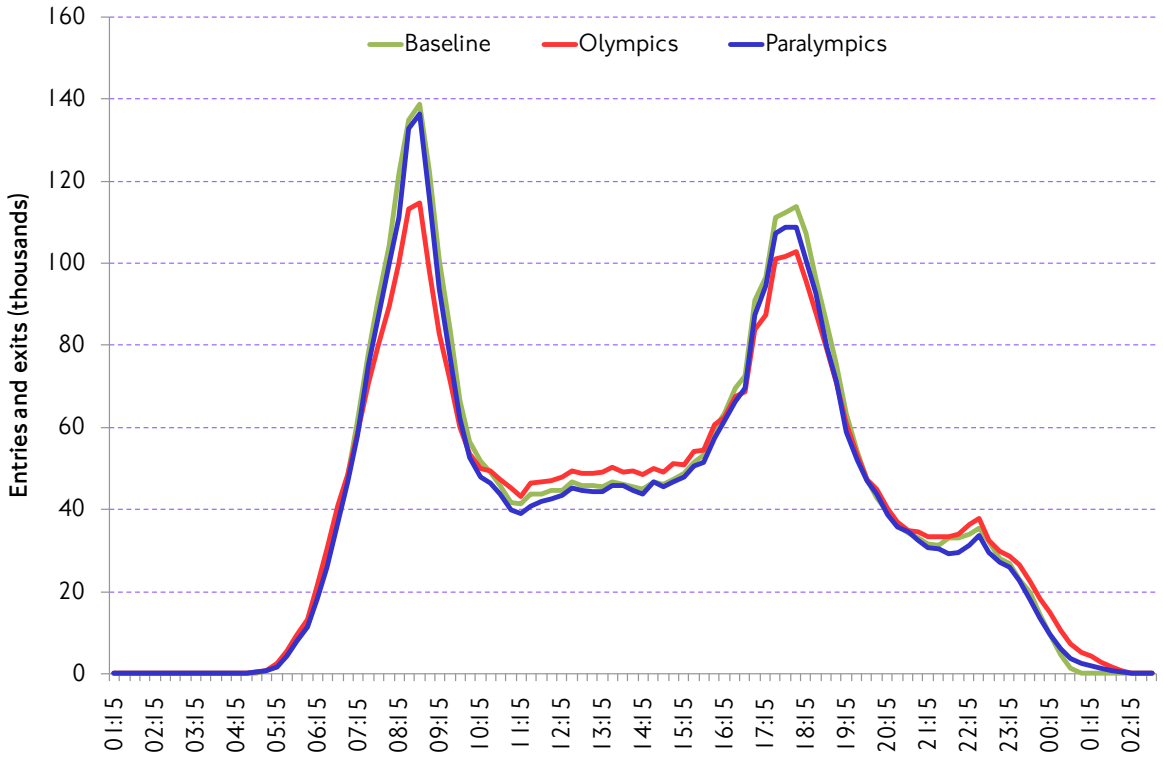
Figure 10.26 Time of day profile – venue stations. All Oystercard entries and exits.




*Source: TfL Customer Experience.*

## Time of day profiles for Oystercard holders: National Rail terminal stations only

Figure 10.27 Time of day profile – National Rail terminal stations. All Oystercard entries and exits.



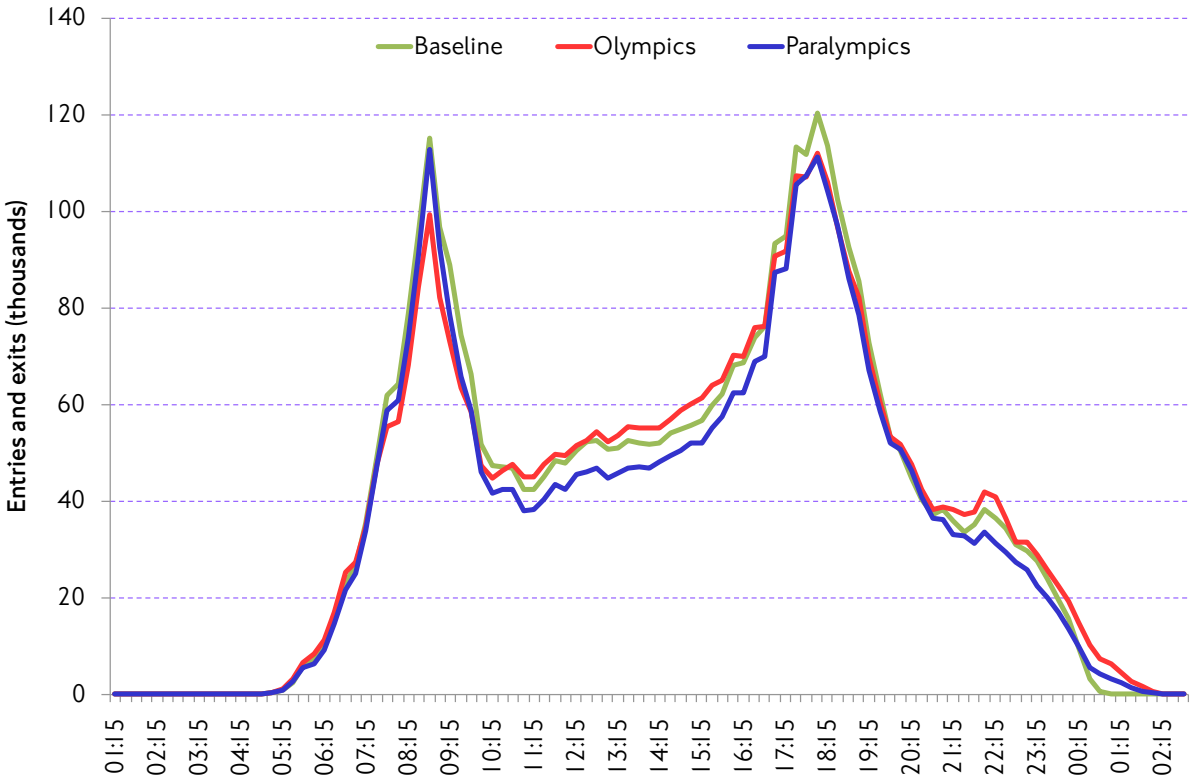

*Source: TfL Customer Experience.*

Figure 10.27 shows the equivalent profile for National Rail terminal stations. The morning and evening peak periods were notably lower than the June 2012 baseline for the Olympics (by 14.6 and 4.4 per cent respectively), partially reflecting school holiday effects. Paralympic profiles however are very similar to the baseline.

### Time of day profiles for Oystercard holders: West End stations only

Figure 10.28 shows the profile for Oystercard holders at West End stations and, as such, would not reflect the additional travel to these stations made by spectators using Games Travelcards. Travel in the morning peak period was 11.7 per cent lower during the Olympics compared to June 2012 and 5.4 per cent lower during the Paralympics. Travel during the inter-peak period (09:30-16:00) was marginally higher overall during the Olympics (by 2 per cent), higher volumes around the mid-day period being offset by lower relative volumes on the 'shoulders' of each peak. During the Paralympic period however volumes in both the inter-peak and evening were marginally lower.

Figure 10.28 Time of day profile - West End stations. All Oystercard entries and exits.

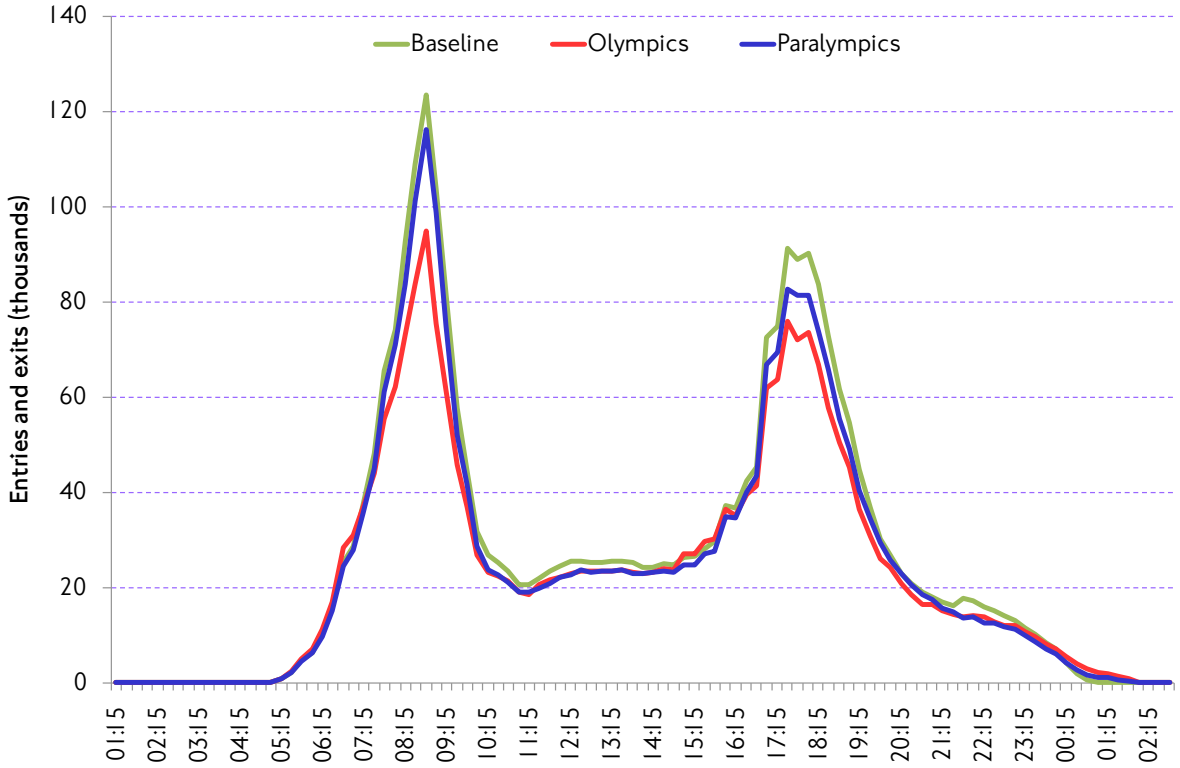



*Source: TfL Customer Experience.*

### Time of day profiles for Oystercard holders: 'Commuter' stations only

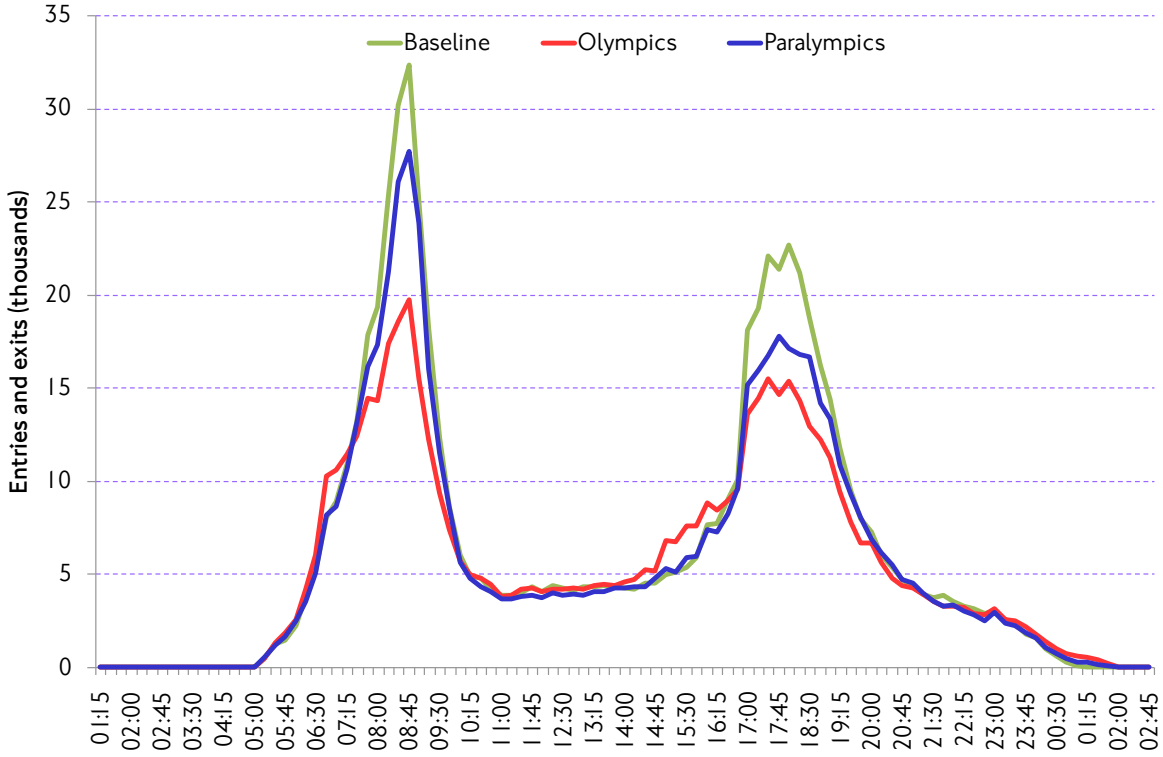
It is at 'commuter' related stations where the biggest reductions in peak-time Oystercard travel during Games time were seen (figure 10.29). Total Oyster transactions were down by 19.2 per cent in the morning peak (07:00 to 09:30) during the Olympics, and by 6.5 per cent during the Paralympics. In the evening peak (16:00 to 19:00), the number of Oystercard transactions during the Olympics was 15.3 per cent lower, and 8.7 per cent lower during the Paralympics.

Figure 10.29 Time of day profile – City and Canary Wharf stations. All Oystercard entries and exits.




*Source: TfL Customer Experience.*

Figure 10.30 Time of day profile – Canary Wharf station only. All Oystercard entries and exits.




*Source: TfL Customer Experience.*

Looking specifically at Canary Wharf (figure 10.30) a much bigger effect is seen. TfL worked closely with the Canary Wharf Group to encourage and facilitate travel behaviour change by employees during Games time. Morning peak Oystercard travel was 27 per cent lower during the Olympics and 10.2 per cent lower during the Paralympics. The corresponding reductions for the afternoon peak were 23.2 and 16.1 per cent respectively. Oystercard transactions during the inter-peak and evening periods at this station during Games time were closely comparable to the June 2012 baseline. Although largely driven by commuter demand, Canary Wharf would also have been impacted by the Games in the form of additional interchange traffic, particularly for spectators heading to the equestrian events at Greenwich. Therefore the reduction in travel by commuters would have been somewhat higher than indicated by these aggregate changes.

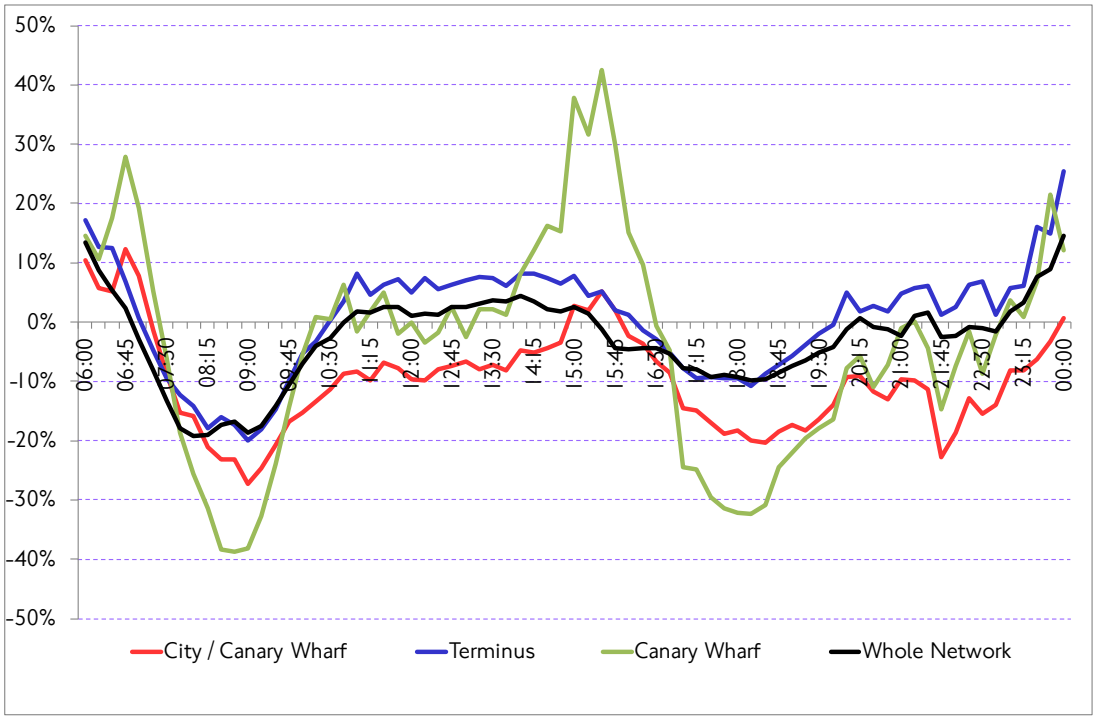
Table 10.8 Time-shifting during Games. Percentage of pre-Games baseline traffic by time period (absolute numbers of people, pre-Games total = 1.00). All Oystercard entries/exits combined.

| Olympics | All | Venue | Terminal | West End | Commuter | Canary Wharf |
|---|---|---|---|---|---|---|
| 00.00-06.00 | 1.57 | 1.82 | 1.86 | 2.04 | 1.56 | 1.52 |
| 06:00-07:00 | 1.06 | 1.29 | 1.11 | 1.10 | 1.09 | 1.20 |
| 07:00-08:00 | 0.88 | 0.97 | 0.92 | 0.95 | 0.93 | 0.96 |
| 08:00-09:00 | 0.82 | 0.87 | 0.84 | 0.87 | 0.79 | 0.65 |
| 09:00-09:30 | 0.82 | 0.90 | 0.81 | 0.84 | 0.74 | 0.64 |
| AM (07:00-09:30) | 0.84 | 0.91 | 0.85 | 0.88 | 0.81 | 0.73 |
| 09:30-12:00 | 0.96 | 1.08 | 0.99 | 0.97 | 0.87 | 0.93 |
| 12:00-16:00 | 1.02 | 1.28 | 1.06 | 1.05 | 0.96 | 1.14 |
| 16:00-19:00 | 0.92 | 1.03 | 0.93 | 0.97 | 0.85 | 0.77 |
| 19:00-22:00 | 0.97 | 1.11 | 1.00 | 1.01 | 0.86 | 0.87 |
| 22:00-24:00 | 1.01 | 1.35 | 1.07 | 1.08 | 0.88 | 1.00 |
| **All day** | **0.95** | **1.11** | **0.97** | **0.99** | **0.87** | **0.85** |
| **Paralympics** | | | | | | |
| 00.00-06.00 | 1.16 | 1.29 | 1.20 | 1.30 | 1.15 | 1.17 |
| 06:00-07:00 | 0.97 | 1.16 | 0.97 | 0.92 | 0.95 | 1.00 |
| 07:00-08:00 | 0.95 | 0.99 | 0.96 | 0.95 | 0.94 | 0.96 |
| 08:00-09:00 | 0.95 | 0.95 | 0.96 | 0.96 | 0.93 | 0.86 |
| 09:00-09:30 | 0.92 | 0.96 | 0.94 | 0.92 | 0.94 | 0.92 |
| AM (07:00-09:30) | 0.94 | 0.97 | 0.96 | 0.95 | 0.93 | 0.90 |
| 09:30-12:00 | 0.93 | 0.96 | 0.94 | 0.89 | 0.90 | 0.94 |
| 12:00-16:00 | 0.96 | 1.07 | 0.98 | 0.91 | 0.93 | 0.99 |
| 16:00-19:00 | 0.95 | 1.02 | 0.96 | 0.93 | 0.91 | 0.84 |
| 19:00-22:00 | 0.97 | 1.00 | 0.97 | 0.95 | 0.93 | 0.97 |
| 22:00-24:00 | 0.90 | 1.27 | 0.94 | 0.86 | 0.83 | 0.93 |
| **All day** | **0.95** | **1.03** | **0.96** | **0.93** | **0.92** | **0.91** |

*Source: TfL Customer Experience.*

Table 10.8 summarises these time-of-day patterns for each of the indicator groups of stations. Figure 10.32 shows patterns at the network level and for 'commuter-related' stations during the Olympics (only), as percentage changes from the baseline. Figure 10.31 clearly shows lower relative demand during the morning and evening peak periods, with demand during the middle of the day and evening being relatively close, overall, to non-Games levels. Canary Wharf did however accommodate a proportion of Games-related travel, by virtue of role as a key interchange with the DLR. To the extent that this travel was made using Oyster cards it is reflected in the graphic, most obviously by the spike in relative demand in the middle of the afternoon, which may also have reflected a degree of 'time-shifting' in the form of earlier departures from work.

Figure 10.31 Time-shifting during Olympics. Difference in relation to pre-Games baseline traffic by quarter-hour period (pre-Games total = 1.00). All Oystercard entries/exits combined.




*Source: TfL Customer Experience.*

## 10.10 Operational performance of the Underground

London Underground successfully ran a more intensive level of service more reliably to support the Games. A net 11 per cent increase in available train capacity was provided – providing space for an additional 488,000 journeys per day, or 14 million extra journeys over the combined Games period. London Underground ran 98 per cent of scheduled kilometres during the Olympics, and 99 per cent during the Paralympics – an improvement on the already excellent levels of reliability more usually attained. There was a 38 per cent reduction in the impact of service disruption – equivalent to 29,000 fewer Lost Customer Hours over the entire Games period. Customer Satisfaction scores for LU's performance during Games time were at 'best ever' levels.

London Underground's improved performance over Games time was only possible due to a change in how the railway was operated. There was a significant reduction in engineering works during the Games, with non-essential capital and maintenance

works postponed. London Underground re-organised these works so that they took place either side of the Games, leading to fewer closures and reliability issues. London Underground also operated higher frequencies and late running on certain lines as well as ensuring that there was more staff on stations (including volunteers and front-line staff).

### Headline network performance statistics

Tables 10.9 and 10.10 summarise 'headline' performance indicators at the LU network level for the Olympic and Paralympic Games periods respectively. Games time performance is generally compared against the average recorded over the first four four-week periods of the 2012/12 financial year (spring and early summer). Service delivery and performance in many ways exceeded levels that are usually achieved, especially over the Paralympic period, with a net 11 per cent increase in train service capacity (over both Games) delivered with very high levels of consistency and reliability.

### Olympics

For the Olympics, London Underground scheduled 9 per cent more capacity than usual, and provided 11 per cent more. In other words, a more intensive level of service was operated more effectively, with 98.0 per cent of scheduled train-kilometres operated, compared to a typical value of 97.1 per cent for the early part of the 2012/13 financial year. A 'good service' was operated on 80 per cent of days, this being defined as days for which train service reliability targets were met at the network level. Total lost customer hours (a measure of the impact of service disruption on journey times) during the Olympics period was 28 per cent lower than the 2012 representative value.

Table 10.9 Underground service performance during Games time: Key network-level train service indicators (Olympics period).

| Whole LU network | 2012 Comparator | Olympics | Difference Olympics/2012 comparator | Difference Olympics/2012 comparator (%) |
|---|---|---|---|---|
| Scheduled train capacity (place-kms) | 4,803,758 | 5,249,048 | 445,290 | +9% |
| Actual capacity (place-kms) | 4,603,923 | 5,098,194 | 494,271 | +11% |
| Scheduled train kms | 213,495 | 234,306 | 20,811 | +10% |
| Actual train kms | 207,275 | 229,722 | 22,446 | +11% |
| % train kms operated | 97.1 | 98.0 | +0.9% point | +1% |
| Excess platform wait time (seconds) | 29 | 26 | -3 | -10% |
| Average journey time | 15 min 5 sec | 15 min 2 sec | 3 sec | 0% |
| % days good service operated | 71% | 80% | +9% point | 9% |
| Total lost customer hours (per day) | 76,505 | 54,795 | -21,710 | -28% |

*Source: London Underground.*

### Paralympics

Looking at the Paralympics period, London Underground scheduled 7 per cent more capacity than usual, and delivered 10 per cent more, again operating a more intensive level of service more effectively, with 99.0 per cent of scheduled train-kilometres operated, compared to the typical value of 97.1 per cent for the early part of the

2012/13 financial year. A 'good service' was operated on 89 per cent of days, compared to an average value of 71 per cent for the early part of 2012/13. Total lost customer hours, a measure of the impact of service disruption on journey times, during the Paralympics was 51 per cent lower than the 2012 typical value.

Table 10.10 Underground service performance during Games time: Key train service indicators (Paralympics period).

| Whole LU network | 2012 Comparator | Paralympics | Difference Paralympics/ 2012 comparator | Difference Paralympics/ 2012 comparator (%) |
|---|---|---|---|---|
| Scheduled train capacity (place-kms) | 4,803,758 | 5,160,852 | 357,094 | +7% |
| Actual capacity (place-kilometres) | 4,603,923 | 5,082,787 | 478,864 | +10% |
| Scheduled train kms | 213,495 | 230,058 | 16.563 | +8% |
| Actual train kms | 207,275 | 227,754 | 20,479 | +10% |
| % train kms operated | 97.1 | 99.0 | +1.9% point | +2% |
| Excess platform wait time (seconds) | 29 | 17 | -11 | -39% |
| Average journey time | 15 min 5 sec | 14 min 46 sec | -19 sec | -2.1% |
| % days good service operated | 71% | 89% | +19% point | +19% |
| Total lost customer hours (per day) | 76,505 | 37,546 | -38,959 | -51% |

*Source: London Underground.*

The following sections look at these service performance indicators in more detail.

### Service operated – London Underground

Providing an enhanced level of service over extended operational hours was the basis of London Underground's Games time planning, particularly to cater for increased levels of demand during the mid-day and late evening periods associated with Games events. Tables 10.11 and 10.12 show scheduled and actual operated train-kilometres by line over the Olympic and Paralympic periods respectively. All lines benefitted from enhanced levels of service, with 21 per cent more train kilometres operated on the key Jubilee line during the Olympics period (9 per cent during the Paralympics), and 12 per cent more on the Central line (11 per cent Paralympics). Other Games-time critical lines, especially the District and Hammersmith and City/Circle lines, typically saw service enhancements of greater than 10 per cent.

Table 10.11 Average daily kilometres run by line. Olympics.

| | Daily average P1-4 12/13 | | | Daily average over Olympics | | | Kms run | |
|---|---|---|---|---|---|---|---|---|
| | Scheduled Kms | Kms run | % | Scheduled Kms | Kms run | % | Difference | % Change |
| Bakerloo | 10,139 | 9,858 | 97.2% | 10,665 | 10,401 | 97.5% | 543 | 6% |
| Central | 32,887 | 31,817 | 96.7% | 36,526 | 35,545 | 97.3% | 3,728 | 12% |
| Circle & Hammersmith | 11,576 | 10,846 | 93.7% | 12,767 | 12,592 | 98.6% | 1,745 | 16% |
| District | 27,266 | 26,427 | 96.9% | 30,100 | 29,346 | 97.5% | 2,918 | 11% |
| Jubilee | 27,577 | 26,655 | 96.7% | 32,622 | 32,157 | 98.6% | 5,502 | 21% |
| Metropolitan | 20,520 | 19,673 | 95.9% | 22,364 | 21,988 | 98.3% | 2,315 | 12% |
| Northern | 32,522 | 32,063 | 98.6% | 35,116 | 34,992 | 99.6% | 2,928 | 9% |
| Piccadilly | 33,521 | 32,792 | 97.8% | 35,053 | 33,897 | 96.7% | 1,105 | 3% |
| Victoria | 16,695 | 16,366 | 98.0% | 18,152 | 17,877 | 98.5% | 1,511 | 9% |
| Waterloo and City | 791 | 778 | 98.4% | 940 | 928 | 98.7% | 150 | 19% |
| **Network total** | **213,495** | **207,275** | **97.1%** | **234,306** | **229,722** | **98.0%** | **22,446** | **11%** |

*Source: London Underground.*

Table 10.12 Average daily kilometres run by line. Paralympics.

| | Daily average P1-4 12/13 | | | Daily average over Paralympics | | | Kms run | |
|---|---|---|---|---|---|---|---|---|
| | Scheduled Kms | Kms run | % | Scheduled Kms | Kms run | % | Difference | % Change |
| Bakerloo | 10,139 | 9,858 | 97.2% | 10,669 | 10,558 | 99.0% | 700 | 7% |
| Central | 32,887 | 31,817 | 96.7% | 35,549 | 35,345 | 99.4% | 3,528 | 11% |
| Circle & Hammersmith | 11,576 | 10,846 | 93.7% | 12,741 | 12,395 | 97.3% | 1,549 | 14% |
| District | 27,266 | 26,427 | 96.9% | 30,075 | 29,614 | 98.5% | 3,187 | 12% |
| Jubilee | 27,577 | 26,655 | 96.7% | 29,369 | 29,134 | 99.2% | 2,480 | 9% |
| Metropolitan | 20,520 | 19,673 | 95.9% | 22,359 | 22,074 | 98.7% | 2,401 | 12% |
| Northern | 32,522 | 32,063 | 98.6% | 35,103 | 34,954 | 99.6% | 2,890 | 9% |
| Piccadilly | 33,521 | 32,792 | 97.8% | 35,074 | 34,688 | 98.9% | 1,896 | 6% |
| Victoria | 16,695 | 16,366 | 98.0% | 18,175 | 18,048 | 99.3% | 1,683 | 10% |
| Waterloo and City | 791 | 778 | 98.4% | 944 | 943 | 100.0% | 165 | 21% |
| **Network total** | **213,495** | **207,275** | **97.1%** | **230,058** | **227,754** | **99.0%** | **20,479** | **10%** |

*Source: London Underground.*

### Service reliability: Excess Platform Waiting Time (EPWT)

Figure 10.32 looks at a 'headline' indicator of Underground service reliability – Excess Platform Wait Time (EPWT) – over both the Olympic and Paralympic Games. EPWT is the additional time, on average, that customers have to wait for a train over and above that which would be expected if the service operated perfectly to schedule. Lower levels of EPWT indicate better performance. A line-by-line breakdown is given, as is a comparison baseline that shows the average levels of EPWT recorded over the first sixteen weeks of the 2012-13 financial year (spring to early summer before Games). Key things to note from the figure are:

- Over both the Olympics and Paralympics, levels of EPWT are generally lower than the pre-Games baseline. Average network-wide levels over the Olympics were 1.26 minutes, 18.2 per cent lower than the comparison baseline of 1.54 minutes.

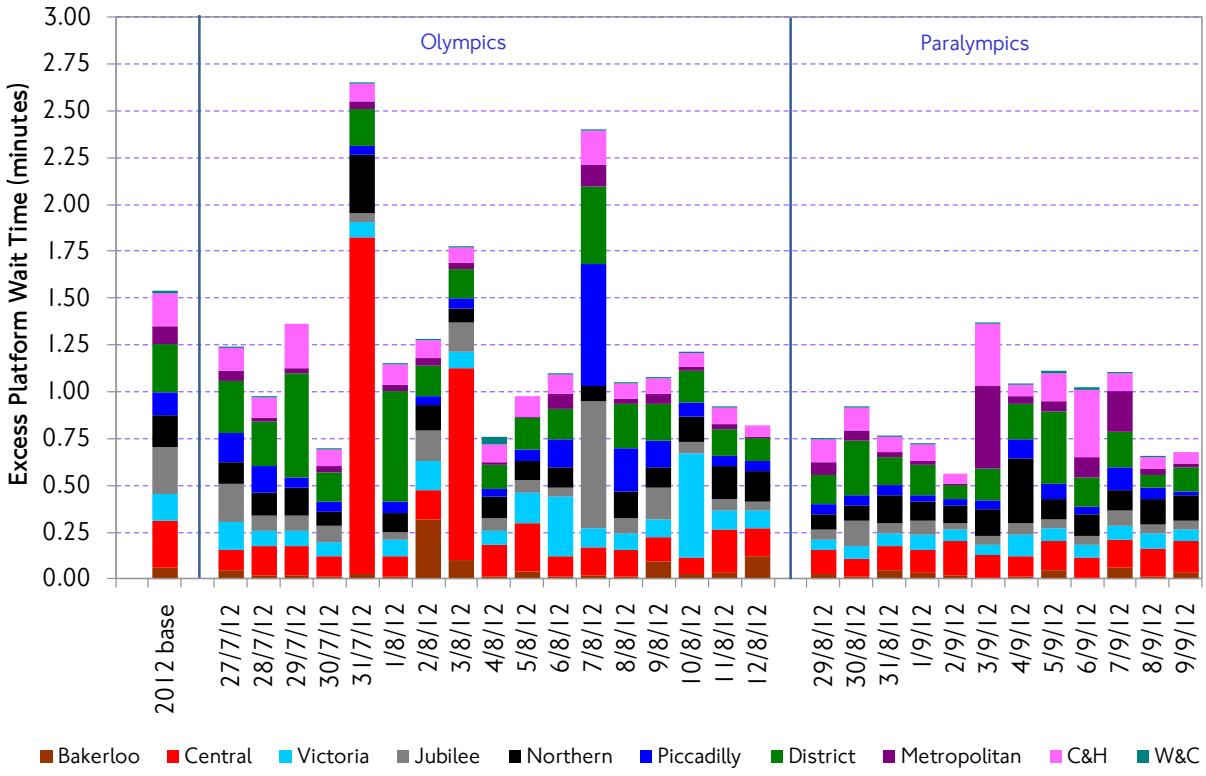
Average levels over the Paralympics were 0.89 minutes, 42.2 per cent lower than the comparison baseline. There were three days during the Olympics where EPWT was significantly higher than the comparison baseline.

- Service performance during the Paralympic period was more consistent, and there were no days when the network-level EPWT was higher than the comparison baseline. There were also no major incidents affecting the key Central and Jubilee lines during this period.

Looking at the performance of Games-critical lines in comparison to their performance over the first sixteen weeks of the year (line-specific baselines):

- Jubilee line average daily EPWT was 0.13 minutes - 48 per cent better than the baseline of 0.25 minutes (Olympics) and just 0.06 minutes – 76 per cent better than the baseline (Paralympics).
- Central line average daily EPWT was 0.30 minutes – 15 per cent worse than the baseline of 0.26 minutes (Olympics), reflecting the specific incidents of 31 July and 3 August, but 0.14 minutes – 46 per cent better than the baseline (Paralympics).
- District line average daily EPWT was 0.24 minutes – 4 per cent better than the baseline of 0.25 minutes (Olympics) and 0.18 minutes – 28 per cent better than the baseline (Paralympics).
- Circle/Hammersmith and City average daily EPWT was 0.11 minutes – 35 per cent better than the baseline of 0.17 minutes (Olympics) and 0.13 minutes – 24 per cent better than the baseline (Paralympics).

Figure 10.32 Underground service performance during Games time: Excess Platform Wait Time (EPWT) by line.




*Source: London Underground.*

### Service consistency

Service consistency is a measure of 'good service', and is defined as the percentage of days that the daily Excess Platform Wait Time target was met. Values for the Olympic and Paralympic Games periods are shown in table 10.13, with a comparison against achieved values for the first sixteen weeks of the 2012/13 financial year (spring and early summer before the Games). Most notable are substantial improvements for the Games-critical Jubilee line, which for the Olympics was one of the most reliable lines on the network, although it was a relatively poor performer over the first four periods of the year. Notable also were 100 per cent performances by the Central and Victoria lines over the Paralympic period. At the network level, seven out of ten lines performed better than the baseline during the Olympics, rising to nine out of ten during the Paralympics, with an overall service consistency score of 89 per cent for the Paralympics (compared to 70 per cent in the pre-Games baseline).

Table 10.13 Service consistency by line. Percentage of days 'good service' operated.

| | Period 1-4 2012/13 | Olympics | Difference | Paralympics | Difference |
|---|---|---|---|---|---|
| Bakerloo | 83% | 76% | -6% | 92% | +9% |
| Central | 70% | 76% | +6% | 100% | +30% |
| Victoria | 81% | 82% | +1% | 100% | +19% |
| Waterloo & City | 86% | 71% | -16% | 83% | -3% |
| Jubilee | 67% | 88% | +21% | 92% | +25% |
| Northern | 71% | 88% | +17% | 92% | +21% |
| Piccadilly | 77% | 71% | -6% | 83% | +6% |
| Circle/H'smith | 63% | 88% | +25% | 75% | +12% |
| District | 56% | 65% | +9% | 75% | +19% |
| Metropolitan | 55% | 88% | +33% | 92% | +37% |
| **Network** | **70%** | **79%** | **+9%** | **89%** | **+19%** |

*Source: London Underground.*

### Journey times and the components of journey times

Table 10.14 shows average journey times and their composition for the four lines serving the Olympic Park, for the Olympic and Paralympic periods. Network level statistics are also given for comparison, as is a comparison baseline of the first sixteen weeks of 2012/13 (spring and early summer 2012 before the Games). An 'average train journey time' is made up of platform waiting time, an average in-vehicle ('run') time, and an average service disruption component.

Indicators for the Olympic period are similar to or better than those of the baseline, with a notable improvement on the Jubilee line in particular. In other words, from a customer point of view, the network operated in a way that was comparable to or better than what would be considered typical, despite the extraordinary demands being made on the network at that time. Over the Paralympic period there is clearer evidence of outstanding performance – most indicators for most lines registering substantial improvements over baseline values. Of particular interest are the values for average platform wait time, reflecting increased service provision balanced against

additional demand, and the very low impact of service disruption on total journey times over the Paralympics period.

Table 10.14 Average train wait and journey times. Selected Games-critical lines.

| | Baseline | Olympics | Paralympics |
|---|---|---|---|
| **Network** | | | |
| Average platform wait time | 2 min 23 sec | 2 min 18 sec | 2 min 17 sec |
| Average run time | 12 min 36 sec | 12 min 36 sec | 12 min 28 sec |
| Severe disruption | 6 sec | 8 sec | 1 sec |
| Average train journey time | 15 min 5 sec | 15 min 2 sec | 14 min 46 sec |
| **Jubilee** | | | |
| Average platform wait time | 1 min 48 sec | 1 min 26 sec | 1 min 30 sec |
| Average run time | 10 min 36 sec | 10 min 42 sec | 10 min 23 sec |
| Severe disruption | 17 sec | 6 sec | 1 sec |
| Average train journey time | 12 min 41 sec | 12 min 14 sec | 11 min 54 sec |
| **Central** | | | |
| Average platform wait time | 2 min 5 sec | 2 min 4 sec | 2 min 1 sec |
| Average run time | 13 min 30 sec | 13 min 35 sec | 13 min 26 sec |
| Severe disruption | 11 sec | 31 sec | 0 sec |
| Average train journey time | 15 min 46 sec | 16 min 10 sec | 15 min 27 sec |
| **District** | | | |
| Average platform wait time | 2 min 53 sec | 2 min 54 sec | 2 min 50 sec |
| Average run time | 14 min 23 sec | 14 min 34 sec | 14 min 16 sec |
| Severe disruption | 3 sec | 6 sec | 2 sec |
| Average train journey time | 17 min 19 sec | 17 min 34 sec | 17 min 8 sec |
| **Circle/Hammersmith & City** | | | |
| Average platform wait time | 3 min 32 sec | 3 min 20 sec | 3 min 23 sec |
| Average run time | 10 min 45 sec | 10 min 46 sec | 10 min 45 sec |
| Severe disruption | 3 sec | 0 sec | 0 sec |
| Average train journey time | 14 min 20 sec | 14 min 6 sec | 14 min 8 sec |

*Source: London Underground.*

### Underground performance: Customer satisfaction

A total of 3,623 customers were interviewed over the Olympic and Paralympic Games, as part of an enhancement to London Underground's regular Customer Satisfaction survey. Key features of the results as follows:

- The overall Customer Satisfaction score for the whole Games period was 85 out of 100. This is indicative of 'world class' performance. Generally, ratings over the Olympic and Paralympic period were at similar high levels.
- More than half (54 per cent) of customers gave a rating of 9 or 10 out of 10 for the service, and 79 per cent of customers gave the service a rating of 8 or higher.

- Overall satisfaction scores were highest for Olympic/Paralympic event attendees and volunteers/workers, but somewhat lower for work-related journeys.
- Customers living in London and the South East gave overall average Customer Satisfaction scores of 85, only slightly lower than those living outside the South East (87) and those living outside the UK (86).
- Scores from commuters during this period were very high, which offers a barometer of how the service was actually operating away from the 'feel good' factor of the Games.
- Relative to baseline comparator values for the London Underground Customer Satisfaction Survey, the following aspects scored particularly well during Games time.
    - Journey time, the main driver of customer satisfaction - 87 during Games time compared with 81 for the first quarter of 2012/13.
    - Wait for train, linked to above in driving customer satisfaction - 87 during Games time compared with 84 in Q1 2012/13.
    - Help and appearance of staff around the station - 83 during Games time compared with 79 in Q1 2012/13.
    - Train cleanliness - 82 during Games time compared with 78 in Q1 2012/13.
    - Station staff availability when needed - 81 during Games time versus 77 in Q1 2012/13.

## 10.11 Docklands Light Railway

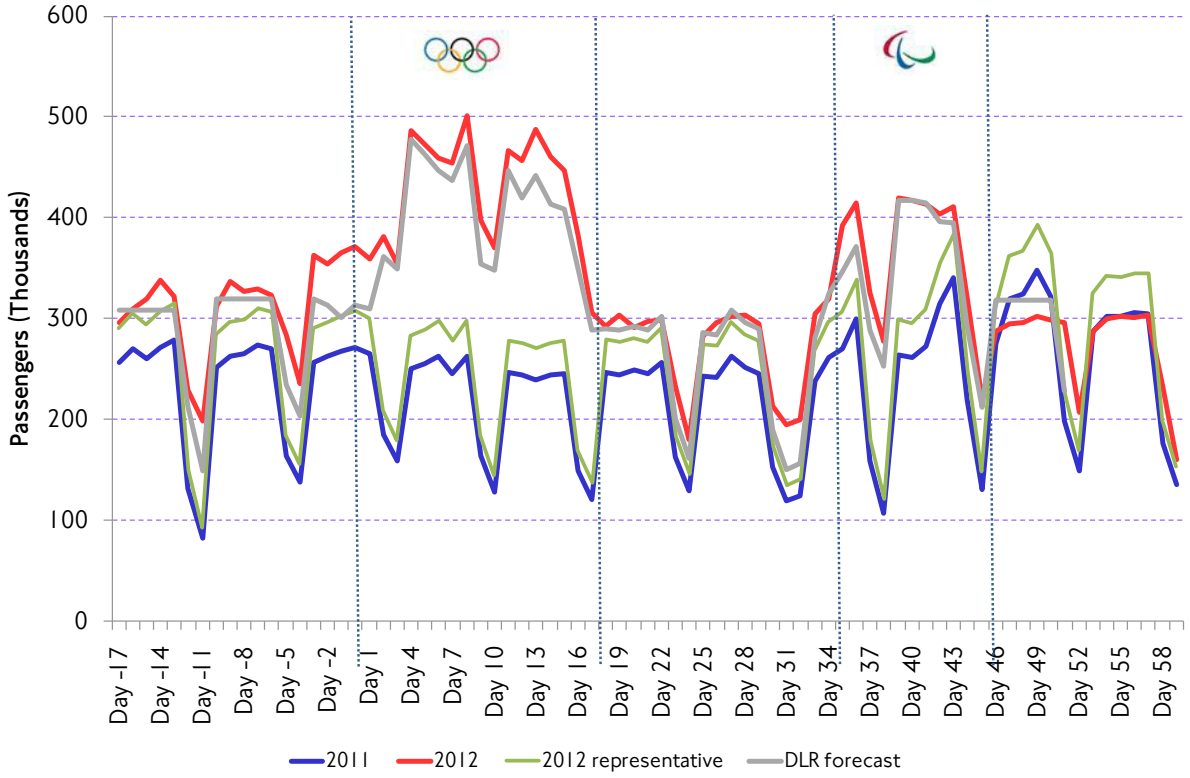
More than 10.8 million journeys were made on the DLR over the London 2012 Games – up almost 88 per cent compared with the equivalent period last year. Over 500,000 journeys on a single day were made for the first time on Friday 3 August, compared to normal daily levels of just under 300,000. Despite these extraordinary levels of customer demand, careful forecasting, appropriate provision of additional capacity (up to one-third more trains) and changes to travel behaviour by regular DLR users ensured that the DLR successfully filled a key role linking several Games venues at the heart of the 'River Zone' in East London. The DLR typically provided between 20 and 30 per cent additional capacity on weekdays, and up to 120 per cent additional capacity at weekends. DLR service performance scores for Games time were generally above the excellent levels more usually attained.

The DLR had a pivotal role at the heart of Games time public transport, directly linking four venues (the Olympic Park itself, ExCel, Greenwich Park and Royal Artillery Barracks). The railway also provides a route to central London from these venues, and serves the business district of Canary Wharf. Specific enhancements to the network that were put in place ahead of the Games included line extensions to Woolwich Arsenal and Stratford International, and the Capacity Enhancement Project to allow operation of three-car trains. Partly because of these enhancements, DLR patronage has grown strongly. Over summer 2012, DLR train schedules were developed to provide maximum capacity for the start and finish of events at each venue. The DLR was forecast to carry up to double the level of passengers during the Games than would have been typical, and enhancements of up to one third over and above normal train service levels were provided.

### Total daily DLR demand across summer 2012

Figure 10.33 shows the daily total number of journey-stages made on the DLR over summer 2012. Data are compared against equivalent days in 2011 and a representative non-Games baseline for 2012 that takes into account the substantial year-on-year background growth in patronage on the DLR (this latter is assessed at 13.1 per cent, based on a comparison of the first three months of 2011 and 2012). The DLR pre-Games patronage forecast is also given for comparison (grey line), in order that the accuracy of planning for the Games on this key network can be appreciated.

Figure 10.33 Daily demand on DLR. Journey-stages on whole network.

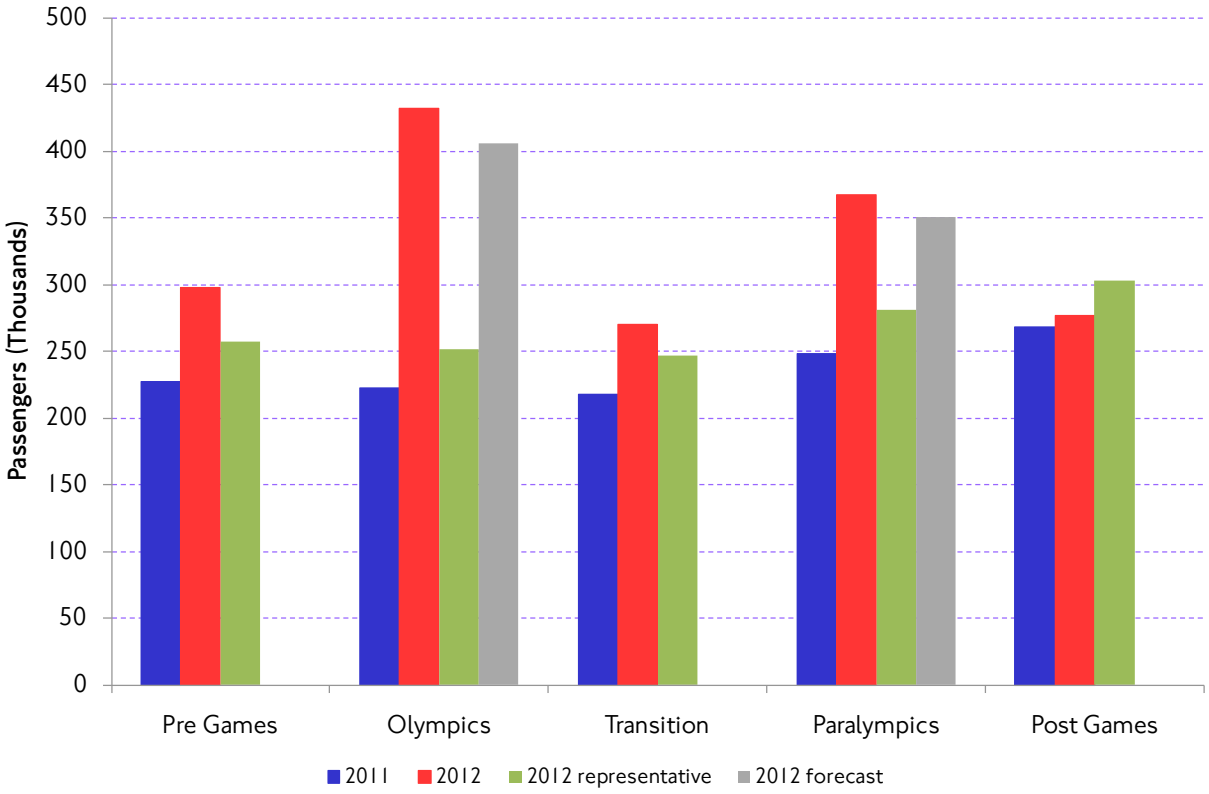



*Source: Docklands Light Railway.*

The effect of the Olympic and Paralympic Games on patronage is very obvious – patronage on some days being over 100 per cent higher than equivalent days in 2011. The highest number of passengers, 500,896, were carried on Friday 3 August (Day 7 of the Olympics), although many of the early Olympic days saw successive 'all-time' records for DLR patronage – at levels much higher than previously experienced but generally not too dissimilar to those forecast. Demand during the Paralympics was also much higher than usual, with total demand on several days exceeding 400,000 passengers.

Figure 10.34 summarises these demand trends, in terms of normalised daily average values for each of the summer 2012 analysis periods. Over the entire Olympic period daily DLR demand was a (normalised) average of 71.8 per cent above the representative summer 2012 non-Games baseline (green line on figure 10.32). The equivalent value for the Paralympics was an increase of 30.7 per cent over baseline.

Figure 10.34 Normalised daily average DLR demand during summer 2012 compared with 2011, 2012 representative values and pre-Games forecasts. Journey stages on whole network.



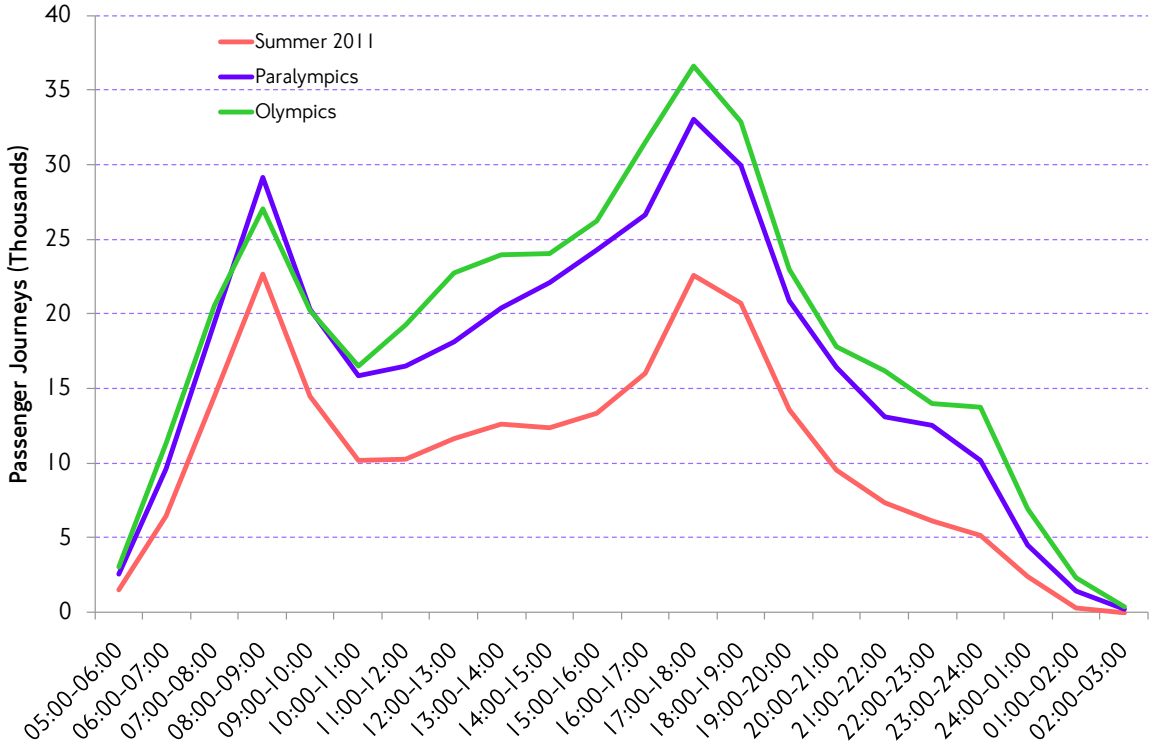

*Source: Docklands Light Railway.*

Looking at non-Games periods in 2012, the two-week pre-Games period saw demand on average 31 per cent above equivalent days in 2011, and 15.8 per cent above the representative 2012 non-Games baseline. The Transition period saw demand on average 9.6 per cent above the representative 2012 baseline (ie what would otherwise have been expected), whilst during the post-Games period patronage reverted rapidly to levels comparable with those of equivalent days in 2011, being on average 8.9 per cent below the representative 2012 baseline, reflecting a particularly low level of journeys in the final week.

**DLR demand patterns by time of day**

An important factor underpinning the ability of the DLR to manage these extraordinary numbers of passengers was the way in which total demand was spread out across the course of the day. Figure 10.35 shows normalised (ie average) hourly demand profiles for the five summer 2012 analysis periods. An equivalent profile is given for the summer 2011 period (11 July to 25 September 2011) for comparison.

Figure 10.35 Normalised hourly profiles of passenger demand on DLR. Journey stages on whole network. Absolute values (normalised).




*Source: Docklands Light Railway.*

The pattern shown is that the additional demand on the DLR was spread across all periods of the day. However, the degree of increase varied considerably, tending to be least during the morning peak period, and greatest during the mid-day inter peak period. The evening peak period (17:00 to 19:00) is particularly notable, with average demand increases of 62.7 per cent (Olympics) and 47.6 per cent (Paralympics), and the highest absolute levels of demand during the course of the day. However, higher proportionate increases occurred at other hours of the day, particularly in the very early morning, early afternoon and late evening.

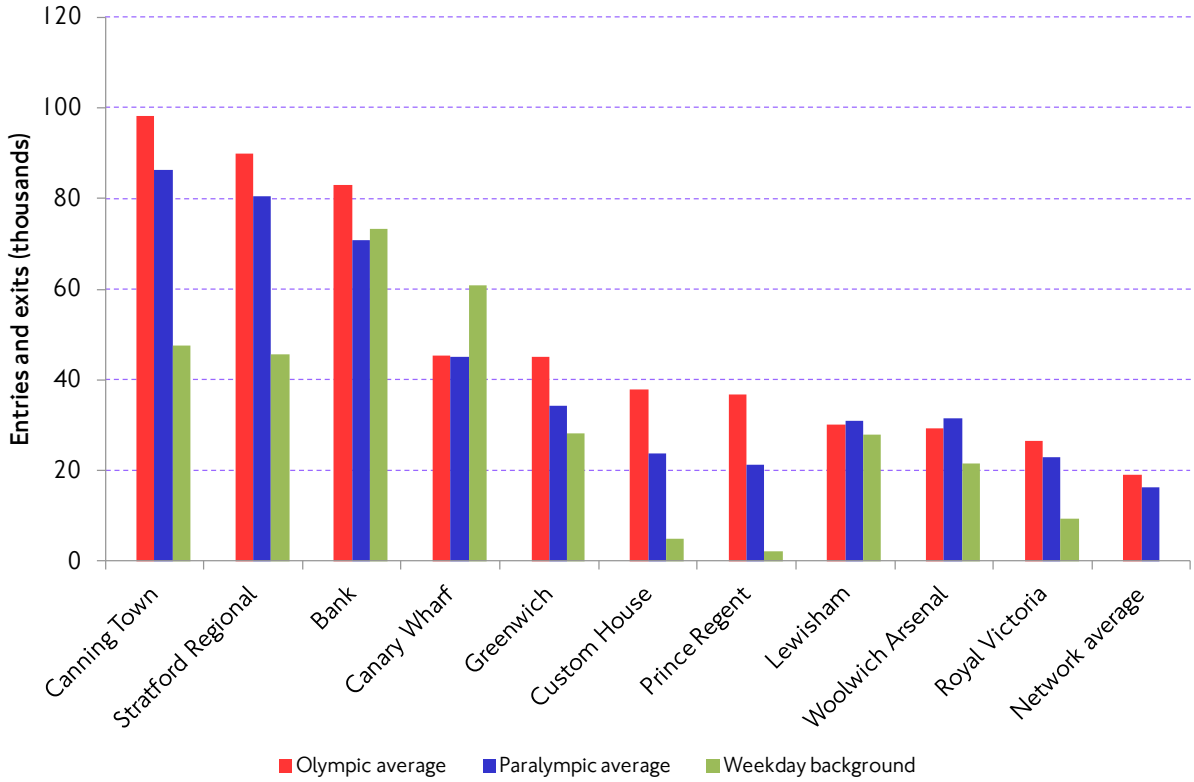
The aggregate demand increases shown by figure 10.35 suggest that any time-shifting behaviour by regular DLR travellers was overwhelmed by the sheer demand increase and thus invisible at the network level. It is therefore of interest to examine patterns of demand at selected DLR stations in more detail to illustrate the diversity of roles played by the DLR over Games time.

### Top ten busiest DLR stations

Figure 10.36 shows the 'top ten' busiest DLR stations, ranked from left to right in terms of the number of passengers during the Olympic period (either boarding or alighting from trains), with Paralympic period and typical daily 'background' values are also shown. Canning Town, the busiest DLR station, is a major interchange point and thus the passenger volumes here are not directly connected to any one Games venue, but do reflect general volumes on the network. Stratford Regional was the second busiest station, although interestingly Stratford International does not feature in the 'top ten'. Games time demand at both Canning Town and Stratford Regional was about double usual levels. Third and fourth busiest are the primarily commuter

stations of Bank and Canary Wharf, although actual Games time demand levels were comparable to, or below, those usually seen at these stations. At Canary Wharf both Olympic and Paralympic demand were about one-quarter below typical levels. Of the remaining six stations, all except Lewisham were directly connected to Games venues, and at these stations Games time demand was generally well above normal levels.

Figure 10.36 DLR demand during Olympic and Paralympic Games. Top ten stations (boarders and alighters combined).




*Source: Docklands Light Railway.*

The following three sections look in more detail at features of DLR demand at six stations, these comprising those serving the Olympic Park (Stratford Regional and Stratford International), two other venue-related stations (Custom House for Excel and Greenwich), and two primarily 'commuter' stations (Bank and Canary Wharf).

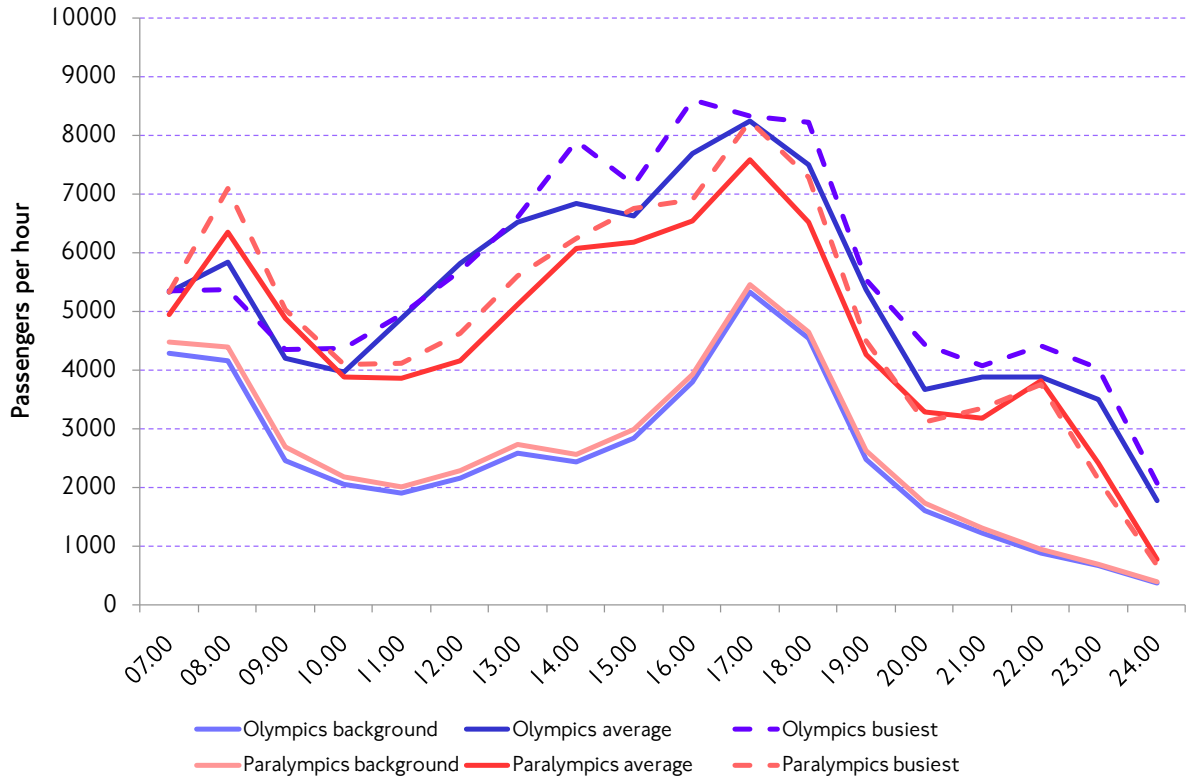
Three pairs of lines are shown in the graphics. First, expected 'background' demand by hour at these stations, reflecting summer 2012 conditions without the Games (ie 'background' demand). Second, a pair of lines showing demand for an average Olympic and Paralympic period day. Third, a pair of lines showing observed demand on the busiest day of the Olympics and Paralympics. The values are straight averages (not normalised) for each period, and (reflecting data availability) only cover the hours of 07:00 to 24:00.

### The DLR at Stratford

Figure 10.37 shows hourly demand profiles for Stratford Regional station. The principal feature here is the consistency of additional Games-related demand across the hours of the day, Games time demand being consistently between 50 and 100 per cent above background for all but the morning peak period. Notable also is the

close relationship between the busiest and average days' patronage for both Olympics and Paralympics. In other words, DLR demand at Stratford Regional was consistently much higher than usual across all hours of all days across both Games.

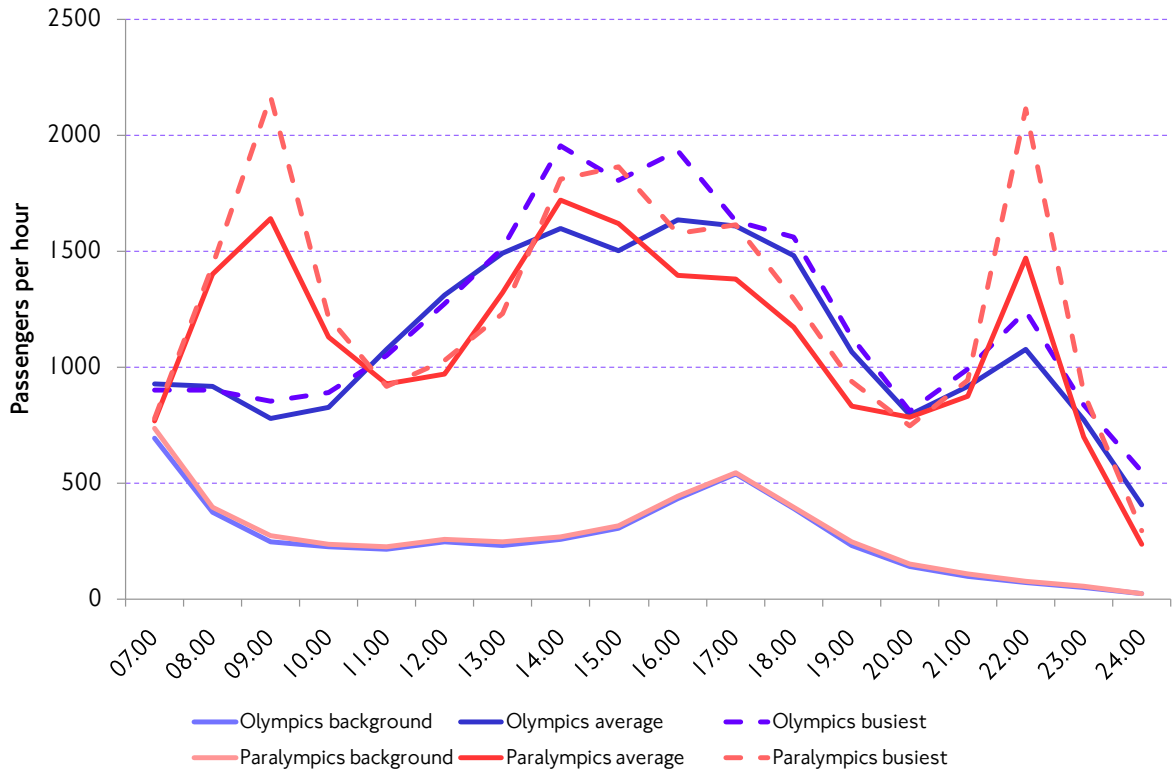
Figure 10.37 Stratford Regional - profiles of DLR demand by hour of day. Combined boarders and alighters.




*Source: Docklands Light Railway.*

Figure 10.38 shows equivalent data for Stratford International. Here, much higher proportionate increases over background demand are seen, albeit at much lower absolute levels (Stratford International was not one of the ten busiest DLR stations during Games time). Of interest however is the difference between morning peak and late evening demand between the Olympics and Paralympics, this being relatively flat during the Olympics, but notably peaked during the Paralympics.

Figure 10.38 Stratford International: Profiles of DLR demand by hour of day. Combined boarders and alighters.



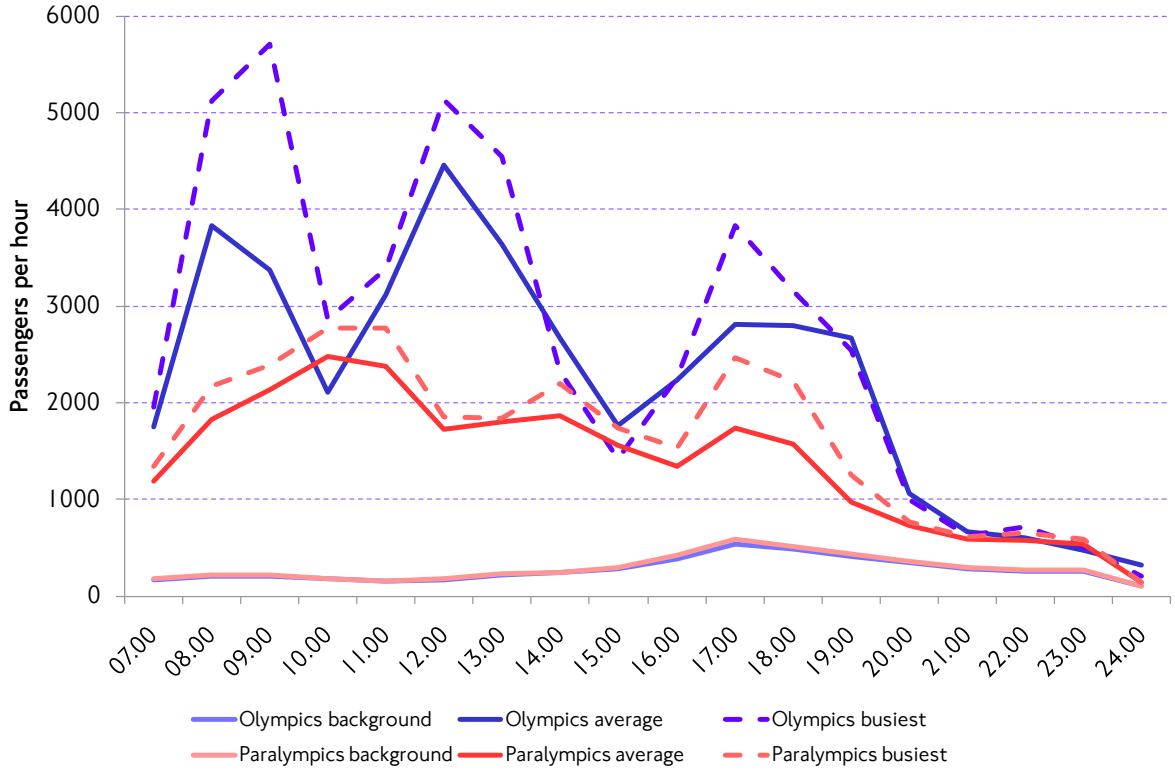

*Source: Docklands Light Railway.*

### The DLR at other Games Venues – Custom House for Excel and Greenwich

Away from the main Olympic Park at Stratford, the DLR also served several other Games venues. ExCel was in fact served by several DLR stations, with special crowd management arrangements in place to spread access to and egress from ExCel between these stations. Signage promoted a one-way system, with people alighting from the DLR at Custom House and West Silvertown, and boarding at Prince Regent and Pontoon Dock stations. However, the majority of people still used the Beckton branch, with Custom House seeing a large number of alighting passengers. A proportion of boarding passengers also used Prince Regent Station. Figure 10.39 shows the daily profile of demand at Custom House, as an example of the stations serving ExCel.

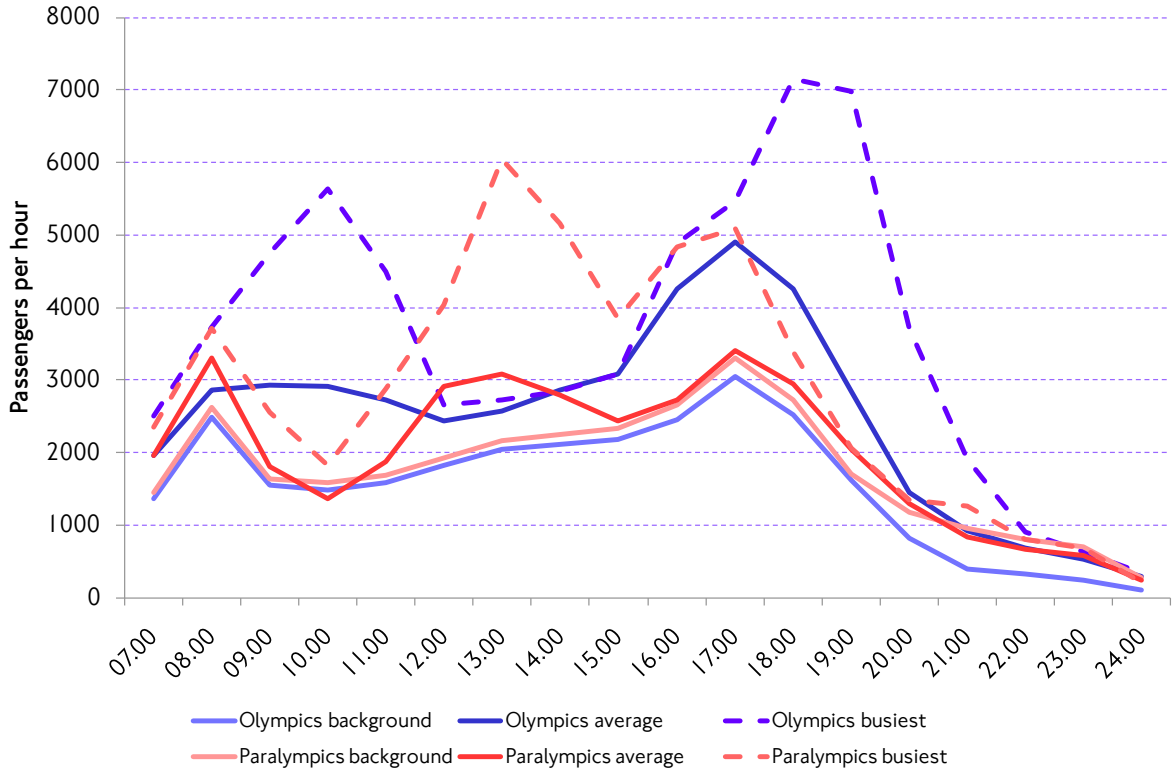
Typical demand at Custom House is between 200 and 500 passengers per hour. During the Olympic period this increased by between 10 and 20 fold, with the balance between average Olympic and Paralympic demand reflecting the different usage of ExCel for events across both Games. Large-scale demand increases are limited to the earlier part of the day, the relatively lower levels of evening/late night demand reflecting the one-way crowd management arrangements for spectators leaving events described above.

Figure 10.39 Custom House for ExCel: Profiles of DLR demand by hour of day. Combined boarders and alighters.




*Source: Docklands Light Railway.*

Figure 10.40 Greenwich: Profiles of DLR demand by hour of day. Combined boarders and alighters.



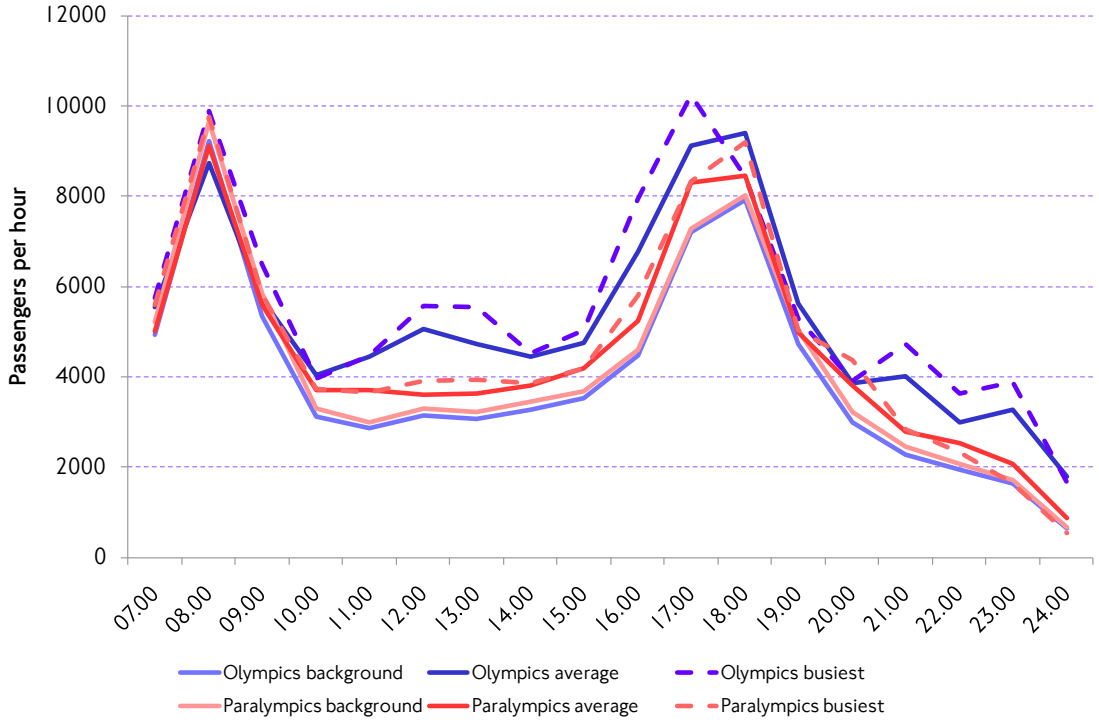

*Source: Docklands Light Railway.*

Greenwich was used selectively during Games to host equestrian events, and the difference between average and busiest days shown by figure 10.40 reflects this. The distinctive 'three peaks' pattern for the busiest days across both Games reflects the starting and finishing times of equestrian events.

### DLR commuter stations: Bank and Canary Wharf

Games time demand patterns at DLR 'primarily commuter' stations contrast with those at venue stations. The most striking feature at Bank (a major network interchange and DLR central London terminal station) is the general similarity of morning and evening peak period demand patterns to those that would normally be expected (figure 10.41), particularly during the morning peak. Games time demand during both the mid-day and late evening periods is consistently higher than normal, although typically at relatively modest absolute levels.

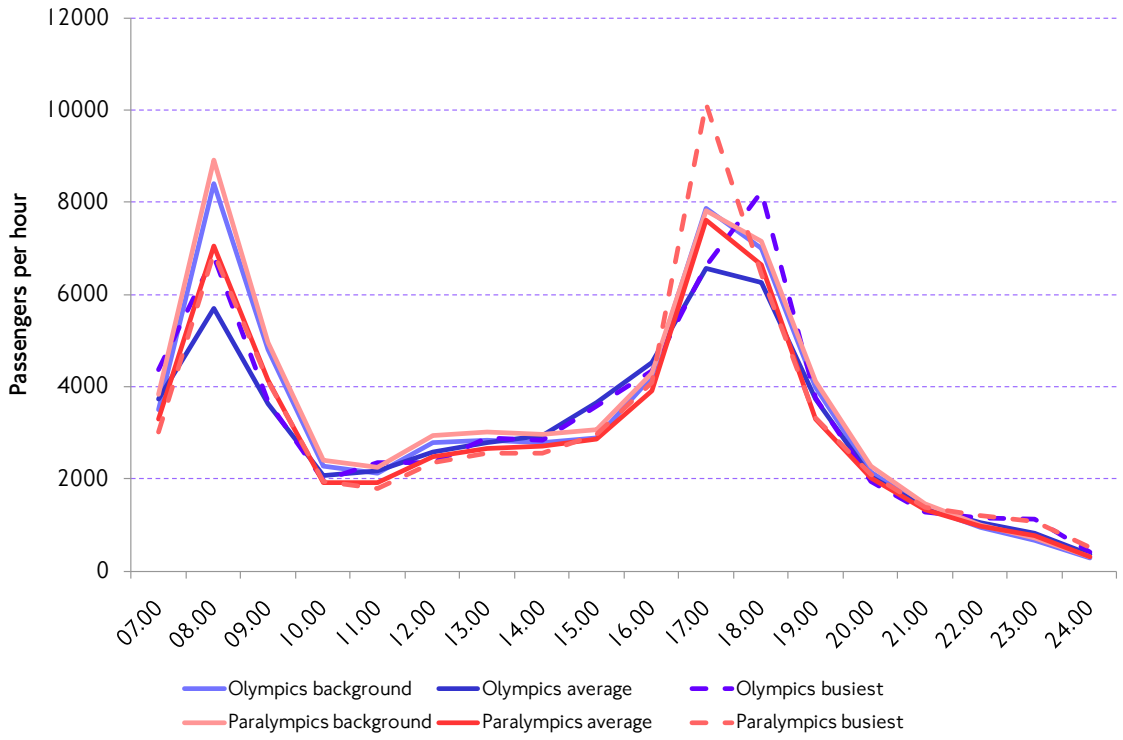
Figure 10.41 Bank: Profiles of DLR demand by time of day. Combined boarders and alighters.




*Source: Docklands Light Railway.*

Looking at Canary Wharf (figure 10.42), it is seen that up until the early afternoon both average and maximum Games time demand were consistently below background volumes, this pattern continuing for average Games time demand for much of the rest of the day. Only on the busiest Olympic and Paralympic days did afternoon peak period demand exceed normal values, and then by only a relatively small amount. Table 10.15 summarises key comparisons for these two stations.

Figure 10.42 Canary Wharf: Profiles of DLR demand by time of day. Combined boarders and alighters.




*Source: Docklands Light Railway.*

Table 10.15 Summary of Games time passenger demand at Bank and Canary Wharf DLR stations. Average passengers per hour (boarders and alighters combined) and difference to expected 'background' levels.

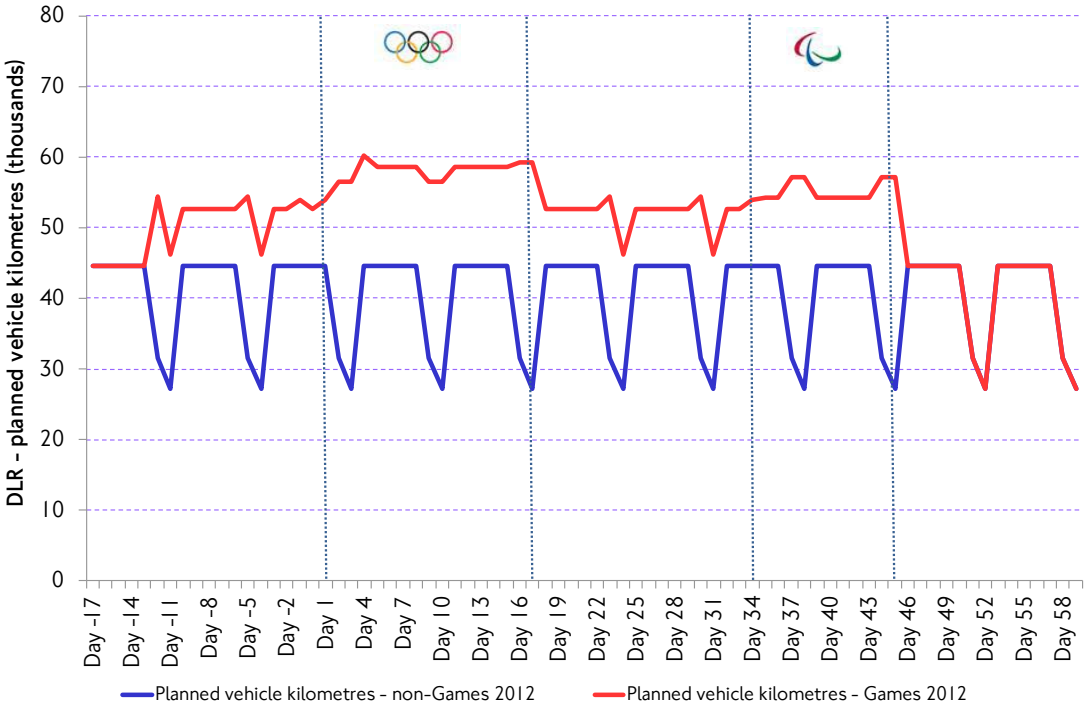
| | Bank | | | | Canary Wharf | | | |
|---|---|---|---|---|---|---|---|---|
| | **Avg. Olympics (%diff)** | **Peak Olympics (%diff)** | **Avg. Para (%diff)** | **Peak Para (%diff)** | **Avg. Olympics (%diff)** | **Peak Olympics (%diff)** | **Avg. Para (%diff)** | **Avg. Para (%diff)** |
| 07:00-08:00 | +12% | +16% | -4% | +7% | +7% | +25% | -14% | -21% |
| 08:00-09:00 | -5% | +7% | -6% | +1% | -32% | -19% | -21% | -23% |
| 09:00-10:00 | +7% | +21% | -4% | -1% | -24% | -23% | -16% | -17% |
| 10:00-12:00 | +42% | +41% | +18% | +17% | -3% | -2% | -17% | -19% |
| 12:00-14:00 | +58% | +79% | +11% | +21% | -4% | -6% | -14% | -18% |
| 14:00-16:00 | +35% | +40% | +12% | +13% | +16% | +13% | -8% | -8% |
| 16:00-17:00 | +52% | +78% | +14% | +26% | +7% | +3% | -9% | -5% |
| 17:00-18:00 | +26% | +42% | +14% | +15% | -16% | -16% | -3% | +30% |
| 18:00-19:00 | +19% | +7% | +5% | +15% | +17% | +17% | -7% | -10% |
| 19:00-21:00 | +23% | +19% | +7% | +14% | -8% | -8% | -16% | -15% |
| 21:00-24:00 | +125% | +154% | +25% | -7% | +54% | +54% | +7% | +54% |
| **All day 07:00-24:00** | **+29%** | **+38%** | **+8%** | **+12%** | **-9%** | **-4%** | **-12%** | **-8%** |

*Source: Docklands Light Railway.*

### DLR service provision

DLR operated a special Games time timetable between 14 July and 9 September, involving various degrees of additional service provision to correspond to expected demand from the day-by-day timetable of events, and with an emphasis on providing maximum capacity around event start and finish times. Figure 10.43 shows these enhancements, with typically between 20 and 30 per cent additional capacity provided on weekdays, and with enhancements of up to 120 per cent at weekends.

Figure 10.43 DLR: Planned Games time service vs. normal 2012 provision.

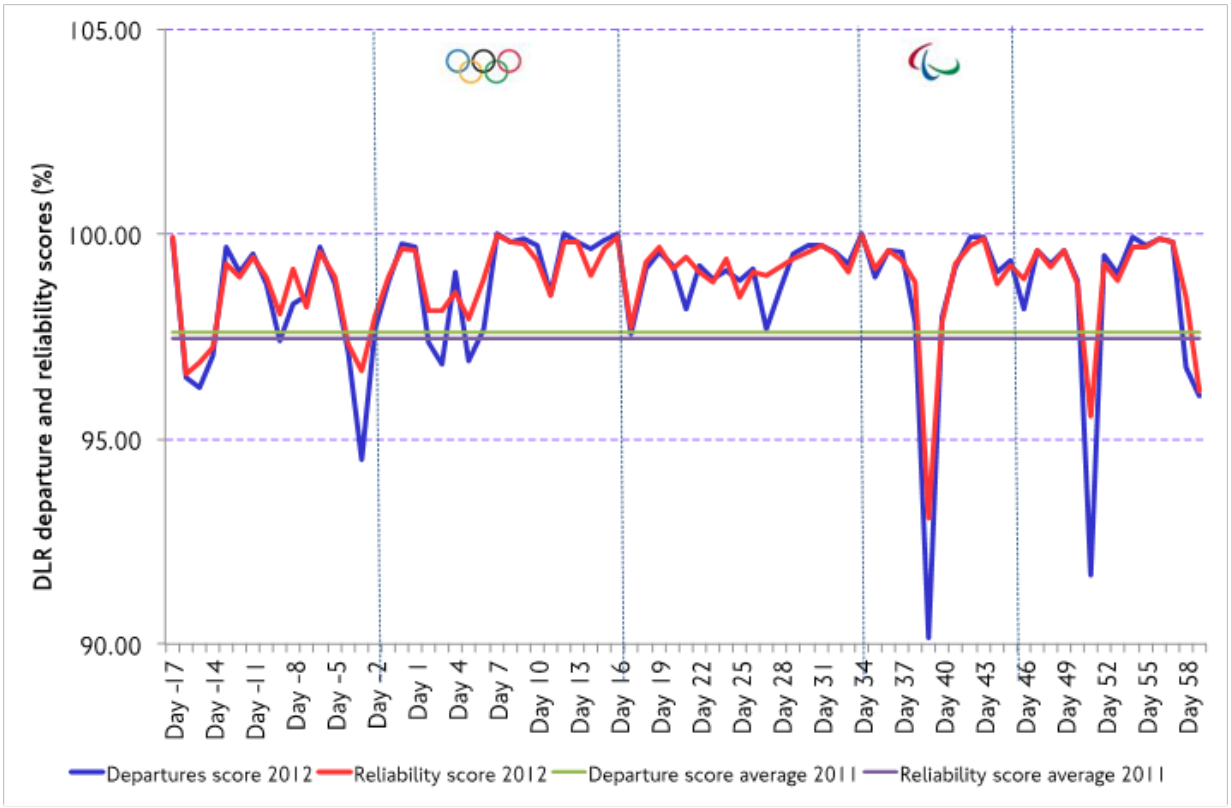



*Source: Docklands Light Railway.*

### DLR operational performance

As with the Underground, the enhanced DLR service was operated with a greater degree of reliability (figure 10.44). DLR's Departure Score reflects the percentage of scheduled services actually operated, whilst the Reliability Score measures the percentage of trains arriving at their destination within 3 minutes of the scheduled time. Over summer 2012, the average Departure Score was 98.63 per cent, and the average Reliability Score was 98.86 per cent – a level of performance generally above the excellent levels of performance more usually attained (values for the equivalent period in 2011 are shown on the graphic for comparison).

Figure 10.44 DLR service reliability: Departure and Reliability scores.




*Source: Docklands Light Railway.*

## 10.12 London Overground

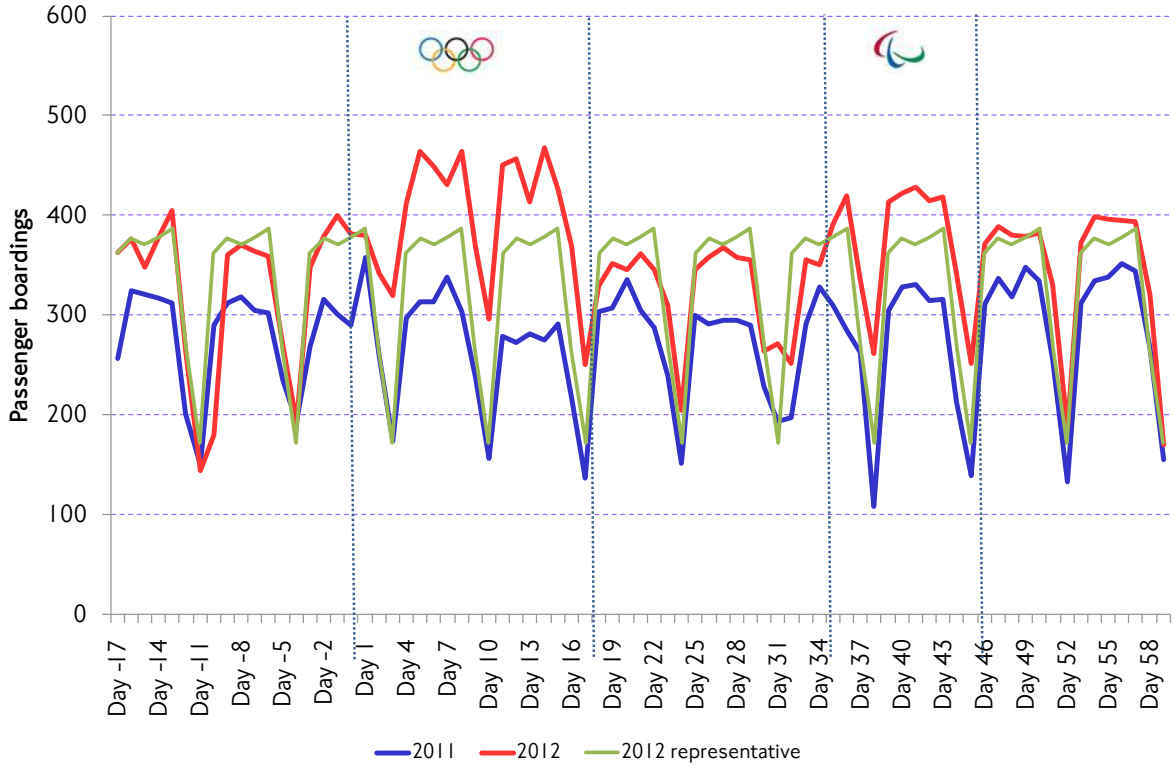
Over 10.3 million journeys were made on London Overground services during the Games – up 48 per cent compared to the equivalent period last year, with normalised average daily demand up by 22.3 per cent against representative non-Games levels during the Olympics, and 13.5 per cent up during the Paralympics. PPM measures (a measure of service reliability) were consistently above 98 per cent for both Games, both for the network as a whole and the key North London Line serving Stratford Regional.

Development of the London Overground network was an important part of London's preparations for the Games. The opening of the large Westfield retail development adjacent to Stratford Regional station in mid-September 2011 will have significantly affected demand patterns on the North London line between 2011 and 2012.

### London Overground: Overall demand

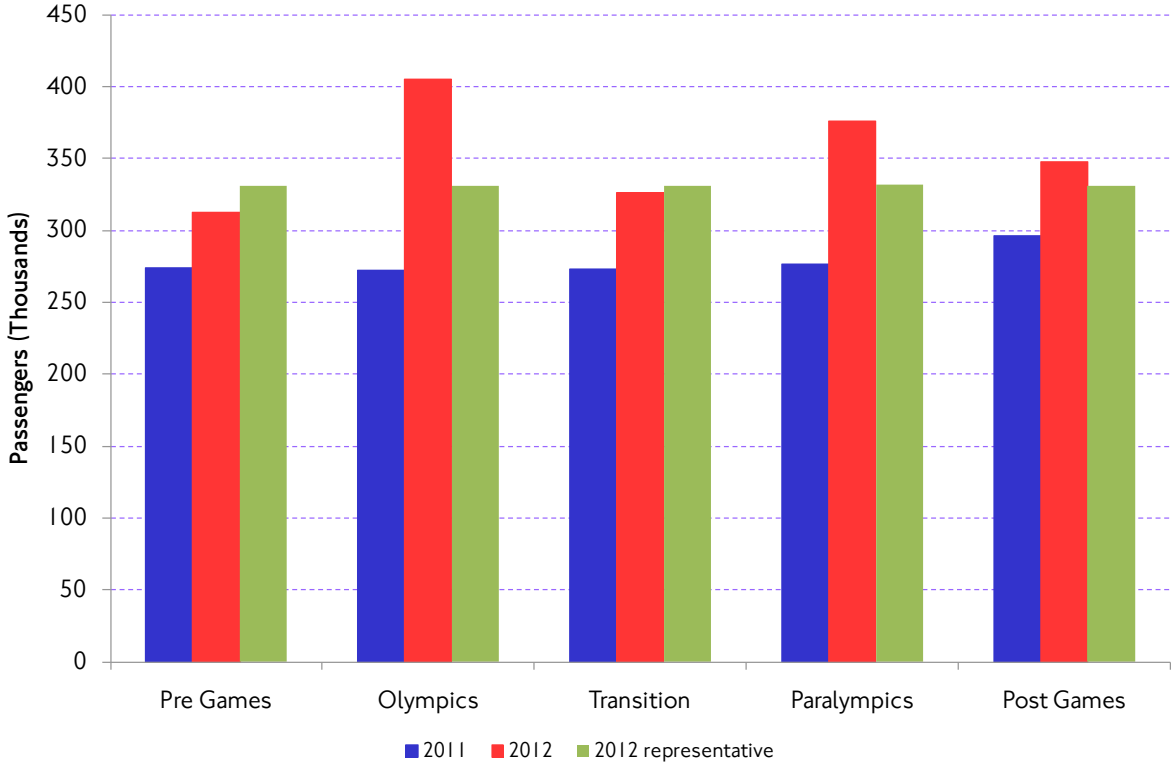
Over 10.3 million journeys were made on London Overground services during the Games – up 48 per cent on the equivalent period last year, with normalised average daily demand up by 22.3 per cent against representative non-Games levels during the Olympics, and 13.5 per cent up during the Paralympics. Figure 10.45 shows daily passenger demand on the whole London Overground Network, and figure 10.46 shows average values normalised to each of the five summer 2012 analysis periods.

Figure 10.45 London Overground. Daily passenger boardings. Summer 2012 and 2011 compared.




*Source: TfL London Rail.*

Figure 10.46 Normalised daily London Overground demand during summer 2012compared to 2011/2012 baselines. Journey stages on whole network.

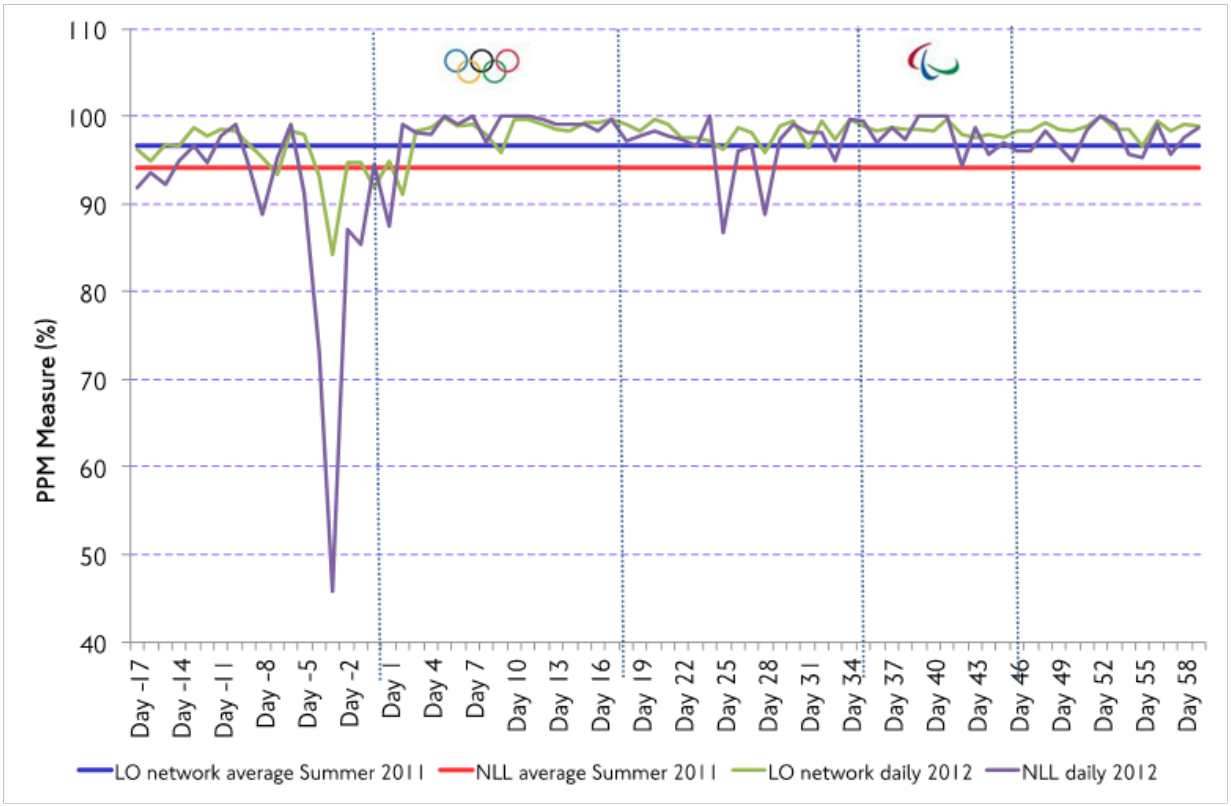



*Source: TfL London Rail.*

### Operational performance of London Overground

In common with the National Rail network, the operational performance of London Overground is measured through a Public Performance Measure (PPM). This combines figures for punctuality and reliability into a single measure, so that the PPM is the percentage of trains that arrive 'on time' (within 5 minutes of schedule) compared to the total number of trains planned to run. Figure 10.47 shows the daily PPM measure for the whole London Overground network over summer 2012 compared to the average PPM achieved over the equivalent period in summer 2011. The figure also shows the PPM measure for the North London Line – which directly served the Olympic Park at Stratford Regional station.

Figure 10.47 London Overground operational performance. Public Performance Measure (PPM).




*Source: TfL London Rail.*

PPM measures were consistently above the 2011 comparator for both the Olympic and Paralympic periods. With the exception of problems related to infrastructure and power supply failures on 23 July 2012, performance was consistently very good over the summer period. Average PPMs for the Olympics (normalised) were 98.2 per cent for the London Overground Network (98.4 per cent for the North London Line). Equivalent values for the Paralympics were 98.5 and 98.2 per cent respectively.

## 10.13 London Buses

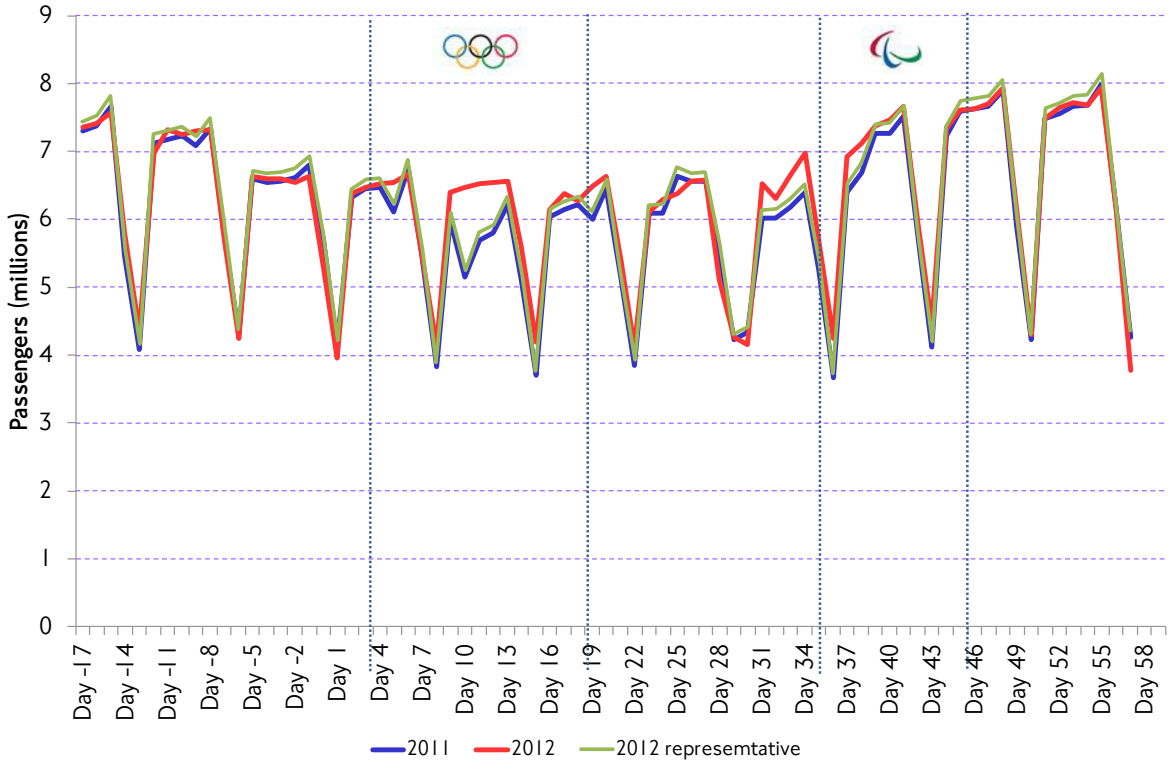
London's bus network played a vital role in keeping the Capital moving during the 2012 Games, carrying around 6.5 million passengers per day during the Olympics and about 7.5 million per day during the Paralympics. Travel patterns showed significant increases around the venues and in the evenings and early mornings, offset by reductions in general traffic across the city where road closures and traffic management measures meant that bus services were curtailed or diverted. Operational performance of buses during Games time was better than the very good levels more usually achieved, despite significant alterations and diversions to bus routes necessitated by the ORN and PRN and road-based events.

London's bus network played a vital role in keeping the Capital moving during the 2012 Games, carrying around 6.5 million passengers per weekday during the Olympics and about 7.5 million per weekday during the Paralympics, reflecting the end of the school summer holiday. Services on some of the Capital's busiest bus routes were enhanced and some routes put on diversion during the Games, principally to accommodate the ORN and PRN and road-based events, although the extent of this was carefully managed to minimise disruption to bus users.

Bus patronage over the summer 2011 comparison baseline was particularly affected by the widespread civil disturbances of early August, particularly affecting the period 6 – 10 August 2011, with both disruptions to the services themselves and also a particular impact on bus demand as people stayed away from the worst affected areas. Year-on-year 'background' growth in bus patronage is assessed at 2 per cent between summer 2011 and summer 2012.

**London Buses – total demand across summer 2012**

Figure 10.48 Daily demand on buses and comparison with equivalent days in 2011 and 2012 representative baseline. Journey-stages on whole network.

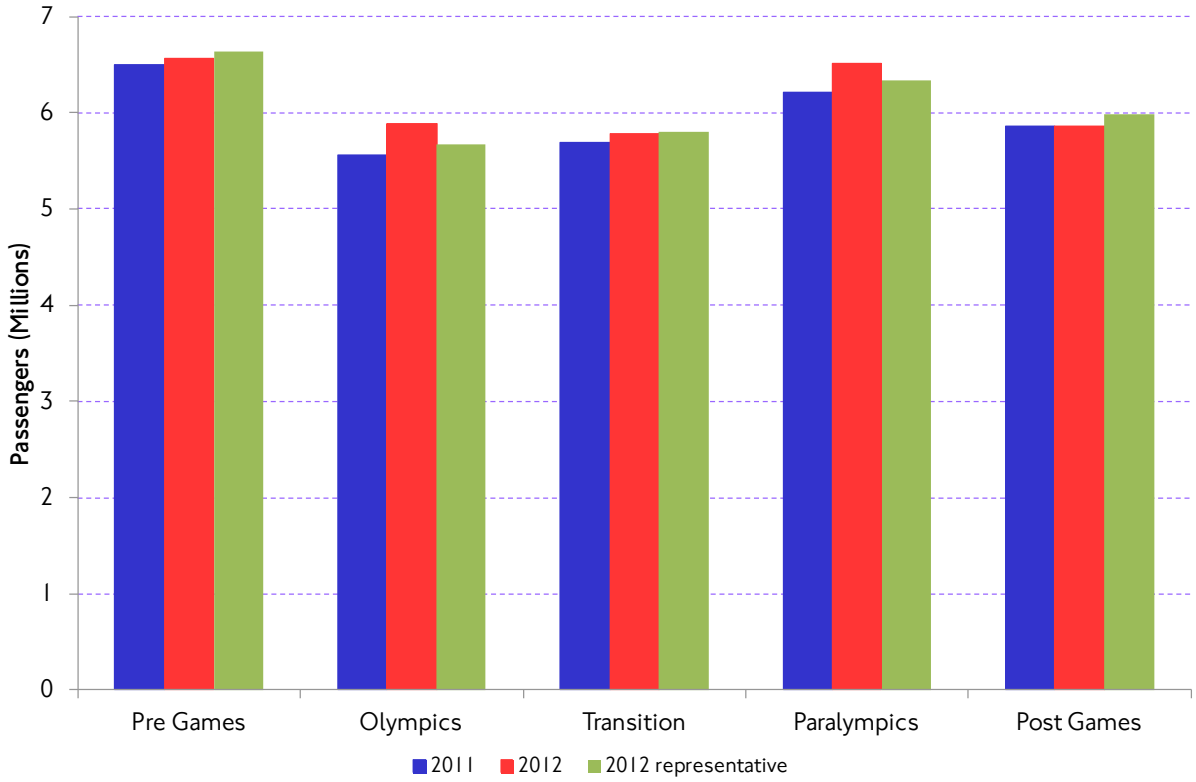



*Source: TfL Customer Experience.*

Figure 10.48 shows daily total bus demand at the whole-network level over summer 2012, compared against equivalent days in summer 2011 and a 2012 representative baseline (ie including year-on-year growth). The immediate impression is that the demand profiles are very similar, reflecting a typical 'school summer holiday' pattern, the bus network in particular carrying many education-related journeys.

At the network level the most obvious feature during the Olympic period is the reduced patronage in 2011 reflecting the civil disturbances. There is little evidence at this level of significant patronage impacts from either the Olympics or Paralympics, although patronage during the Olympics and Transition periods were both slightly higher than would otherwise have been expected. Figure 10.49 is a normalised summary of these trends.

Figure 10.49 Normalised daily bus demand during summer 2012. Average number of bus passengers (journey stages) per day.



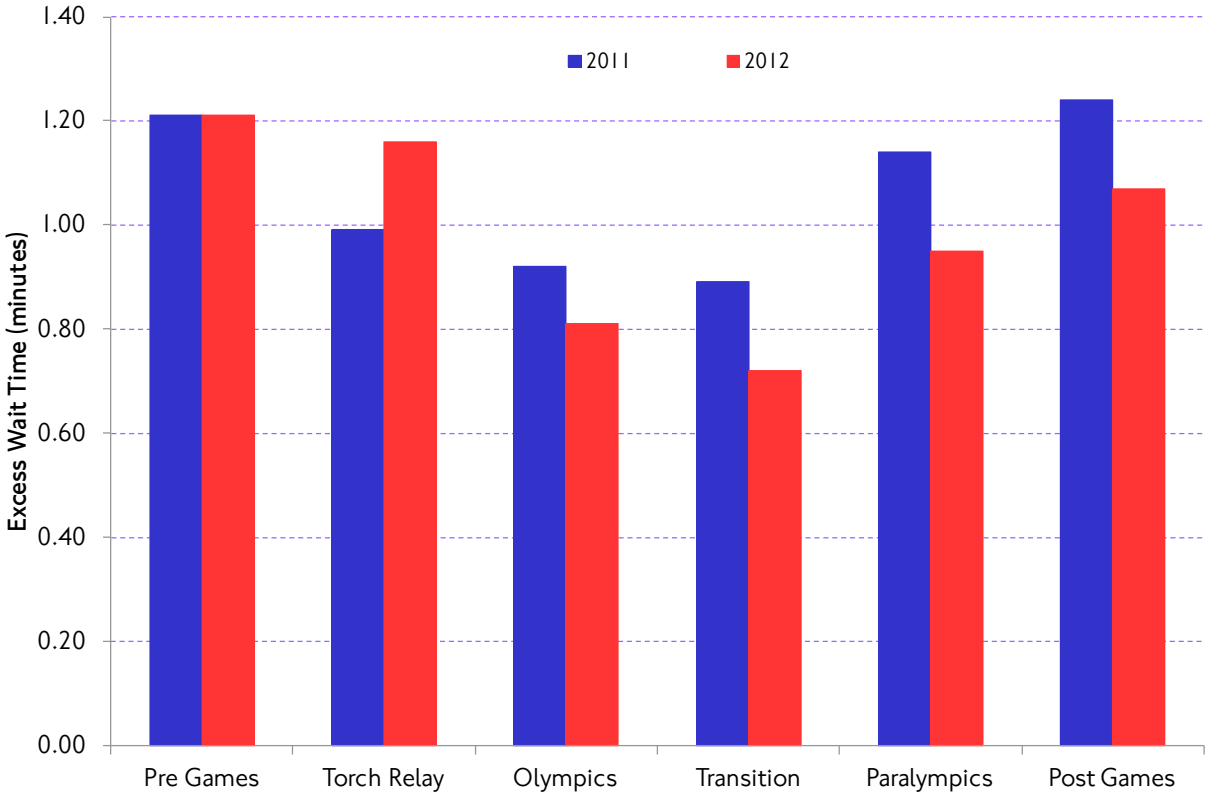

*Source: TfL Customer Experience.*

### Operational performance of the bus network during summer 2012: Excess Wait Time

The conventional measure for bus reliability is Excess Wait Time (EWT) – the additional time (on average) that passengers have to wait for a bus over and above that which would be expected if all buses ran exactly to time. This has fallen consistently over recent years to stand at an (annual) average of 1.0 minute for 2011/12 (see section 4.4 of this report). Figure 10.50 shows network-level EWT over summer 2012 compared to summer 2011 (normalised values). The period of the London 'Torch Relay' was also notable for disruption due to the phasing in of adjusted traffic signal timings associated with the introduction of the ORN and the road capacity requirements of the Torch Relay itself. Apart from this specific period, however, network-level EWT in summer 2012 was consistently lower than the 2011

equivalent. Table 10.16 shows EWT values for bus route groupings of particular interest (central area, the ORN and PRN and routes serving Stratford).

Figure 10.50 Bus network reliability. Excess wait time (minutes). Normalised values, whole network.




*Source: TfL London Buses.*

The group of routes serving the Central area and ORN and PRN generally shared in the year on year improvement in EWT at network level during the Olympics and in subsequent periods. Only the Stratford groups showed a slight deterioration during both Games periods.

Table 10.16 Bus network reliability. Excess wait time (minutes). Route groupings of interest.

| | Central | | ORN | | Stratford | | Network | |
|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| Pre | 1.57 | 1.38 | 1.51 | 1.45 | 1.22 | 1.26 | 1.21 | 1.21 |
| Torch | 1.27 | 1.4 | 1.23 | 1.5 | 1.14 | 2.01 | 0.99 | 1.16 |
| Olympics | 1.09 | 1.02 | 1.06 | 1.01 | 0.95 | 1.02 | 0.92 | 0.81 |
| Transition | 1.00 | 0.77 | 0.98 | 0.8 | 0.99 | 0.89 | 0.89 | 0.72 |
| Paralympics | 1.30 | 0.97 | 1.29 | 1.04 | 1.13 | 1.26 | 1.14 | 0.95 |
| Post Games | 1.37 | 1.14 | 1.39 | 1.16 | 1.5 | 1.03 | 1.24 | 1.07 |

*Source: TfL London Buses.*

## 10.14 Other public transport modes: Tramlink, Emirates Air Line and National Rail in London

All public transport modes played an essential part in making London 2012 the 'Public Transport Games'. Tramlink served Wimbledon – the venue for the Olympics tennis competition, but patronage during summer 2012 was consistently above what would otherwise have been expected, taking into account the impact of the civil disturbances in summer 2011. Operational performance was again excellent, with close to 100 per cent of the schedule being operated.

The new Emirates Air Line cable car was opened just ahead of the Olympics and was an attraction in its own right during summer 2012. On Saturday 11th August 2012 31,964 people made 'flights' across the river, with typically 22,400 flights per day during the Olympics, and 16,700 per day during the Paralympics.

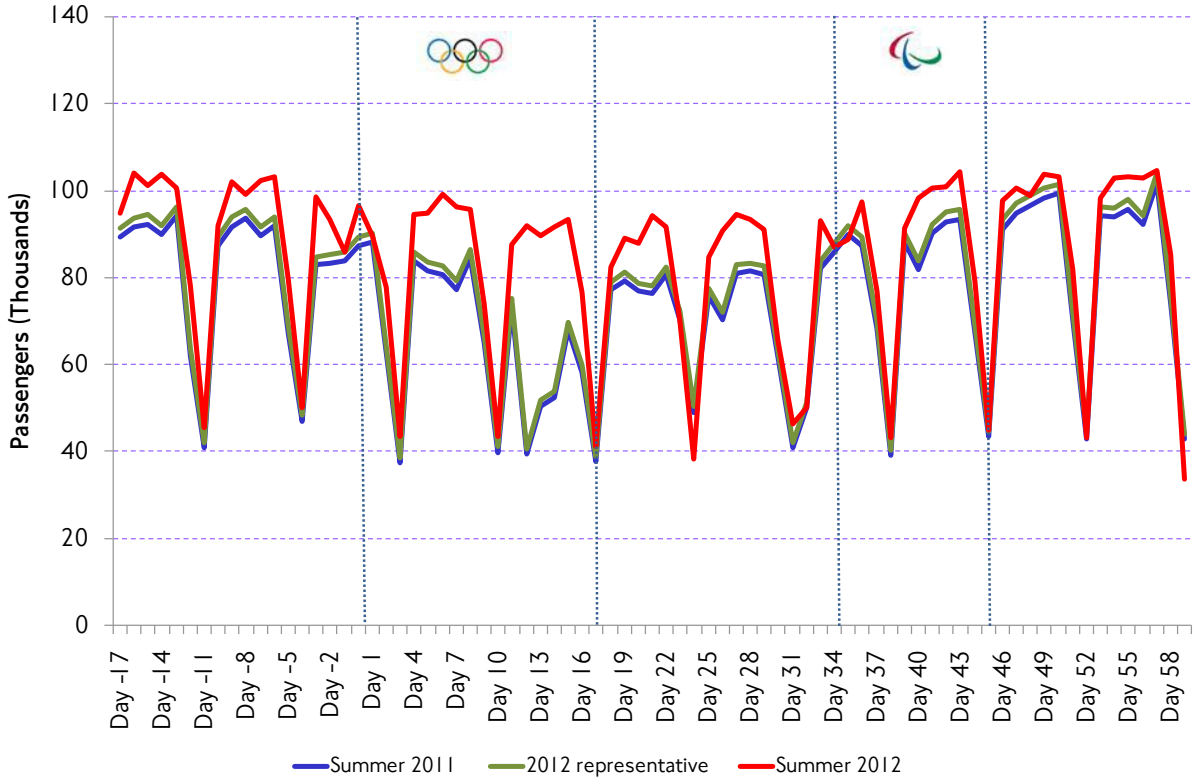
National Rail services performed strongly UK wide during the Games, with 60 per cent of spectators using National Rail services at some point and punctuality around 94 per cent– notably higher than that usually achieved. About 20 million additional journeys were made on London and South East operators across both Games. The Games time only 'Javelin' service between St Pancras, Stratford International and destinations in Kent carried an estimated 1.4 million passengers in total during the Olympics, and 1.0 million during the Paralympics, again operating with a greater level of reliability than that more usually attained.

This section looks briefly at Games time patronage and performance aspects for other public transport modes in London; London Tramlink, the newly-opened Emirates Air Line cable car, and National Rail in London.

**London Tramlink: Patronage**

Figure 10.51 shows daily London Tramlink passenger demand across summer 2012, compared to equivalent days in 2011. Annual patronage growth on London Tramlink is assessed at 2.5 per cent, and a summer 2012 'representative' baseline is also shown using this value. The figure shows that Tramlink patronage was typically above what would otherwise be expected during most of summer 2012. However, patronage on London Tramlink was particularly affected by the civil disturbances of summer 2011, and this is evident both in the comparison baseline for the second week of the Olympics, as well as in relatively subdued patronage for the next few weeks. The Olympic tennis competition was held at Wimbledon during the first week of the Games, and this is probably reflected in slightly higher relative patronage over this week.

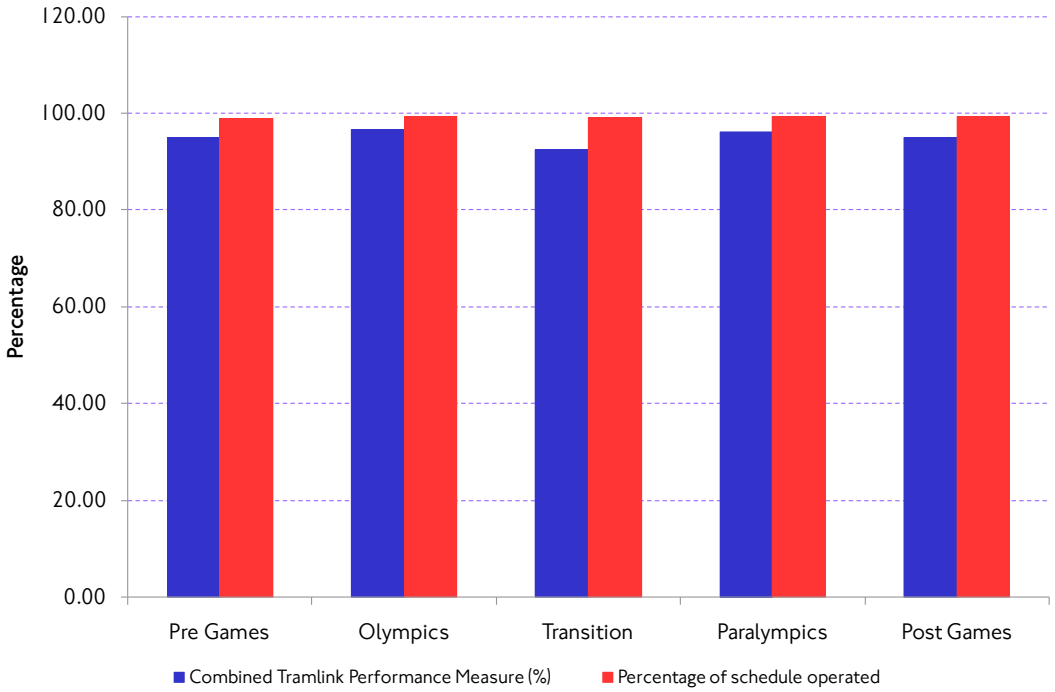
Figure 10.51 London Tramlink. Daily patronage (journey stages).




*Source: TfL London Tramlink.*

## London Tramlink: Operational performance during summer 2012

Figure 10.52 London Tramlink. Combined performance measure and percentage of schedule operated.




*Source: TfL Tramlink.*

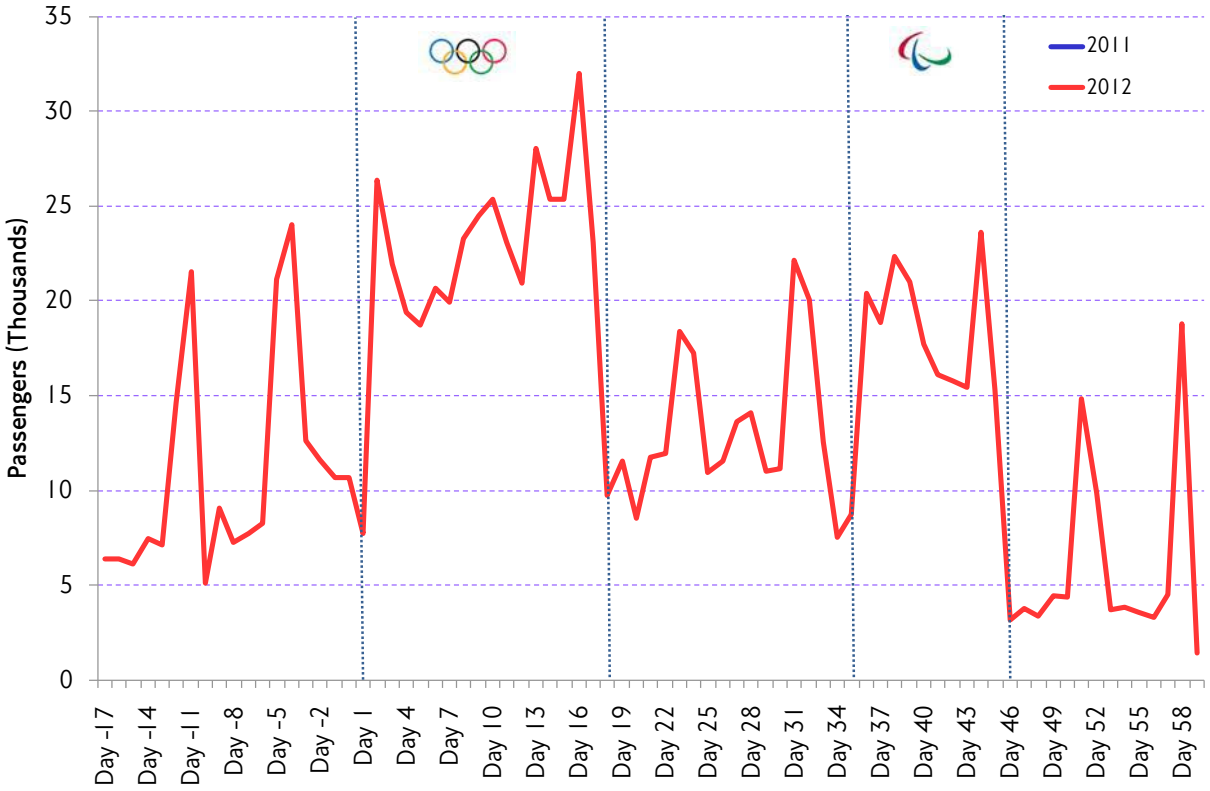
London Tramlink operational performance is measured through a 'combined performance measure', as well as the percentage of scheduled services operated (figure 10.52). In terms of the former measure, levels during summer 2012 were comparable to those more usually achieved, whilst very close to 100 per cent of the schedule was operated throughout summer 2012.

**Emirates Air Line: Patronage**

The Emirates Air Line - the latest addition to London's transport network - opened on 28 June 2012, just ahead of the 2012 Games. The UK's first urban cable car links Greenwich with the Royal Docks across the Thames, and also connected the two Games venues of North Greenwich Arena and ExCel. Providing panoramic views, the Emirates Air Line was an additional attraction in its own right over summer 2012 in East London, although the very recent opening date means that no baseline comparison data are available.

Figure 10.53 shows daily patronage across summer 2012. Highest passenger demand occurred on week end days, with periods of relatively high patronage during the Olympics and, to a lesser extent, the Paralympic Games.

Figure 10.53 Emirates Air Line. Daily patronage (journey stages). Summer 2012.




*Source: Emirates Air Line.*

As shown in table 10.17, average daily demand (normalised) grew from 10,884 'flights' in the Pre Games analysis period to 22,390 during the Olympics. The Paralympics saw an average of 16,675 daily 'flights' per day, which then fell rapidly to average just 5,938 in the Post Games period. Notable also was the daily record of 31,964 'flights' on Saturday 11 August 2012 and, as seen with other modes, the impact of the very poor weather on Sunday 23 September 2012 (day 60).

Table 10.17 Emirates Air Line - daily average number of 'flights' (normalised). Summer 2012.

| | Pre Games | Olympics | Transition | Paralympics | Post Games |
|---|---|---|---|---|---|
| Daily (normalised) | 10,884 | 22,390 | 13,125 | 16,675 | 5,938 |
| Average weekday | 7,107 | 21,136 | 11,484 | 14,389 | 3,824 |
| Average Saturday | 17,879 | 27,590 | 14,765 | 21,229 | 16,814 |
| Average Sunday | 22,774 | 23,463 | 19,694 | 18,826 | 5,631 |

*Source: Emirates Air Line.*

### National Rail in London (excluding London Overground)

As with the other public transport modes, National Rail services in London performed strongly during the Games. An estimated 6.5 million spectators used National Rail services (UK wide) during the Games, with 60 per cent of spectators using National Rail services at some point. Around 18 million additional seats were provided by the train operators, and there were no significant capacity issues. Punctuality was around 94 per cent for the Games period – higher than that usually achieved.

The Department for Transport estimate that there were an additional 13.6 million journeys on National Rail services defined as 'London and South East' during the Olympics, and an additional 6.1 million journeys during the Paralympic period (over and above what would normally be expected at that time of year).

### Javelin

'Javelin' was a special Games time only National Rail shuttle service that operated between London St Pancras and destinations in Kent via the High Speed One rail line, serving Stratford International station (the Gateway to the Olympic Park). An intensive Games time service was operated with, across the Javelin network, an estimated 1.4 million journey stages made in total during the Olympics, and 1.0 million during the Paralympics (287 per cent and 239 per cent higher respectively than would otherwise have been expected). Planned trains were 120 per cent more than normal during the Olympics, and 60 per cent higher during the Paralympics. PPM measures for the Javelin service were 97.3 per cent during the Olympics (compared to 94.9 per cent for the equivalent period in the previous year), and 94.8 per cent for the Paralympics (89.3 per cent in the previous year).

## 10.15 Walking in Greater London during summer 2012

As an indicator of walking levels in Greater London, Olympic and Paralympic pedestrian flows across the Thames in Greater London were around 8-9 per cent higher than would otherwise have been expected.

This section looks at data from a number of surveys that were put in place by TfL to measure walking at the Greater London level over summer 2012. There are no 'ideal' data sources that give a comprehensive view of levels of walking in London during Games time. It is therefore necessary to combine estimates from several different sources. The available data are:

- Counts of pedestrians crossing the river Thames across all accessible crossing points within Greater London (the 'River Thames Screenline'). There are five surveys, covering each of the summer 2012 analysis periods, and these can be compared against similar (but not directly comparable) data from 2010 and 2011. Thames Screenline data gives an indication of general levels of pedestrian activity

throughout London and, in particular, in the Central London zone and Games 'River Zone', although it is obviously geographically specific in coverage.

- Continuous 'spot' counts of pedestrians passing a sample of automatic pedestrian counting sites. These are located in public areas such as retail centres, and give an indication of the relative levels of pedestrian traffic in such locations, as a proxy for relative levels more widely across Greater London. A sample of 39 counters is available for central London, where measureable Games time effects might be expected, although estimation at the wider Greater London level relies on a smaller, stratified sample of 15 sites. Data from these sites cannot be grossed-up to reflect pedestrian activity more widely, but do give an indication of change at these locations.
- To allow observed volumetric trends for pedestrians to be related to non-Games levels in London, a special Games time walking calibration survey was undertaken. This had the specific aim of categorising pedestrians observed at the above count sites into London residents or non-residents, and also to establish proportions making walk-all-the-way trips, as opposed to walking to, from or between other modes of transport (a walk 'stage'). In this way, an estimate that is comparable to TfL's annual estimate of walking (see Section 2.5 of this report) can be made for summer 2012.

The impact of the weather on levels of pedestrian activity is a major 'external' factor to be recognised in this part of the analysis, as well as for cycling in section 10.16. Although the weather during both Games was comparable to what would normally be expected for the time of year, the periods immediately before and immediately after the Games, together with much of the spring and early summer of 2012, were notable for unusually poor weather.

**The Thames Screenline pedestrian count**

TfL counts pedestrians and cyclists crossing the 'screenline', formed by the river Thames, each year. The survey covers all pedestrian-accessible crossing points, including all bridges and other crossings such as foot tunnels and the Woolwich Vehicle Ferry. The timing of the survey varies, but complete data are available for the spring and summer period for both 2010 and 2011. The average of these two surveys is used as a baseline comparator for this part of the analysis, although it should be recognised that it represents a longer part of the year than that of interest for the Games.

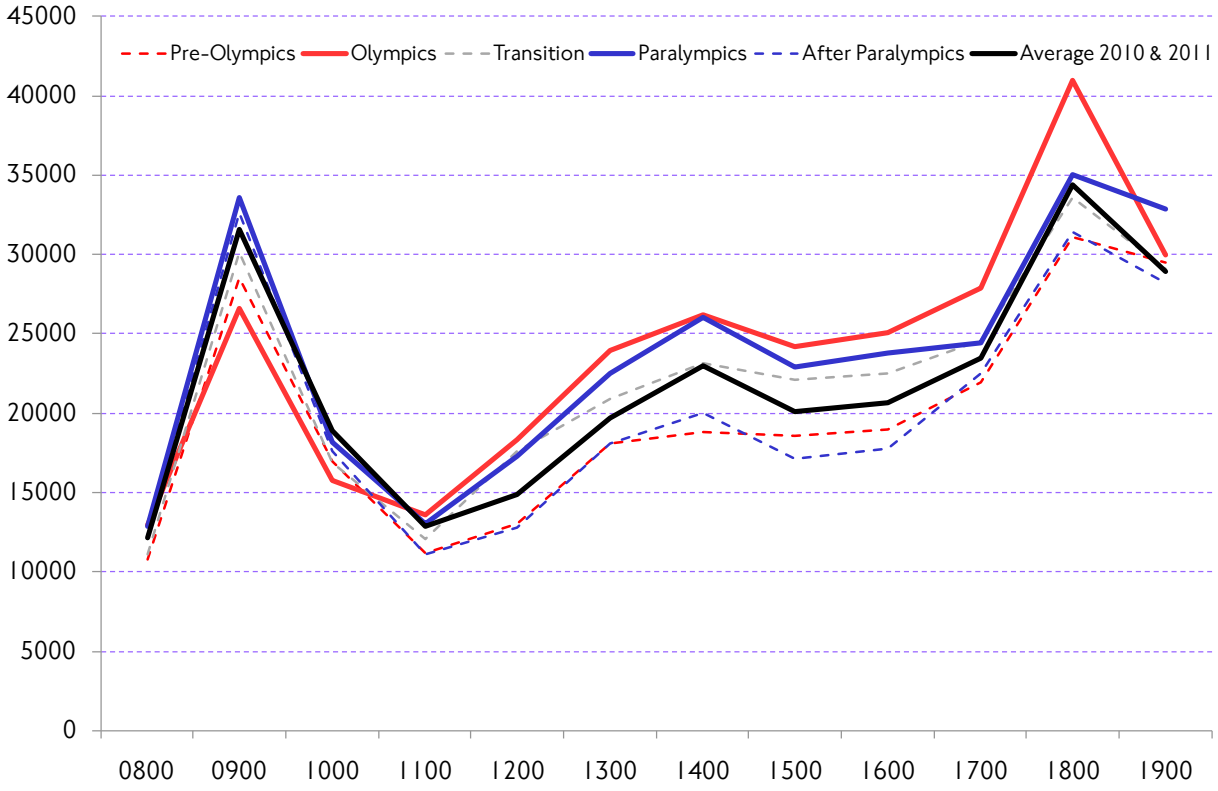
For summer 2012, five waves of this survey were deployed, using the same method as the historic TfL surveys. For the purpose of this analysis and to help identify Games-related effects the cordon is divided into three geographic segments. These are: all crossings East of Tower Bridge (excluding the Emirates Air Line for reasons of historic comparability), where a significant Games effect may be expected; all crossings between Tower Bridge and Vauxhall Bridge (inclusive), representing Thames crossings in central London, which may be expected to reflect both the Games and wider cultural events; and finally all crossings to the West of Vauxhall Bridge, where a minimal Games impact may have been expected.

**Pedestrian flows across the river Thames during summer 2012**

Figures 10.54 through 10.57 show results for each of the five summer 2012 analysis periods according to these geographic sub-divisions. Data are presented by hour of day and baseline comparisons are given for the average of the 2010/2011 counts. The

2010/2011 average baseline (black) and Olympic (red) and Paralympic (blue) period lines are shown in bold for clarity.

Figure 10.54 Pedestrians crossing the river Thames by hour of day. All crossings within Greater London excluding Emirates Air Line. Summer 2012 analysis periods with 2010/11 representative baseline.



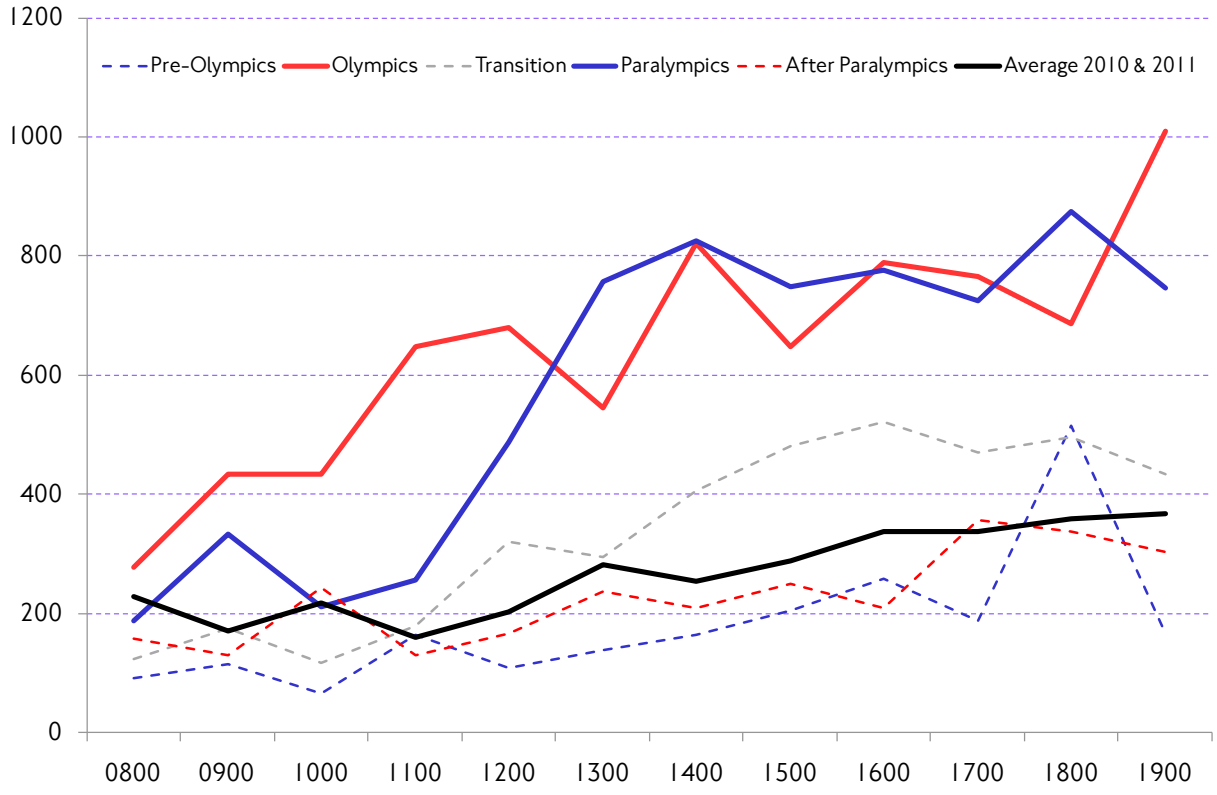

*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.54, for all Thames crossings, shows a mixed picture, with evidence of a relative increase in walking across both Olympic and Paralympic periods in 2012, but relatively lower levels either side of the Games. A total of 285,600 pedestrians were observed crossing the Thames on a typical Olympics day, with 282,400 on a typical Paralympics day, compared to 260,600 in the 2010/2011 baseline (increases of 8.7 per cent and 8.4 per cent respectively). Numbers during the transition period (264,000) were just 1.2 per cent higher overall than the 2010/2011 baseline. Numbers for the pre- and post-Games periods were markedly lower than the base, by around 8 per cent overall, this perhaps being explained by the relatively poor weather during both the pre-Games period and on the second weekend of the post-Games period.

The figures in this section also allow examination of time-of-day patterns. Here it can be observed that, although total pedestrian traffic changed relatively little in the morning peak period, the Olympic and Paralympic periods featured both the lowest (Olympics) and highest (Paralympic) levels of pedestrian activity at this time. For the Olympics at least, this could reflect a lower level of daily commuter traffic – the bridges being used in central London in particular for onward travel on foot from main line railway stations south of the river. Likewise, most of the Paralympic period was notable for good weather, which may have particularly encouraged commuter walking in preference to public transport at this time.

The additional pedestrian traffic during the Olympic and Paralympic periods mainly occurred after mid-day, with notable increases in the daytime inter-peak and evening periods. Olympic period flows were an average of 11.5 per cent higher than the 2010/2011 baseline and 26.2 per cent higher than the pre- and post-Games periods combined during the inter-peak period (10:00 to 16:00), and 15.3 per cent and 16.2 per cent higher (respectively) during the evening period (16:00 to 20:00). Equivalent figures for the Paralympics were 9.6 and 24.1 per cent higher respectively for the inter-peak period, and 8.0 and 8.8 per cent higher for the evening period. This pattern may reflect the predominance of afternoon/evening time leisure activity, although -no data are available for the late evening/night-time periods.

Figure 10.55 Pedestrians crossing the River Thames by hour of day. All crossings east of Tower Bridge excluding Emirates Air Line. Summer 2012 analysis periods with 2010/11 representative baseline.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.55 looks at those crossings to the east of Tower Bridge (exclusive). Here, the available crossing points are quite sparse, reflected in the relatively small absolute number of pedestrians recorded, although of course they also reflect activity in the Games 'River Zone'.

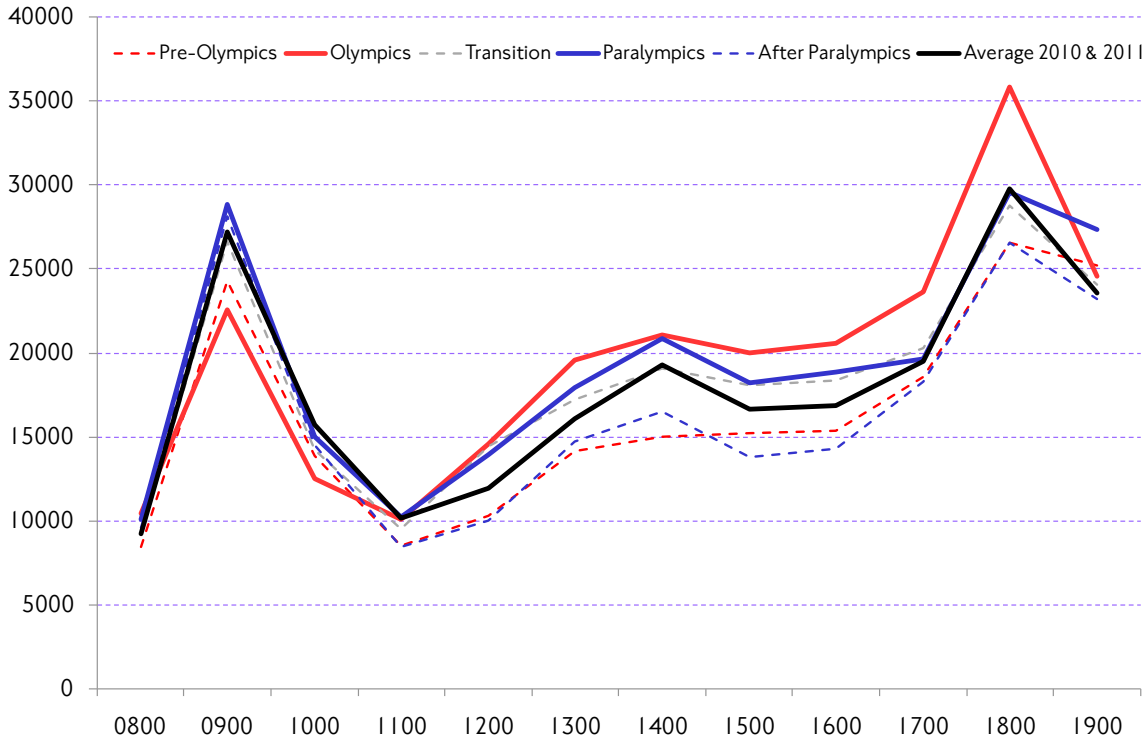
The most notable feature from this graph is that the Olympic and Paralympic periods clearly stand out from the comparison baselines. Pedestrian volumes were typically more than double those at non-Games times, although overall these crossings only account for just over 1 per cent of total pedestrian activity recorded across the whole screenline (based on the average of 2010/11 baseline values).

Again there is a clear tendency towards higher pedestrian activity in the post-midday period, although in contrast to the picture more generally across the screenline,

morning peak time volumes are relatively higher for both the Olympic and Paralympic periods, although the absolute increases in volumes are very small. As with the complete screenline, pre- and post-Games volumes are lower than the comparison baseline, and flows during the transition period are higher.

Figure 10.56 looks at crossings within central London, between Tower Bridge and Vauxhall Bridge (inclusive). These collectively account for the large majority (83 per cent) of pedestrian activity across the cordon (2010-2011 base), and not surprisingly therefore the patterns shown are very similar to those in figure 10.53.

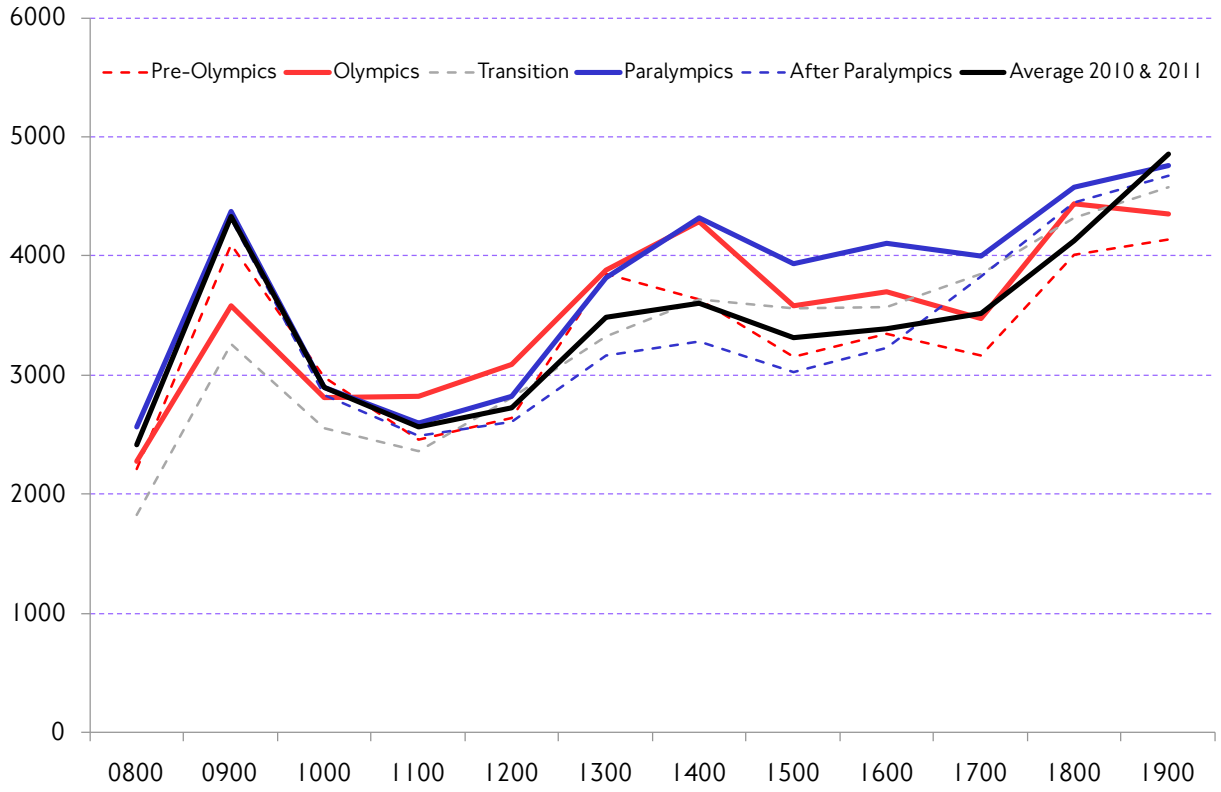
Figure 10.56 Pedestrians crossing the River Thames by hour of day. All crossings between Tower Bridge and Vauxhall Bridge inclusive (central London). Summer 2012 analysis periods with 2010/11 representative baseline.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.57 shows pedestrian volumes for all crossings west of Vauxhall Bridge (exclusive). Although numerous in number they collectively account for just 15.9 per cent of pedestrian Thames crossings in Greater London (2010/2011 baseline). These crossings are largely outside the zone likely to be directly affected by the Games, and although they do show similar features to the crossings in central and East London, the extent of change is much less pronounced. Pedestrian volumes during the Olympic and Paralympic periods were higher than at other times, (up by 2.4 per cent and 8.3 per cent respectively in relation to the 2010/2011 base), and the bulk of this increase was seen in the post-midday period, although the differentiation between the analysis periods in the evening is much less pronounced.

Figure 10.57 Pedestrians crossing the river Thames by hour of day. All crossings West of Vauxhall Bridge inclusive (West London). Summer 2012 analysis periods with 2010/11 representative baseline.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Table 10.18 summarises comparisons from this survey of pedestrians crossing the River Thames. The best assessment would be that Olympic and Paralympic pedestrian flows across the Thames were around 8-9 per cent higher than would otherwise have been expected, although this was matched by lower volumes than might have been expected during the immediate pre- and post-Games periods.

Table 10.18 Pedestrians crossing the river Thames in London during summer 2012. Summary results and key comparisons (12 hour totals).

| | Pre Games | Olympics | Transition | Paralympics | Post Games | Average 2010/11 |
|---|---|---|---|---|---|---|
| GL Total | 238,300 (100%) | 285,600 (100%) | 263,600 (100%) | 282,400 (100%) | 241,400 (100%) | 260,600 (100%) |
| CL Total | 195,600 (82.1%) | 235,600 (82.5%) | 220,000 (83.4%) | 230,700 (81.7%) | 198,200 (82.1%) | 216,100 (83.0%) |
| EL Total | 3,000 (1.3%) | 7,700 (2.7%) | 4,000 (1.5%) | 6,900 (2.5%) | 2,700 (1.1%) | 3,000 (1.1%) |
| WL Total | 39,700 (16.7%) | 42,300 (14.8%) | 39,700 (15.0%) | 44,800 (15.9%) | 40,500 (16.8%) | 41,300 (15.9%) |

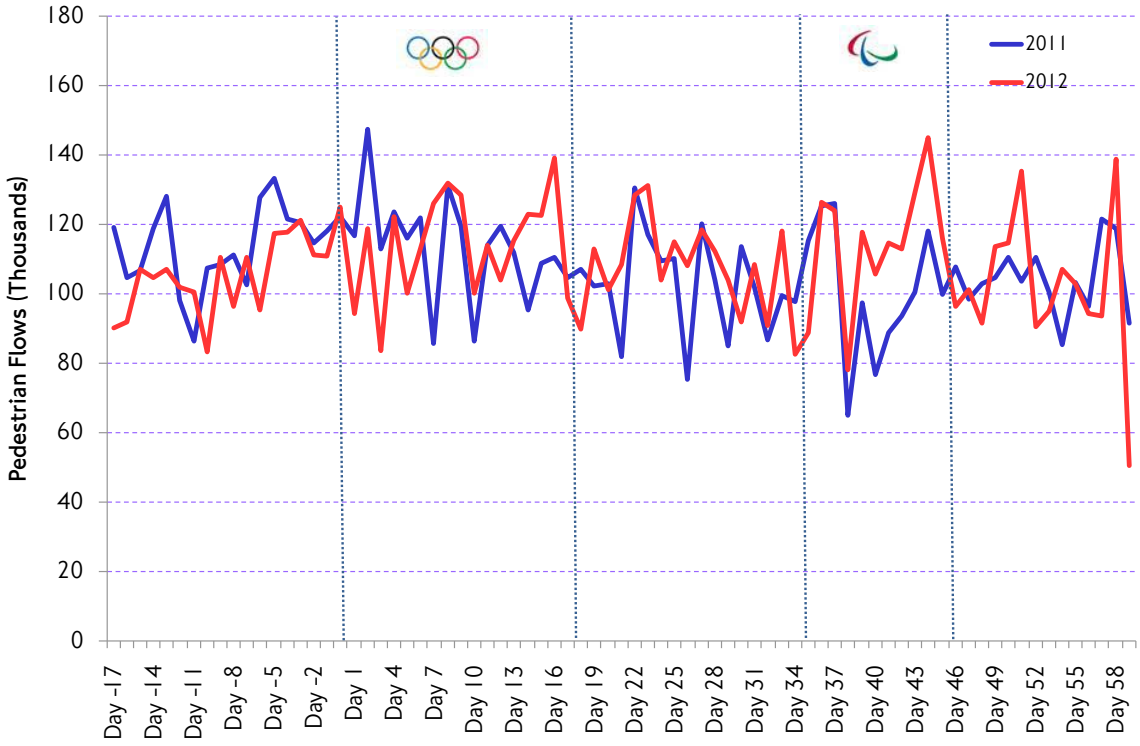
| | | | | | | |
|---|---|---|---|---|---|---|
| GL difference average 2010/11 | -8.5% | +8.7% | +1.2% | +8.4% | -7.3% | n/a |
| CL difference average 2010/11 | -9.5% | +9.0% | +1.8% | +6.8% | -8.3%% | n/a |
| EL difference average 2010/11 | +0.5% | +159.1% | +34.5% | +132.0% | -8.7%% | n/a |
| WL difference average 2010/11 | -3.9%% | +2.4%% | +4.1% | +8.3% | -2.1% | n/a |

*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

### Representative measure of pedestrian activity in Greater London

Automatic pedestrian counters use movement detection technology to count the number of pedestrians passing through 'virtual zones' at selected public places across London. These do not give an estimate that is reflective of the absolute numbers of pedestrians in the area that they are located, but they do give a reasonable estimate of relative change in pedestrian volumes over summer 2012 at these locations. A sample of sites, stratified so as to give comparable estimates for central, Inner and Outer London, are included in figure 10.58, although no weighting is applied to account for the different scale of pedestrian activity in these areas. Note that the majority of these sites are located in places that are unconnected with Games venues and, as such, would not necessarily be expected to show a direct impact from spectator event-related travel.

Figure 10.58 Pedestrians passing automatic pedestrian counter sites across Greater London. Summer 2012 compared to equivalent days in summer 2011. Average of observations across 15 sites (indicative unweighted sample).




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

The most obvious feature of figure 10.57 is the general similarity of numbers of pedestrians, across each of summer 2011 and summer 2012, and also between them. Perhaps surprisingly, there is no obvious 'Olympic' effect, against either the 2011 baseline or against adjacent 2012 periods, although totals for the Paralympics are notably higher in 2012 than the 2011 equivalent. As with the Thames screenline, relatively low pedestrian numbers characterise the pre- and post-Games periods in 2012, and the notably poor weather on the final day of the post-Games period is reflected in a sharp dip in pedestrian numbers on this day.

Table 10.19 breaks down the London wide sample by area, and it is seen that there is relatively little spatial differentiation between central, Inner and Outer London. The final two rows of table 10.19 show indicative percentage changes at the Greater London level, for walk-all-the-way journey stages (analogous to walk trips) and all walk stages (walks as part of a longer multi-mode trip), derived primarily for the purpose of the synthetic analysis described in section 10.17.

Table 10.19 Pedestrians passing automatic counter sites across Greater London. Summer 2012 compared to equivalent days in summer 2011 (normalised values). Percentage change by area and analysis period.

| | Pre Games | Olympics | Transition | Paralympics | Post Games | Whole Summer |
|---|---|---|---|---|---|---|
| Central | -10.4% | 2.6% | 9.7% | 16.7% | -1.4% | 2.9% |
| Inner | 0.2% | -7.4% | -3.4% | 2.7% | -7.3% | -3.1% |
| Outer | -7.8% | 0.4% | 1.7% | 1.5% | -0.2% | -1.1% |
| Greater London – walk trips | -4.6% | -2.7% | +0.4% | +3.7% | -3.4% | -1.5% |
| Greater London – walk stages | -4.9% | -2.5% | +0.7% | +4.0% | -3.3% | -1.4% |

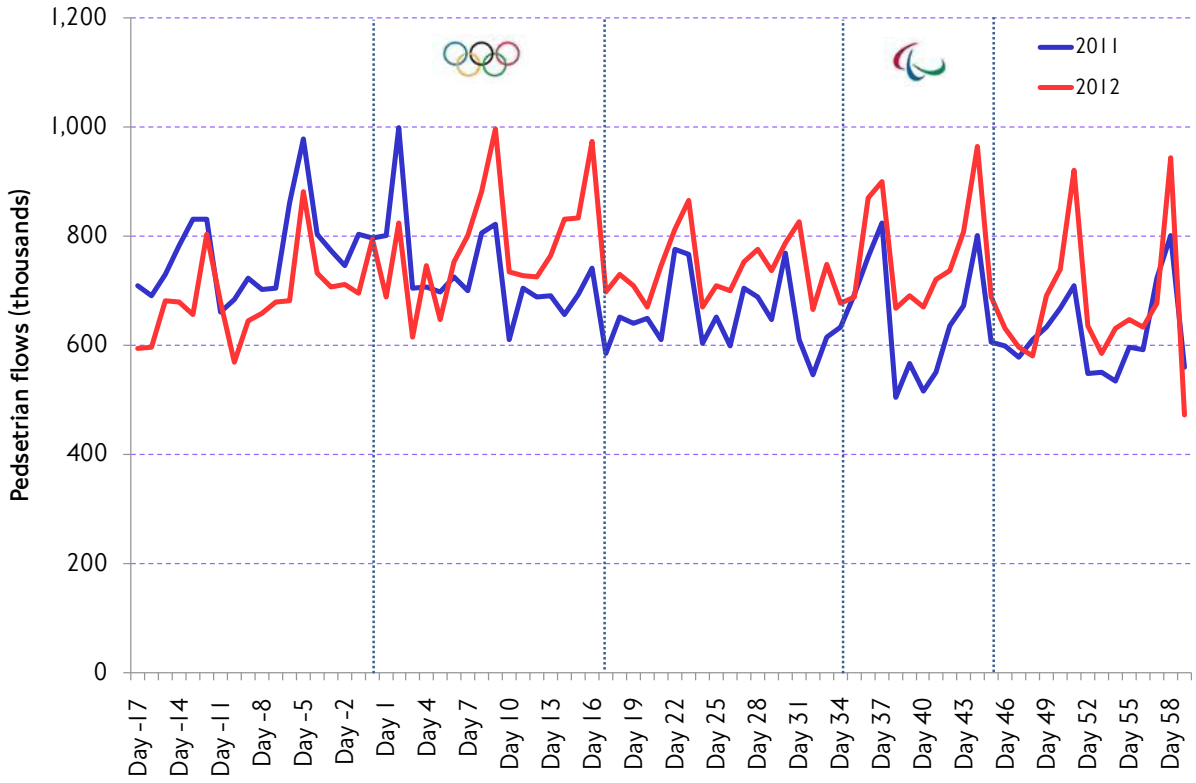
*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

### Indicative measure of pedestrian activity in central London

There are a large number of pedestrian counters in central London, but very few in Inner and Outer London. The data in figure 10.57 drew on an equal number of counters in each zone to give a view that was representative of Greater London as a whole. It is however possible to get a more specific view of trends in central London using the full set of 39 counters that are available here (figure 10.59). The counters are typically located in major retail centres, primarily in the West End, and therefore would be expected to reflect a good mix of regular non-Games visitors and visitors specifically related to the Games and associated cultural events in central London.

The main observation here is that pedestrian numbers in 2012 are significantly and consistently above the equivalent period in 2011, with the notable exception of the pre-Games period and the first few days of the Olympics themselves. This pattern reflects that seen for some other modes, particularly the Underground, in the West End. Over the whole summer 2012 analysis period, 6 per cent more pedestrians were counted here than over the equivalent period in 2011. Over the whole Olympic period, an average of 7.1 per cent more pedestrians were counted. There were 11.9 per cent more pedestrians during the Transition period, and 16.8 per cent more during the Paralympics, again reflecting other evidence of greater levels of walking at this time. post-Games levels were 7.7 per cent above the 2011 equivalent period.

Figure 10.59 Pedestrians passing automatic pedestrian counter sites in central London. Summer 2012 compared to equivalent days in summer 2011. Total of observations across 39 sites (indicative sample).




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

**Walking: calibration survey of pedestrians to contribute to overall estimates of Games time travel demand**

Table 10.20 shows summary results from a 'calibration survey' of pedestrians undertaken across summer 2012. This survey was designed to gather simple information from a sample of pedestrians to allow estimation of total volumes of walking in Greater London during summer 2012, in a similar way to that for other modes.

Looking at table 10.20 and as might be expected, non-residents typically account for less than 10 per cent of pedestrians in London overall, although this varies considerably by site, with typical proportions of non-residents in central London being in the 20-40 per cent range. Although there is some evidence that the proportion of non-resident pedestrians was higher during Games time it is not conclusive, with relatively high proportions also observed during the Transition and post-Games periods also.

Table 10.20 Key characteristics of pedestrians at count locations in Greater London during summer 2012. Percentage belonging to category by location.

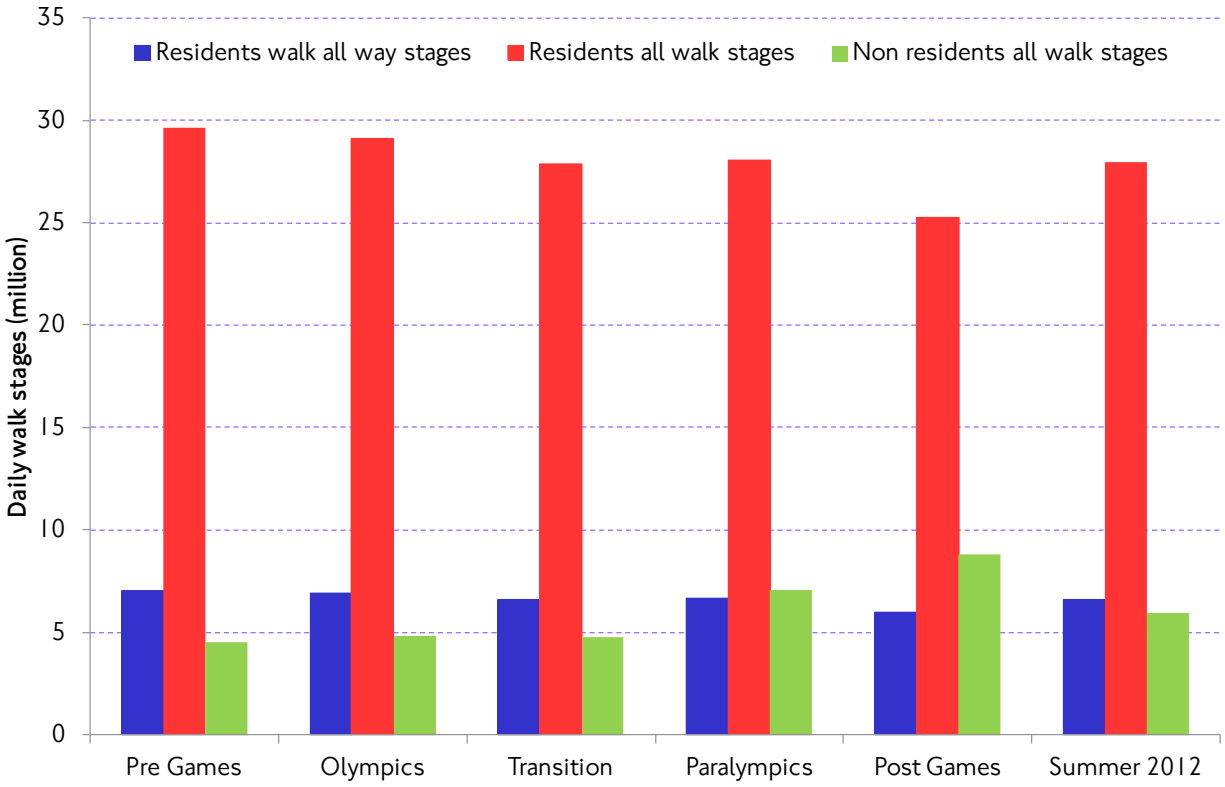
| | Resident Trip (%) | Resident Stage (%) | Non-resident Trip (%) | Non-resident Stage (%) |
|---|---|---|---|---|
| **Pre Games** | | | | |
| Central | 0.23 | 0.30 | 0.18 | 0.29 |
| Inner | 0.52 | 0.45 | 0.01 | 0.02 |
| Outer | 0.52 | 0.41 | 0.04 | 0.03 |
| Thames Bridges | 0.20 | 0.24 | 0.26 | 0.30 |
| Greater London[1] | 0.48 | 0.41 | 0.06 | 0.05 |
| **Olympics** | | | | |
| Central | 0.23 | 0.23 | 0.24 | 0.30 |
| Inner | 0.59 | 0.33 | 0.04 | 0.03 |
| Outer | 0.38 | 0.49 | 0.06 | 0.08 |
| Thames Bridges | 0.11 | 0.25 | 0.20 | 0.45 |
| Greater London[1] | 0.45 | 0.39 | 0.12 | 0.04 |
| **Transition** | | | | |
| Central | 0.27 | 0.18 | 0.30 | 0.24 |
| Inner | 0.49 | 0.42 | 0.04 | 0.06 |
| Outer | 0.45 | 0.47 | 0.01 | 0.07 |
| Thames Bridges | 0.10 | 0.24 | 0.25 | 0.40 |
| Greater London[1] | 0.48 | 0.41 | 0.05 | 0.06 |
| **Paralympics** | | | | |
| Central | 0.20 | 0.27 | 0.18 | 0.35 |
| Inner | 0.46 | 0.46 | 0.03 | 0.05 |
| Outer | 0.53 | 0.39 | 0.02 | 0.06 |
| Thames Bridges | 0.14 | 0.25 | 0.20 | 0.40 |
| Greater London[1] | 0.46 | 0.40 | 0.05 | 0.09 |
| **Post Games** | | | | |
| Central | 0.20 | 0.26 | 0.34 | 0.20 |
| Inner | 0.55 | 0.34 | 0.06 | 0.05 |
| Outer | 0.52 | 0.37 | 0.06 | 0.05 |
| Thames Bridges | 0.15 | 0.28 | 0.23 | 0.34 |
| Greater London[1] | 0.42 | 0.34 | 0.15 | 0.09 |

*Source: TfL Group Planning, Strategic Analysis.*
*Note 1: Indicative proportions for Greater London are derived as follows. For residents, the proportions for central, Inner and Outer London are weighted in proportion to the number of walk stages (including walk-all-the-way trips) with destinations in each area recorded for this group in the London Travel Demand Survey. For non-residents, a split is applied to the remaining (non-resident) proportion based on the absolute numbers of non-residents observed by this calibration survey, on a wave-by-wave basis. As there is no direct link between these sources for non-residents, the proportions for this category for Greater London should be regarded as broadly indicative only. Rows add to 100 per cent.*

### Overall estimates of Games time walking activity in Greater London

For the purpose of this analysis it is the proportion of residents that is key, as these are a direct counterpart of the population used to estimate the walking mode shares in section 2.5 of this report, and the proportions relate directly to the absolute volumes of pedestrians observed in figure 10.58. It is therefore possible to construct synthetic estimates of resident and total walking in London for each of the five Games time analysis periods. Figure 10.60 brings all of these data together in providing an indicative estimate of total pedestrian activity in Greater London across summer 2012. These estimates necessarily draw on established 'seasonality' profiles for walking – as illustrated by figure 3.12 of this report. It is notable from this data that 'background' levels of walking at automatic walking counter sites are substantially lower in August than they are in July – reflecting seasonal factors as they apply to these counters (which are not representative of all walking in London). The impact of this change on the estimates in figure 10.60 is to offset some of the growth observed during Games time in terms of the Greater London estimates, as the 'background' seasonal trend at this time is downwards.

Figure 10.60 Normalised estimates of total walking trips/stages in Greater London over summer 2012.




*Source: TfL Group Planning, Strategic Analysis.*

## 10.16 Cycling in Greater London during summer 2012

Cycling across the river Thames in Greater London during the Olympics was about 12 per cent higher, and cycling during the Paralympics was 25 per cent higher, than would otherwise have been expected. Equivalent values for crossings in central London were 25 and 36 per cent higher respectively. The time profile of cycling journeys was closely comparable to that more usually observed, suggesting that cycling was preferentially used as a means of travel to work during Games time. Across summer 2012, 20 per cent more cyclists were observed on major roads in London than would otherwise have been expected. The recently-extended Barclays Cycle Hire scheme saw 43 per cent more hires than would otherwise been expected during the Olympics, and 30 per cent more hires over the Paralympics.

Summer 2012 volumetric data for cyclists arise from three sources. First, the Thames Screenline count survey as described in the previous section for pedestrians also counted cyclists – all those observed crossing the Thames across all cyclist-accessible crossing points. As with pedestrians, Thames Screenline data gives an indication of general levels of cycling throughout London and, in particular, in the Central London zone and Games 'River Zone', although as for pedestrians it is geographically specific in coverage. The second source is from continuous 'spot' counts of cyclists passing a sample of automatic cycle counting sites (15 in total), these being located on London's major roads (the TLRN network). This provides an index of relative change that is compatible with, but not identical to, long-term indices of cycling in London (see section 3.11 of this report). Finally, specific data relating to the daily number of hires is available from the recently-extended Barclays Cycle Hire scheme.

The Thames Screenline and TLRN cycle counts will give an indication of how cycling in different parts of Greater London varied across summer 2012, but will not directly give estimates of the absolute levels of cycling. Data from Barclays Cycle Hire will give specific additional information on cycling levels in central and inner-East London – an area that would be expected to have been directly affected by the Games. As with pedestrians, synthetic estimates of the absolute levels of cycling activity in Greater London can be constructed by relating variability observed over summer 2012 to 'known' annual average totals, as described elsewhere in this report. As with pedestrians, the weather may have been a particular influence on the extent of cycling over summer 2012.

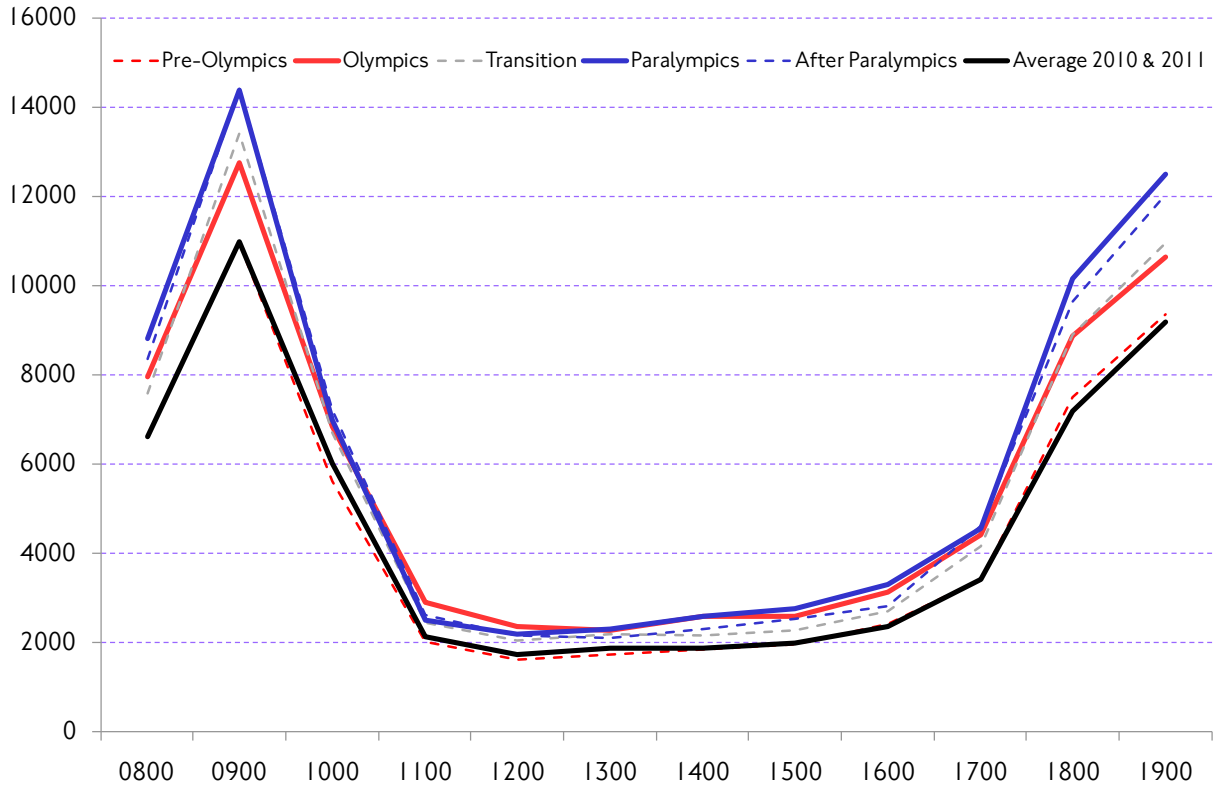
**Cycling: Cyclists crossing the river Thames**

For the purpose of this analysis and to help identify Games-related effects the Thames screenline is divided into three geographic segments. These are: all crossings East of Tower Bridge (excluding the Emirates Air Line for reasons of historic comparability), where a significant Games effect may be expected; all crossings between Tower Bridge and Vauxhall Bridge (inclusive), representing Thames crossings in central London, which may be expected to reflect both Games and wider cultural events; and finally all crossings to the West of Vauxhall Bridge, where a minimal Games impact may have been expected.

Figure 10.61 shows total cyclist counts at all Thames crossings. In contrast to the equivalent graphic for pedestrians it shows a more consistent pattern, with clear indications of a Games time impact. Total cyclists observed during all five summer 2012 analysis periods were higher than the 2011 baseline, although only marginally so during the bad-weather-affected pre Games period. As with pedestrians, highest

volumes were observed during the Paralympic period, although the Olympic period also stands out in this respect. During the Olympics, 19 per cent more cyclists crossed the Thames compared to the 2010/2011 baseline. During the Paralympics, there were 32 per cent more cyclists. However, the Transition and post Games periods saw 15.9 and 25.2 per cent more cyclists respectively. Across the whole of summer 2012 there were 17.3 per cent more cyclists, on average, than the 2010/2011 baseline, although this should be seen in the context of year-on-year growth for cycling in London, which has been of the order of 5 per cent per year.

Figure 10.61 Cyclists crossing the river Thames by time of day. All crossings within Greater London excluding Emirates Air Line. Summer 2012 analysis periods with 2010/11 representative average.



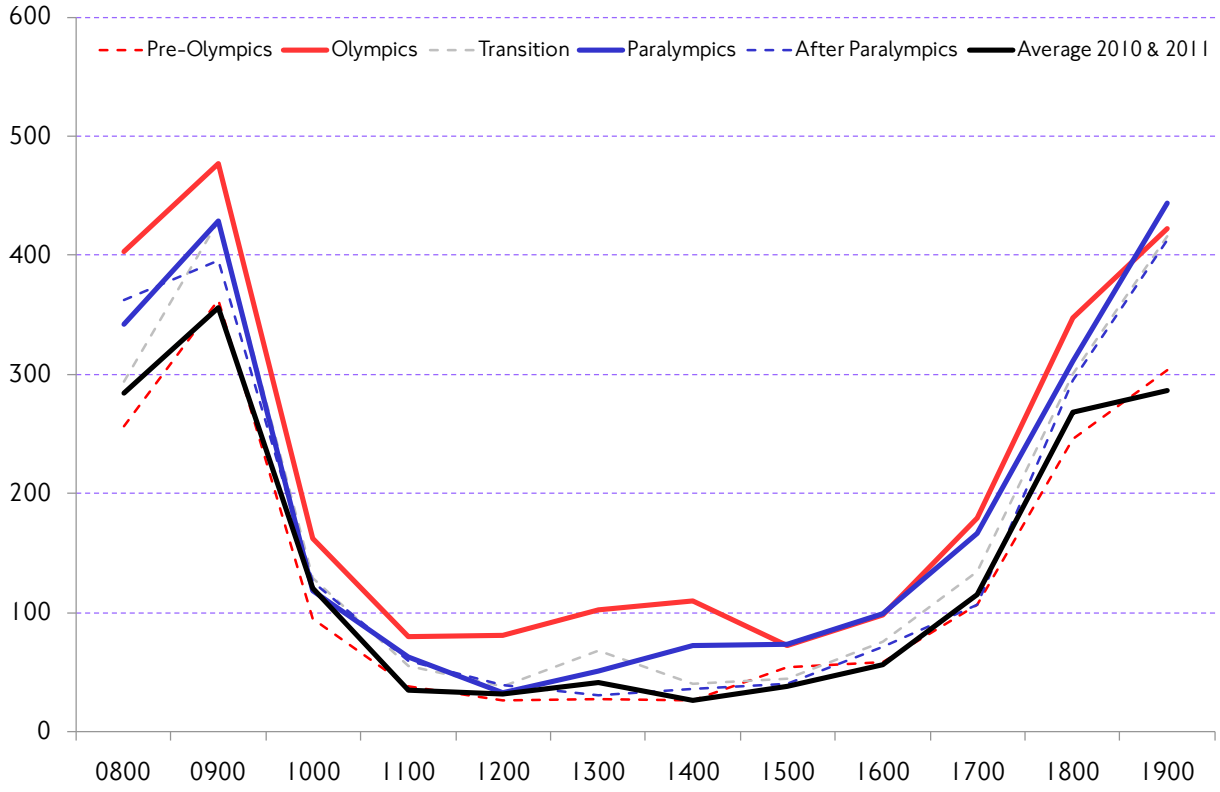

*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Looking at time of day distribution for cyclists, the most striking feature is the pronounced morning and evening peaks. Volumes at the height of the morning and afternoon peak periods can be up to 7 times those of the mid-day period. This pattern, which is associated with the use of cycles for work-related commuting journeys, does not materially change during Games time, although volumes are noticeably higher.

Figure 10.62 looks at those crossings to the east of Tower Bridge (exclusive). Here, the available crossing points are quite sparse, reflected in the relatively small absolute number of cyclists recorded, although of course they also reflect activity in the Games 'River Zone'. There is evidence of relative increases in cyclists during the Olympic and Paralympic periods, although the absolute numbers are quite small, these crossings accounting for just 2.4 per cent of cyclist crossings in London, based on the average of the 2010 and 2011 baseline counts. Of interest is the fact that Olympic period cyclist flows were higher than those of the Paralympics, and there

was also a notably higher increase in Olympics flows during the mid-day period, suggesting a closer correlation of observed trends here with the Olympic Games themselves.

Figure 10.62 Cyclists crossing the river Thames by time of day. All crossings east of Tower Bridge excluding Emirates Air Line. Summer 2012 analysis periods with 2010/11 representative baseline.



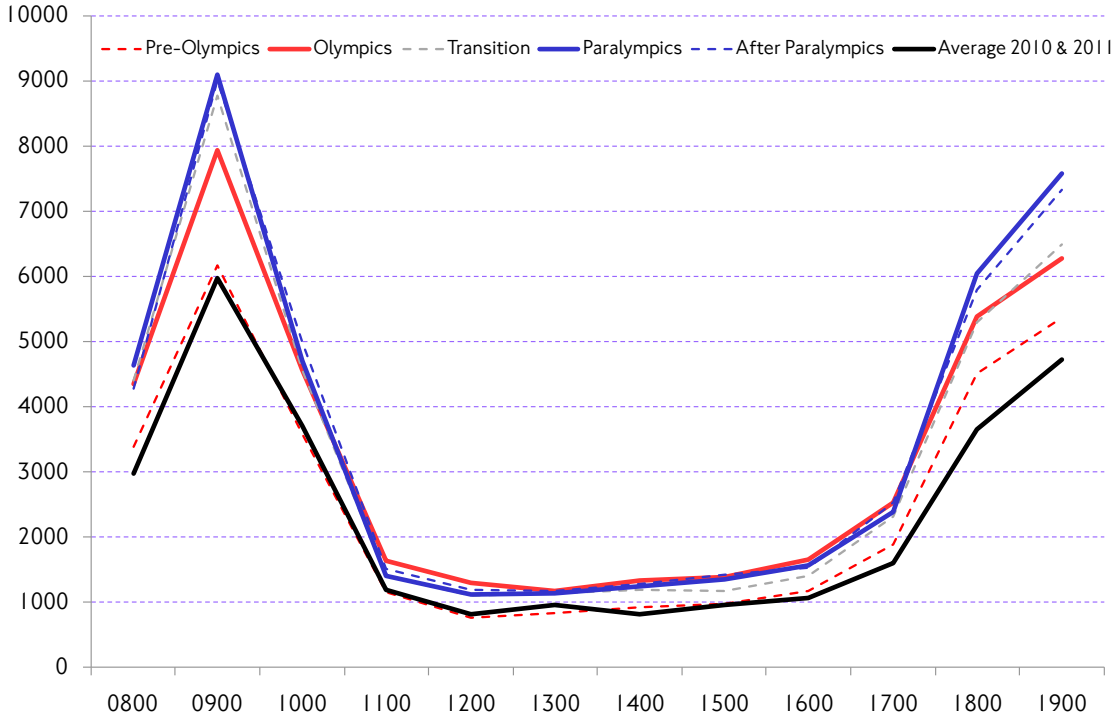

*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.63 looks at cyclist crossings within central London. These collectively account for the majority (53.9 per cent) of cycling activity across the cordon, and as with pedestrians the patterns shown are similar to those in figure 10.59. Again there is evidence that volumes across summer 2012 were consistently higher than those of 2010/2011, although the weather-affected pre Games period stands out as being relatively low for 2012, and background growth in cycling will be a factor in these comparisons.

Total cyclist flows during the Olympics period were 32.3 per cent higher than the average of 2010/11, with 39,500 cyclists counted crossing bridges in central London. Flows during the Paralympics period were 41.6 per cent higher than 2010/11 and, again, relatively high flows were sustained for the post Games period (at 40.9 per cent higher than the 2010/11 average).

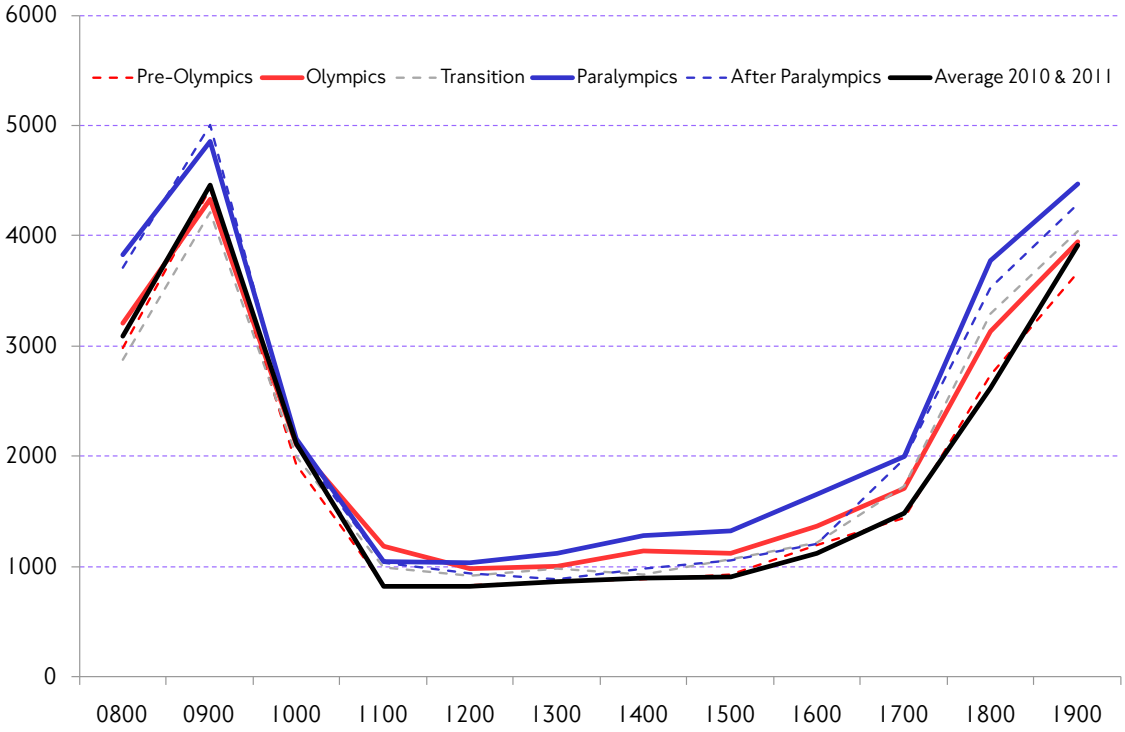
Within this overall picture of substantial increases there is no clear evidence of time-shifting by cyclists in response to the Games, and it seems that cycling was used preferentially as a means of travel to work during these periods.

Figure 10.63 Cyclists crossing the river Thames by time of day. All crossings between Tower Bridge and Vauxhall Bridge inclusive (central London). Summer 2012 analysis periods with 2010/11 representative baseline.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.64 Cyclists crossing the river Thames by time of day. All crossings West of Vauxhall Bridge (exclusive) to the Greater London boundary. Summer 2012 analysis periods with 2010/11 representative baseline.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

Figure 10.64 shows cyclist volumes for all crossings west of Vauxhall Bridge (exclusive). These collectively account for 43.7 per cent of cyclist cordon crossings (based on an average of the 2010 and 2011 baselines). Here again Olympic and Paralympic flows are consistently higher than the 2010/2011 baseline, but the largest increment was seen during the Paralympics, with 18.2 per cent more cyclists. The increase against baseline during the Olympics was much smaller – just 4.4 per cent, and lower than might have been expected given the year-on-year background growth in cycling.

### Summary

Table 10.21 summarises key comparisons from this survey of cyclists crossing the river Thames. The principal conclusions to be drawn are that:

- With the exception of the bad-weather-affected pre-Games period, summer 2012 saw substantial increases in cycling across the Thames compared to the 2010/2011 baseline. Over the whole summer 2012 analysis period 17.3 per cent more cyclists were observed than in 2010/2011, against an 'expected' increase of about 7.5 per cent based on year-on-year 'background' growth. In comparing these estimates, it should be recognised that the Thames screenline cycle counts were one-off 12-hour surveys, whereas background growth in cycling is an index derived from continuous data from automatic cycle counters.
- Cycling during the Olympics was 19 per cent higher, and cycling during the Paralympics was 32 per cent higher, with similar-scale increases during the Transition and immediate post-Games periods. This should however be set against the approximate 5 per cent year-on-year 'background' growth in cycling in London, from which a 'background' increase of around 7.5 per cent might have been expected.
- The extent of the Games time change varied considerably, with notably increases in the Olympic 'River Zone' and in central London, which much more stable numbers to the West of London.
- Interestingly, the distribution of cyclists by hour of day did not materially change during Games time, suggesting that the population of cyclists, and the purposes for which they made their journeys, did not change significantly during the Games from those at non-Games times.

Table 10.21 Cyclists crossing the river Thames in London during summer 2012 – summary results (12 hour totals).

| | Pre Games | Olympics | Transition | Paralympics | Post Games | Average 2010/11 |
|---|---|---|---|---|---|---|
| GL Total | 55,000 (100%) | 67,300 (100%) | 65,500 (100%) | 73,000 (100%) | 71,000 (100%) | 56,500 (100%) |
| CL Total | 30,700 (55.8%) | 39,500 (58.7%) | 39,200 (59.9%) | 42,200 (57.9%) | 42,000 (59.4%) | 29,800 (53.9%) |
| EL Total | 1,560 (2.8%) | 2,530 (3.8%) | 2,030 (3.1%) | 2,200 (3.0%) | 1,980 (2.8%) | 1,390 (2.4%) |
| WL Total | 22,700 (41.3%) | 25,200 (37.5%) | 24,200 (37.0%) | 28,600 (39.1%) | 26,700 (37.8%) | 24,200 (43.7%) |

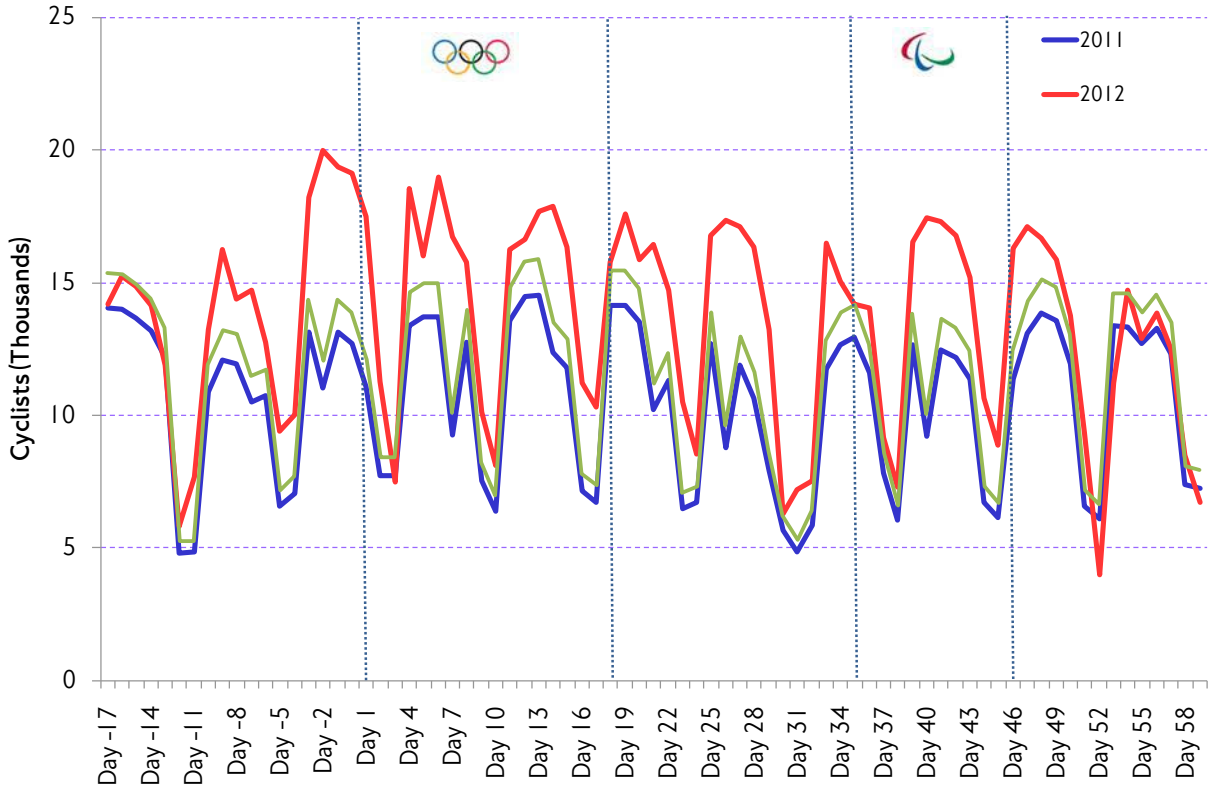
| | | | | | | |
|---|---|---|---|---|---|---|
| GL difference average 2010/11 | -2.6% | +19.0% | +15.9% | +32.0% | +25.2% | n/a |
| CL difference average 2010/11 | +2.9% | +32.3% | +31.5% | +41.6% | +40.9% | n/a |
| EL difference average 2010/11 | +15.1% | +81.9% | +45.4% | +58.3% | +41.9% | n/a |
| WL difference average 2010/11 | -6.0% | +4.4% | +0.3% | +18.2% | +10.6% | n/a |

*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

### Cycling: cyclists on major roads in London

Figure 10.65 shows the daily trend in the number of cyclists observed on the TLRN (major) road network in London. This uses a similar set out automatic cycle counters to those used to compile the indicator at figure 3.8 of this report. However, technical issues with some of these counters over summer 2012 means that the data below draw on a smaller, although still broadly-representative selection of sites. A representative 2012 non-Games baseline has been derived, by applying the average annual growth (+9.3 per cent for this indicator) over the last five years.

Figure 10.65 Cyclists on major roads in London. Summer 2012 vs. equivalent days in 2011.




*Source: TfL Surface Transport/ Group Planning, Strategic Analysis.*

With the exception of the bad-weather-affected first and last weeks of the summer 2012 period, it is seen that average cycle flows on major roads were consistently and

substantially above the non-Games comparison baselines. The number of cyclists counted across summer 2012 was 29 per cent above the equivalent period in 2011, and 19.7 per cent above 2012 non-Games expectation, given year-on-year growth.

For the Olympic period the (normalised) increase was 34.2 per cent (2011 baseline) and 22.8 per cent (2012 non-Games baseline). For the Paralympic period, the increase was 33.2 per cent (2011) and 21.8 per cent (2012 non-Games). Higher proportionate increases were seen over the Transition period (39.4 per cent 2011, 27.5 per cent 2012 non-Games), but these need to be set against relatively low volumes of cyclists at this time in 2011.

The overall picture from this indicator of cycling activity in summer 2012 accords well with that from the Thames Screenline. Taking year-on-year background growth into account, and noting that this is assessed as being at a higher rate for cyclists on the TLRN than for cycling in Greater London as a whole (9.3 per cent compared to approximately 5 per cent), both indicators saw between 10 and 20 per cent more cyclists than would otherwise have been 'expected' across summer 2012. As with the Thames screenline data, distinct increases related to the Games are seen, with similar effects during the non-Olympic periods. This probably reflects a combination of the strong association of cycling with travel to work (reflecting TDM initiatives to encourage people to work from home and increased leave-taking during this period) and the relatively better weather during the latter part of summer 2012.

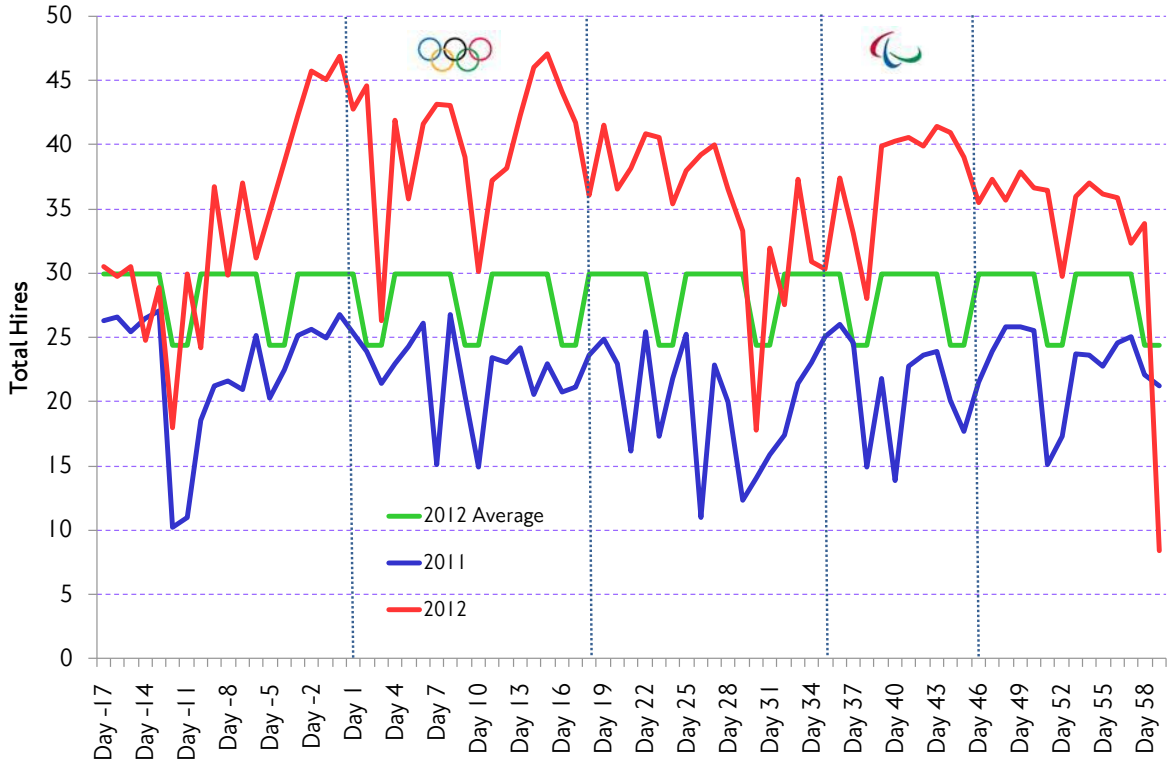
**Cycling: Barclays Cycle Hire**

Barclays Cycle Hire was developed to provide an alternative transport solution for short trips in central London and to contribute to the Mayor's goal of encouraging more people to cycle. The scheme was launched in July 2010 with an initial total of around 6,000 bicycles across 315 docking stations in central London. Incremental extensions to the scheme saw 6,500 bicycles available for hire during summer 2011. Between 2011 and 2012 the scheme was extended eastwards to cover Docklands and the area to the south of the Olympic Park. As of March 2012, in preparation for the Games, the number of cycles stood at 9,200 across 551docking stations in central and inner-East London.

Figure 10.66 shows the daily trend in the total number of hires (all hire types) across summer 2011 and 2012. A comparison baseline of average hires in May and June 2012 is also given, this being the most appropriate comparison given the expansion of the scheme prior to March 2012, although the early summer of 2012 was notable for consistently poor weather.

The most notable feature of the graph is that hires in summer 2012 are consistently much higher than those of 2011, by an average of 64 per cent over the entire analysis period. They are also consistently higher than those of early summer 2012, the more appropriate comparison baseline, by an average of 25 per cent, which will at least in part reflect the relatively better weather over the Games period compared to the earlier summer months. Table 10.22 breaks this down by analysis period, where it is seen that the relative increase in hires was particularly pronounced over the Olympic and Paralympic periods (increase of 43 per cent and 30 per cent respectively).

Figure 10.66 Barclays Cycle Hire. Total daily hires (all hire types). Summer 2012 compared to equivalent days in 2011 and average daily hires during early summer 2012.




*Source: Barclays Cycle Hire.*

Table 10.22 Barclays Cycle Hire. Total daily hires (all hire types). Summer 2012 compared to equivalent days in 2011 and average hires during early summer 2012. Summary of changes. Normalised values.

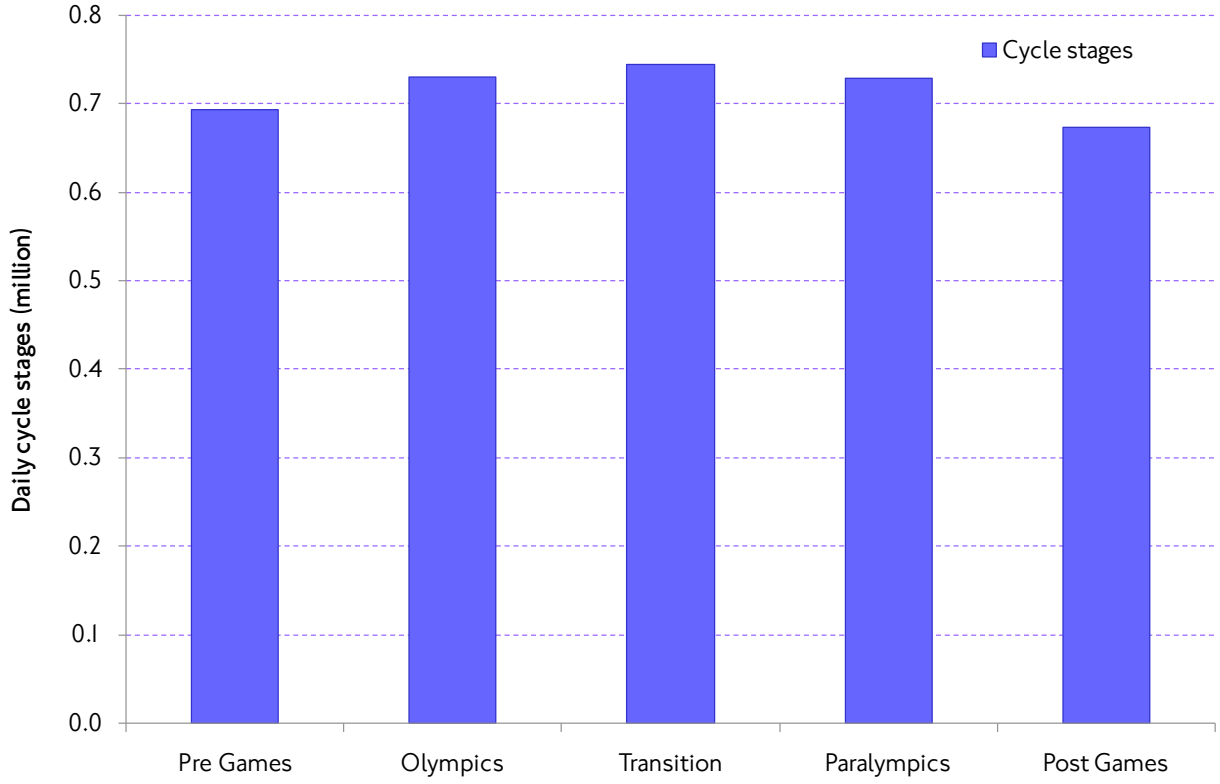
| | Pre Games | Olympics | Transition | Paralympics | Post Games |
|---|---|---|---|---|---|
| 2012 daily average | 30,343 | 40,575 | 36,138 | 36,938 | 33,500 |
| 2011 daily average | 21,670 | 22,388 | 19,552 | 21,608 | 22,740 |
| **Difference (%)** | **40%** | **81%** | **85%** | **71%** | **47%** |
| 2012 representative | 28,341 | 28,341 | 28,341 | 28,341 | 28,341 |
| **Difference (%)** | **7%** | **43%** | **28%** | **30%** | **18%** |

*Source: Barclays Cycle Hire.*

### Overall estimates of Games time cycling in Greater London

As with walking, it is possible to draw together the available data to construct indicative synthetic estimates of total levels of cycling in Greater London over summer 2012 (figure 10.67). This suggests that there were around 700,000 cycle journey stages made in London on an average day, with relatively higher values during the Olympics, Transition and Paralympics periods.

Figure 10.67 Normalised estimates of total cycle trips/stages in Greater London over summer 2012.




*Source: TfL Group Planning, Strategic Analysis.*

## 10.17 Overall Games time travel demand, mode shares and estimates of travel behaviour change – exploratory analysis

This section brings together normalised estimates of observed average daily travel demand at the Greater London level from all of the individual modes considered in this chapter. Estimates are also made for National Rail travel in London, including the Games-time only 'Javelin' service, and other modes such as taxis, to provide a complete picture of all travel in London. Normalisation - accounting for the different day-lengths and day type compositions of the Olympics and Paralympics - allows travel estimates for each of the five 'analysis periods' over summer 2012 to be compared on an equivalent basis. This is in terms of journey stages per average day, normalised to two weeks per period. These estimates can also be compared directly to established 'annual average day' estimates of travel, for 2011, as set out in section 2.6 of this report, which can likewise be factored to two-week 'summer' equivalents.

Looking at Games time travel demand in this way also allows an exploratory approach to be made to estimating the degree of reduction to aggregate travel demand as a result of TfL's Travel Demand Management initiatives. This is possible as, for most modes, a good estimate of what demand 'would have been' across summer 2012 had there been no Games can be derived directly from travel volumes observed in summer 2011, adjusted to include year-on-year 'background' growth, as shown in the sections above. These 'counterfactual' baselines can be similarly summed across the modes, to arrive at totals that can be compared directly to those actually observed in 2012. The difference between the two broadly represents the aggregate (ie net) 'Games impact' on total travel demand.

Having established total Games time travel, this analysis then be taken a step further. It is possible to make an independent estimate of 'total travel directly connected with the Games', considering aspects such as spectator numbers and Games workforce, but excluding travel associated with normal summer holiday time leisure activities. This 'Games related travel' can then be subtracted from that actually observed (during the Olympic and Paralympic analysis periods only) to arrive at estimates of 'non-Games related' travel during both events. This can then be compared to the appropriate counterfactual baselines for each period. In simple terms this provides an estimate of the aggregate reduction in 'background' travel demand during Games time that can then be compared with survey-based evidence on the response to TDM initiatives.

A disadvantage of considering Games time demand in this way (as averages at the Greater London level), is that the sometimes intense variability in travel demand, at specific locations and at specific times and as illustrated in the preceding sections for each mode, is not visible. It should therefore be recognised that the aggregate totals considered here comprise often very different 'components' from the patterns of travel more usually observed. In simple terms, Games-related parts of the network were much busier than usual, and non-Games related parts (the large majority) were on the whole quieter than usual.

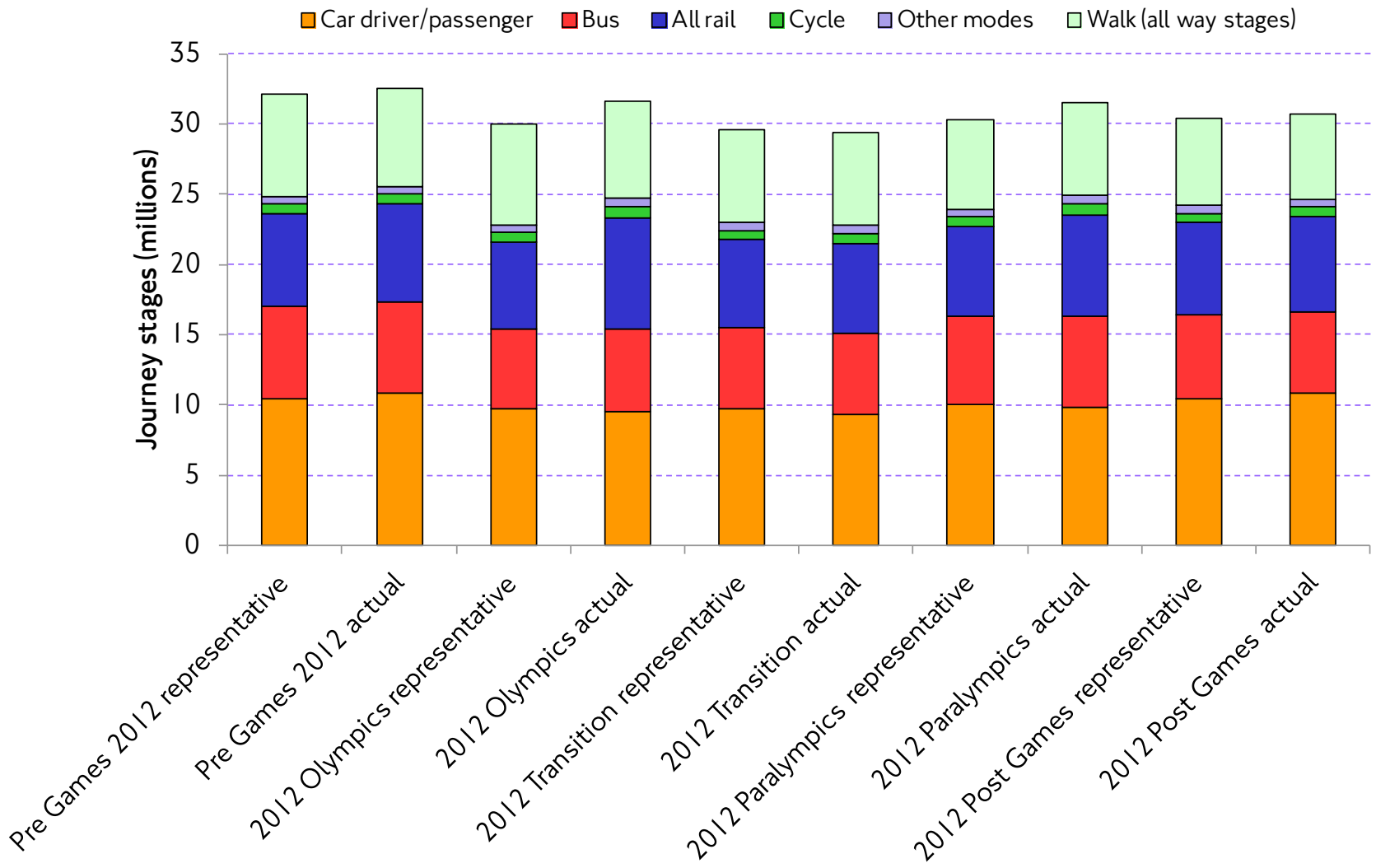
**Consolidated estimates of travel demand over summer 2012**

Figure 10.68 shows these consolidated estimates of travel demand across all main modes for each of the five summer 2012 analysis periods. Two bars are given for each period. The first of each pair is the counterfactual baseline for 2012. This represents volumes of travel that would be expected for each analysis period 'were there no Games in 2012'. It takes into account both seasonal variations in travel volumes, reflecting travel changes that normally take place over the school summer holiday period, and year-on-year 'background' growth in travel demand for the different modes. The second bar of each pair shows the demand that was actually observed in that period. These have been derived by summing the observed values for the individual modes as described in the sections above, making reasonable estimates for modes not directly covered. The units are journey-stages on an average day within the whole of Greater London for each normalised two-week period.

Three basic observations should be made from figure 10.68. The first is that the total number of journey stages per day is broadly consistent with TfL's annual average estimate in section 2.6 of this report of 29.9 million for 2011. This is to be expected – the summer holiday period does not necessarily equate to large reductions in total demand across many modes, as reduced work- and education-related travel is replaced to an extent by increased leisure-related travel. Furthermore, although it cannot be quantified directly, background growth in travel demand has continued in 2012, and therefore the 'real' average daily travel volume for summer 2012 would be higher than that for 2011, by a percentage point or two. This generally close correspondence between what are effectively independent estimates is therefore reassuring.

The second observation is that the differences seen across summer 2012 between 'observed' and 'expected' travel are of a relatively small magnitude. Again this is to be expected. As described in section 10.3, spectator travel (taken in isolation) would equate to just 3.1 per cent of normal daily travel in London during the Olympics, and 2.1 per cent during the Paralympics.

Figure 10.68 Normalised estimates of total travel (person journey-stages) in Greater London over summer 2012.




*Source: TfL Group Planning, Strategic Analysis.*

Finally, it is possible to recognise a typical 'summer holiday' pattern, travel in the pre and post-Games periods being higher than during the Transition (wholly in August), and higher than the counterfactual baselines for both the Olympics and Paralympics (both partially in August).

Looking now at the differences between the counterfactual and observed travel volumes for each of the five analysis periods in turn:

- Observed travel volumes in the pre-Games period were higher than would otherwise have been expected, by a relatively modest 1.3 per cent. This may be a reflection of additional travel associated with preparations for the Games, such as venue workers, rehearsal events, tourists arriving in advance of the Games etc. It could also reflect the postponement of holiday travel away from London by residents that had been re-timed, in accordance with TDM advice, to take place over the actual Games period, although there is no direct evidence that would allow these effects to be quantified further.
- During the Olympics, observed travel volumes were 5.6 per cent higher than expected – an increase that at first sight seems relatively modest, albeit consistent with the spectator numbers (plus other Games related travel) given in section 10.3. Crucially, however, this net outcome includes both reductions to 'background' travel and substantial increases from Games related travel. The balance between these two countervailing effects is examined below. At this stage it is instructive to note that Olympic period travel demand was just 5.7 per cent, on average, above annual average daily travel demand in 2011, that this increment would be smaller when continuing 'background' growth in travel is taken into account, and that total travel demand during the Olympics was lower than in the pre-Games period.
- Travel demand during the Transition period was, as expected, below annual average levels and there is no significant difference (down by 0.7 per cent) between volumes that would be 'expected' and those that were observed. Again, however, this net outcome probably conceals elements of both increased 'Games-related' travel, even though there were no events, (workers, tourists extending their stay etc.), and decreased 'background' travel by regular travellers.
- Looking at the Paralympics, average daily travel demand was 3.9 per cent higher than would otherwise have been expected. Again this increase reflects elements of both increased Games related travel and reduced 'background' travel.
- Finally, the post-Games period shows evidence of the 'return to work' with total volumes of travel edging back to those seen in the pre-Games period. Actual observed volumes of travel were 0.9 per cent higher than would otherwise have been expected at this time.

### Mode shares over summer 2012

Looking at mode shares across the five analysis periods, it is necessary to recognise that 'seasonal' influences within the summer period are more pronounced for some modes – for example walking (see section 3.15 of this report) than for total travel. A consequence of increased levels of walking observed in summer, compared to the annual average values, is that the public transport mode **share** of all travel will be less when compared to the annual average values. It is also necessary to recognise that the Games brought additional demand – the overwhelming proportion of which was expected to be on public transport. In considering the proportions of travel by each mode it is therefore necessary to think in terms of changes to aggregate mode share,

as opposed to mode shift, although changing mode for regular journeys was one of the 'Four R's' that were promoted by the TDM advice.

Table 10.23 Summary of modes shares across summer 2012. Percentage of journey-stages. Normalised average day.

| | | | 2012 Counterfactual | | |
|---|---|---|---|---|---|
| | Pre Games | Olympics | Transition | Paralympics | Post Games |
| Car driver/passenger | 32% | 32% | 33% | 33% | 34% |
| All rail | 20% | 21% | 21% | 21% | 22% |
| **Bus** | **21%** | **19%** | **20%** | **20%** | **20%** |
| Walk | 23% | 24% | 22% | 21% | 20% |
| **Cycle** | **2%** | **2%** | **2%** | **2%** | **2%** |
| **Other** | **2%** | **2%** | **2%** | **2%** | **2%** |
| **All PT** | **41%** | **40%** | **41%** | **42%** | **41%** |
| **All PT exc. Walk** | **55%** | **54%** | **54%** | **55%** | **53%** |
| **PT, walk/cycle** | **66%** | **66%** | **65%** | **65%** | **64%** |

| | | | 2012 Observed | | |
|---|---|---|---|---|---|
| | Pre Games | Olympics | Transition | Paralympics | Post Games |
| **Car driver/passenger** | **33%** | **30%** | **32%** | **31%** | **35%** |
| **All rail** | **21%** | **25%** | **22%** | **23%** | **22%** |
| **Bus** | **20%** | **19%** | **20%** | **21%** | **19%** |
| **Walk** | **22%** | **22%** | **22%** | **21%** | **20%** |
| **Cycle** | **2%** | **2%** | **2%** | **2%** | **2%** |
| **Other** | **2%** | **2%** | **3%** | **2%** | **2%** |
| **All PT** | **41%** | **44%** | **41%** | **44%** | **41%** |
| **All PT exc. Walk** | **54%** | **58%** | **55%** | **57%** | **53%** |
| **PT, walk/cycle** | **65%** | **68%** | **66%** | **67%** | **63%** |

*Source: TfL Group Planning, Strategic Analysis.*

Looking at the shares in table 10.23, the general observation is that the changes in net mode share are relatively modest. This mainly reflects the relatively small magnitude of Games related travel compared to normal daily travel in London. A second general observation is that the proportions in the table are broadly comparable to annual average mode shares for 2011 (see section 2.7 of this report). As expected, walk mode shares are typically 2-4 percentage points higher than these. This is primarily a seasonal effect rather than a Games effect, but it does have the general effect of reducing mode shares for the other modes by a percentage point or two in comparison with the 2011 annual averages (as the walking share is greater).

Bearing this in mind, during the Olympics, the public transport mode share increased by 4 percentage points (observed vs. counterfactual). During the Paralympics the increase in share was 2 percentage points. Virtually all of these increases were accounted for by additional journeys on the rail network, rather than reduced journeys by other modes (eg car). To put this in context, an additional 1 million rail journeys per day (about three-quarters of what might be expected from spectator event-related travel alone during the Olympics) would typically increase the rail mode share by 2.5 percentage points, all other things being equal. It is also important to recognise that these mode shares relate to journey-stages. The Games were predominantly held in

East London and, to the extent that Games-related journeys involved people making longer trips than they would otherwise have done, the public transport mode share, expressed on a per-kilometre basis, would be correspondingly higher.

**Impact of Games related travel and Travel Demand Management (reduced travel)**

The primary aim of TfL's Games time TDM initiatives was to encourage regular travellers to adapt their travel patterns to avoid the busiest places and times on the transport networks, so as to free up capacity to accommodate Games spectators. A key adaptation was to Reduce travel (one of the 'Four Rs').

Since total volumes of travel over Games time are known, and since it is possible to estimate the proportions of this travel accounted for by spectators and other travel directly related to the Games, it is possible to derive estimates of 'background' travel over Games time. The extent to which these estimates differ from those that would be 'expected' in summer 2012 without the Games therefore give a direct estimate of the extent to which 'background' travel demand reduced in response to TDM initiatives.

**Estimating spectator and other Games related travel**

It is estimated that 6.25 million ticketed spectators attended events in London during the Olympics, with 2.7 million during the Paralympics. In addition to ticketed spectators at venues, many others attended road-based events and viewed the Games at 'Live Sites' in central London. It is not possible to quantify the numbers of people involved in this latter group directly, but an indicative estimate would be 2 million in total during the Olympics and 0.5 million during the Paralympics (equating to some 550,000 additional journey-stages per day (Olympics) and 258,000 per day (Paralympics).

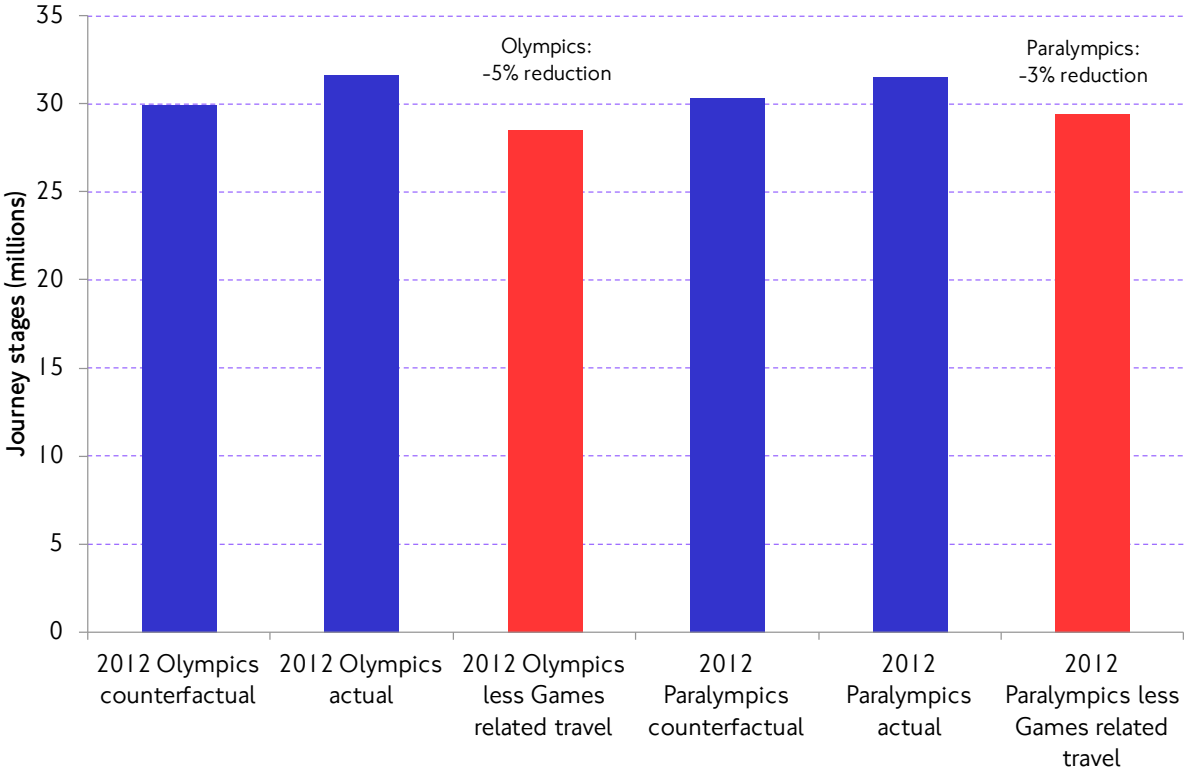
To be added to this spectator travel is Games Family travel (including athletes and officials), estimated at 63,000 per day during the Olympics, and 20,000 per day during the Paralympics.

Finally, the wider Games workforce, including Games Makers and Travel Ambassadors, totalled approximately 220,000 during the Olympics and 180,000 during the Paralympics, and it is possible to make reasonable assumptions about their total daily travel during Games time. Note that this travel by spectators and workers, whilst Games related, may have substituted for other regular trips – for example London-based Travel Ambassadors working at a transport interchange rather than a London-based office location.

**Estimating 'background' travel during the Games**

Using these assumptions and accounting for the different day-lengths for each of the two Games gives estimates for all Games-related travel of 3.1 million journey-stages per day during the Olympics, and 2.1 million journey-stages per day during the Paralympics. These can then be subtracted from total observed travel to derive an estimate of non-Games-related travel for each Games, which can then be compared to travel that would otherwise be expected – the 2012 counterfactual baseline. For this purpose the above quantities for Games-related travel are subtracted from the journey stages total as a whole, not from the individual modes, as it is not possible to derive estimates at this level. The resulting estimates are shown in figure 10.69.

Figure 10.69 Games-related and background travel during the Olympics and Paralympics.




*Source: TfL Group Planning, Strategic Analysis,*

The 'expected' number of journey-stages during the Olympic period is assessed at 29.94 million per average day. The observed number of journey stages was 31.61 million – a 5.6 per cent net increase. Subtracting the Olympics estimate of Games-related travel gives 28.48 million journey-stages. The difference between this and the counterfactual (non-Games) expectation is -4.9 per cent. In other words, background (non-Games) travel during the Olympics was about 5 per cent lower than would otherwise have been expected for the equivalent period in 2012 without the Games.

For the Paralympics, the 'expected' number of journey stages is assessed at 30.32 million per average day. Note that this is marginally higher than the equivalent value for the Olympics – reflecting the fact that the Paralympics partly took place outside of the school summer holiday period. The observed number of journey stages was 31.49 million per average day – a 3.8 per cent net increase. Subtracting the Paralympics estimate of Games-related travel gives 29.40 million journey-stages. The difference between this and the counterfactual (non-Games) expectation is -3.0 per cent. In other works, background (non-Games) travel during the Paralympics was about 3 per cent lower than would otherwise have been expected for the equivalent period in 2012 without the Games.

These estimated reductions to 'background' travel demand relate only to the 'Reduce' element of the TDM '**4 R's**'. Because a fixed relationship between journey stages and trips has been used for these calculations, the percentage reductions apply equally to trips as well as stages. So, on the basis of this estimate, non-Games travellers on average reduced the number of trips they made by about 5 per cent during the Olympics, and by about 3 per cent during the Paralympics. Before looking

in detail at survey-based evidence for travel demand reduction in the next section, it is important to recognise some key features and limitations of these estimates.

First, the estimated net reductions over the two Games reflect a different balance of components. In general terms, 'background' demand was higher during the Paralympics, and Games-related travel lower, than during the Olympics, reflecting the school summer holidays and relatively smaller scale of the Paralympics respectively. Second, the reductions are average ones across a broadly-defined 'population of people travelling in London'. An average reduction of c.5 per cent could reflect a small number of people making no trips, or a much larger number of people making smaller-scale reductions to their travel. Third, a proportion of Games-related travellers on any particular day will also be regular travellers who made no 'regular' trips on that day. However the two categories are mutually-exclusive – for the purposes of estimating travel demand reduction these people contributed to the reduction in 'background travel'. Finally, the pattern of events over the Olympics (and to a lesser extent, the Paralympics) was uneven. For much of the first week of the Olympics there were no events in the Olympic Stadium. The average vales therefore conceal some variation – Games-related travel would have been higher than the average on some days and lower on others – although this would not necessarily translate to reduced background travel.

## 10.18 Survey-based evidence of travel behaviour change

On an average weekday during the Olympics, 35 per cent of people changed their journey to work or another regular journey. Of these, 20 per cent reduced their travel and 15 per cent changed the mode, route or time of their journey. During the Paralympics, 18 per cent of regular travellers reduced their travel and 13 per cent changed the mode, route or time of their journey on an average weekday.

Overall during the Olympics, 77 per cent of the London travelling population made some form of change to their normal travel patterns and just 23 per cent continued to travel as normal throughout. In total, 63 per cent reduced their travel by choosing not to make at least one of the journeys they would normally have made during the Olympic period. 28 per cent changed the time of some of their journeys, 21 per cent changed the route and 19 per cent changed mode at least once in the course of the Games.

The previous section presented exploratory estimates of total travel demand, travel associated with the Games, and the degree of reduction in 'background' travel across the network. In summary, this analysis concludes that background travel demand was around 5 per cent lower during the Olympics and about 3 per cent lower in the Paralympics than would have been expected in summer 2012 without the Games.

Underlying this aggregate reduction in background demand is a much greater level of change to the route, mode and time of journeys made, which in turn lead to a more substantial reduction in background travel demand at some locations, on some modes and at certain times, but not of themselves to any measurable change in the total amount of travel.

The goal of travel demand management during the Games was to achieve reductions of up to 30 per cent in background demand at certain places and times, in order to ensure that the Games family and spectators reached Olympic venues on time and that London continued to operate during the Games. Throughout the Games, much of London remained unaffected: TfL predicted that 65 per cent of stations and 70 per

cent of traffic would be unaffected. The TDM programme was targeted at those who normally travel in or through affected areas and at businesses operating in those areas. Information was provided about the scale of disruption that could be expected and individuals and businesses were encouraged to make plans to help them cope with this disruption. The programme was based on encouraging four principle responses; Reduce, Re-time, Re-mode and Re-route. In addition, the Active Travel Programme aimed to promote walking and cycling during the Games through communications and improved infrastructure.

**Personal travel during the Games**

Survey research has attempted to quantify the totality of change made by London's travelling population, and further to understand the distribution of that change across the population and networks. In particular, the research seeks to understand the volume of change that was required to deliver such a reduction in total background demand and to provide the capacity needed for Games-related travel. For example, did a small number of people make substantial changes to their travel, or did many people make many smaller-scale changes?

It is worth noting that many changes may have the effect of cancelling one another out at an aggregate or local level, but may still be worthwhile in terms of facilitating Games demand. For example, if a journey were re-routed by getting off a train at Vauxhall rather than Victoria, and a second journey re-routed from London Bridge to Victoria, the same amount of travel is seen at Victoria and overall, but perhaps a more efficient use of the network, with travellers avoiding a key Games hotspot (London Bridge). Equally, whilst people may have reduced their 'regular' journeys, these may have been replaced by other journeys contributing to aggregate London-wide demand. So, for a person working from home rather than in a central London office, and popping out to the local shop at lunchtime: a return commute journey is replaced by a return local shopping journey. Thus, it would be expected that the overall reduction in demand would be somewhat lower than the reported reduction in 'regular' journeys.

**Data sources – travel behaviour change**

TfL undertook a large scale Personal Travel Panel Survey interviewing regular travellers in London before, during and after the Olympic Games. The analysis below focuses on changes to travel behaviour identified in the first two waves of the survey (before Games and Olympics). The supplementary Travel in London report to be published in spring 2013 will describe any sustained change identified and explore the reasons why these changes occurred.

The panel survey is an on-line survey of regular travellers in London. A total of 7,194 completed questionnaires were received in wave 1 (before the Games), and 2,805 of the same respondents completed questionnaires in wave 2 (during the Games).

The ODA undertook a small daily survey during the Games, called the Journey Maker survey, to understand the changes to travel behaviour being made. The results of this survey were produced quickly so that the information could be used to review and/or adjust the Games Time travel demand management advice as required. In total, 5,304 respondents completed the survey during the Olympics and 3,439 during the Paralympics. The survey consisted of:

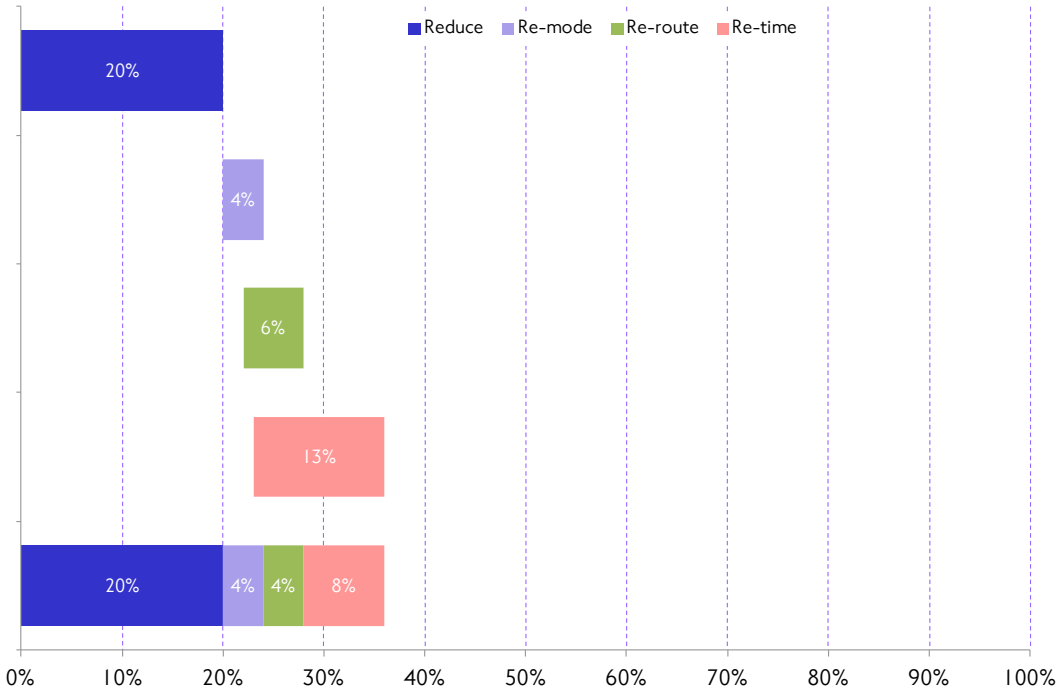
- Olympic Games-time Journey Maker survey, administered daily between 24 July and 12 August, with a typical sample size of 200 to 500 respondents.
- Paralympic Games-time Journey Maker survey, administered daily between 29 August and 7 September, with a typical sample size of 200 to 350 respondents.

**Change in background travel demand on an average day**

Research carried out throughout the Games found that on an average weekday around a third of people changed their travel behaviour during the Olympics and slightly fewer during the Paralympics (based on the Games-time Journey Maker surveys). This group made at least one of four changes to their regular travel: changed the mode, route or time of a journey that they normally make, or reduced their travel by choosing not to make their regular journey. In order to provide an assessment of total change, the options have been classified in a hierarchy based on the assumed difficulty of making such a change. It is assumed that, of the changes that can be made to a journey, it is more inconvenient to change the mode of travel than to alter the route, and it is easiest to change the time of the journey. Clearly, the relative ease of making changes will vary according to individual circumstances so this hierarchy is taken as a common sense average only.

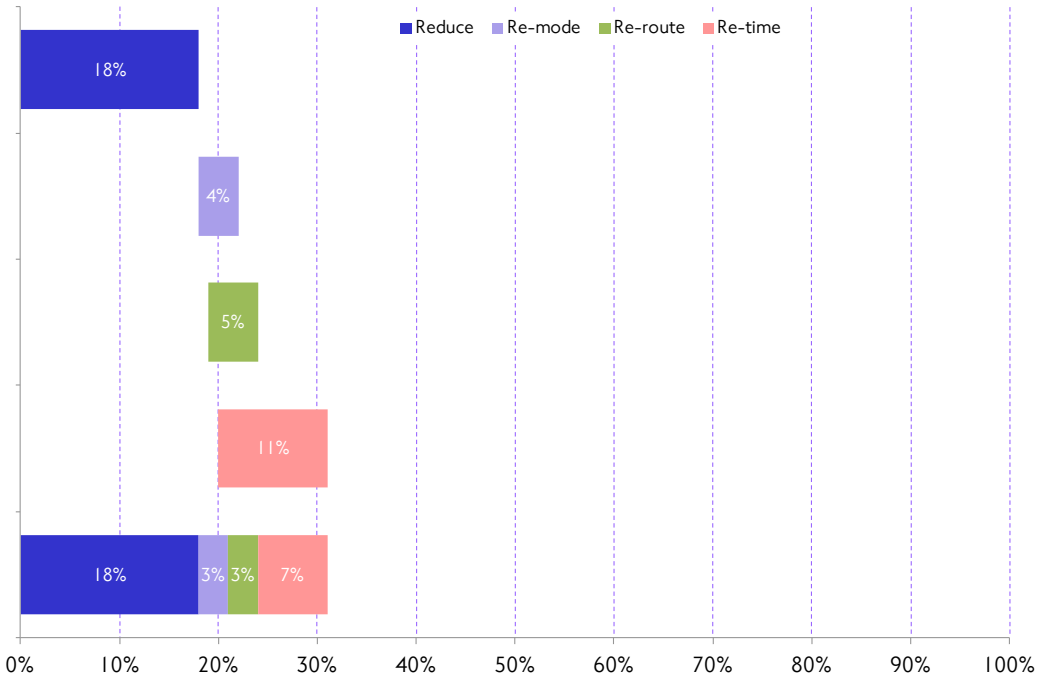
Figure 10.70 shows the reported change to normal travel on an average weekday during the Olympics. 20 per cent of people did not make their normal journey and a further 15 per cent made their normal journey, but changed it in one or more ways. Figure 10.71 shows the reported change to normal travel on an average weekday during the Paralympics. 18 per cent of people did not make their normal journey and a further 13 per cent made their normal journey, but changed it in one or more ways.

Figure 10.70 Overall change in 'regular travel' on an average weekday during the Olympics.




*Source: ODA/TfL TDM Olympic Games-time Journey Maker Survey.*
*Base: 5,304 regular travellers in London.*

Figure 10.71 Overall change in 'regular travel' on an average weekday during the Paralympics.

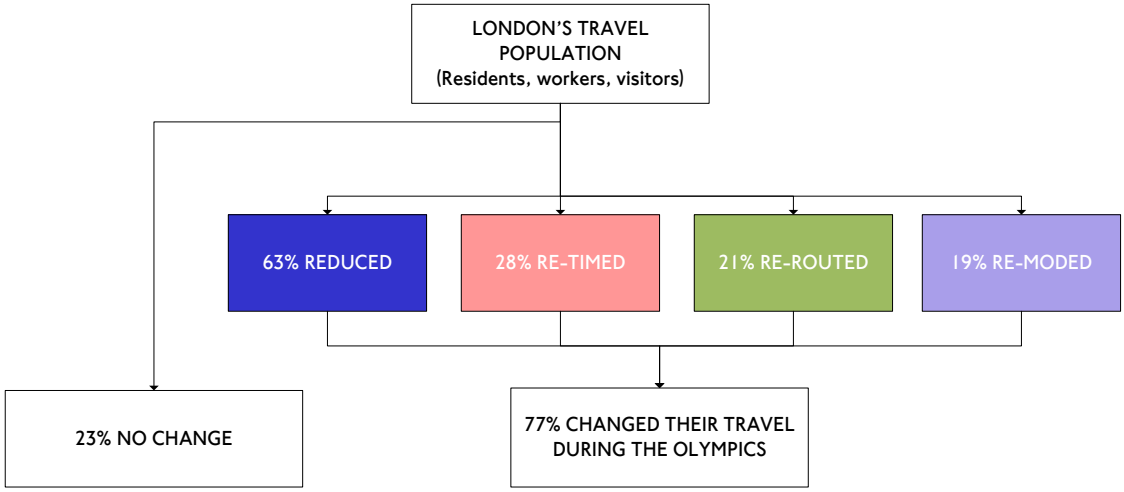



*Source: ODA/TfL TDM Paralympic Games-time Journey Maker Survey.*
*Base: 3,439 regular travellers in London.*

### Change to regular travel patterns throughout the Games

Survey research conducted immediately after the Olympics, during the transition period, can build on this daily estimate – that a third of people changed their travel on an average weekday – by providing a view of what London travellers chose to do throughout the Olympics and across all their journeys. This research has found that, across the two weeks of the Olympic Games, more than three quarters of the London travelling population made some sort of change to their travel patterns as a result of the Games and just 23 per cent continued to travel as normal throughout (based on TfL's Personal Travel Panel Survey). In total, nearly two thirds of London travellers reduced their travel by choosing not to make at least one of the journeys they would normally have made during the Olympic period. This suggests that the aggregate reduction in background demand of 5 per cent is made up of many people changing their travel a little. 28 per cent changed the time of some of their journeys, 21 per cent the route and 19 per cent changed mode at least once in the course of the Games. Many London travellers made more than one change to their travel patterns - 48 per cent of those who made a change.

Figure 10.72 Summary of travel behaviour change by London's normal travelling population during the Olympic Games.




*Source: TfL Personal Travel Panel Survey.*
*Base: 2,805 respondents.*

London travellers were more likely to have made changes to their work-related travel – business and commute trips – than to their travel for other purposes. Nearly two thirds of those travelling for business and commuting had changed their travel, compared to just 42 per cent of those travelling for leisure purposes.

Commuters were more likely than those changing other types of journey to have chosen to change the time, route or mode of their journey. Conversely, those changing their travel for business, shopping, leisure and other purposes were most likely to do so by simply reducing the number of journeys they made. This reflects the more discretionary nature of such journeys, and may also reflect the fact that some normal leisure travel will have been replaced by broadly Games-related leisure travel, such as attending ticketed or un-ticketed events, attending Cultural Olympiad and Games family activities (such as the National Houses), and watching the Games broadcasts at home or elsewhere.

By far the greatest reduction can be seen in business trips, with 55 per cent of those who would have been expected to make a business journey reducing their travel, many of whom did not make a business journey at all in the two working weeks of the Olympics. This may reflect the knock-on impact of changes to commuting, with parts of the workforce working from home or abnormal hours preventing meetings taking place. It is also relevant that workers in 'higher' occupational groups and on a higher income, who are assumed to be more likely to make business journeys in normal conditions, were more likely to have reduced their commute travel.

The remainder of this section explores the nature of changes made in more detail, based on TfL's Personal Travel Panel Survey. Where possible, survey findings are compared with the aggregate changes reported earlier.

### Understanding changes to commuting

This section will consider commuting journeys made in Greater London and how they changed during the Games compared to before the Games. Commuting normally makes up 17 per cent of journeys in London. 2,372 respondents to TfL's Personal Travel Panel Survey normally commute in Greater London. Reflecting normal summer

holiday patterns, 11 per cent of workers were on leave for the entire Olympic Games period for reason unrelated to the Games. This group has been excluded from the remainder of this analysis. In total, 63 per cent of those who would normally have been in work during the Games Reduced, Re-timed, Re-routed or Re-moded their commute journeys.

**Reduction in journeys to usual workplace**

The TDM programme promoted three different ways to reduce travel to usual workplaces during the Games: taking annual leave, working from home or working from a different location. Five per cent of those who would normally have been in work took leave for the full two week period as a result of the Games and a further 32 per cent reduced their travel at some point during the Games. In total, 37 per cent reduced their travel as a result of the Games.

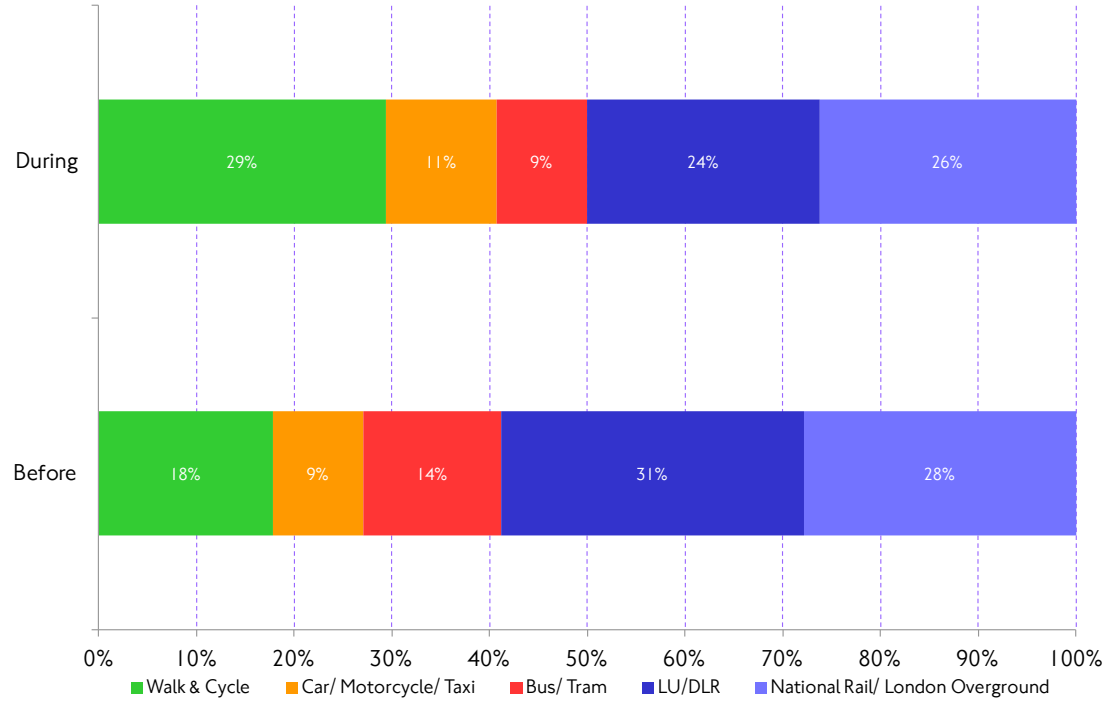
Before the Games, on average employed respondents worked 4.5 days per week at their usual workplace and this decreased to 3.8 days per week during the Games. Twenty-three per cent took annual leave because of the Games (either to attend the Games or to avoid any related disruption), 16 per cent worked from home more than they normally do and 5 per cent worked at other locations more than normal. Some respondents reduced their travel in more than one way, for example by taking some annual leave and working from home on other days.

**Changing the mode of travel to work**

The TDM and Active Travel programmes encouraged commuters in London to use alternative modes to make their journeys during the Games so that they could avoid the busiest parts of the transport network. The Active Travel programme particularly aimed to increase the levels of walking and cycling during the Games.

Twelve per cent of usual workers changed their mode of travel to work at some point during the Games. Figure 10.73 shows the main mode (defined as the method of travel used for the longest distance stage) for journeys to work before and during the Games of those who changed their mode of travel. This shows that respondents generally moved away from travelling by public transport, instead primarily choosing to travel by walking or cycling.

Figure 10.73 Mode share of commuting trips before and during the Games for those who changed mode during the Games.




*Source: TfL Personal Travel Panel Survey.*
*Base: 248 respondents.*

### Changing the route to usual workplaces

The TDM programme encouraged travellers to change the route of their journey to avoid the busiest lines and stations on the rail networks. Eighteen per cent of usual workers reported that they had taken a different route to work at least once.

### Changing the time of travel to usual workplaces

Commuters were encouraged to change the times they set out and returned home so that they avoided the busiest times on the transport network. During the Games, 22 per cent of commuters travelled to work earlier than they normally would, while 6 per cent travelled later. Similar proportions changed the time of their journey home from work with 15 per cent of commuters travelling home earlier than they normally would, while 7 per cent travelled later.

Table 10.24 shows the mean departure time for commuting trips before and during the Games for those who changed travel time split by those who travelled earlier during the Games and those who travelled later. It appears that commuters who changed their travel times generally moved their travel towards the edges of the peak period, in other words, those who normally travel earlier in the peak period travelled even earlier and those who normally travel later travelled even later.

It also appears that there was some shortening of working days for those who travelled earlier, this could be an affect of the school holiday period or the Games, with commuters perhaps leaving work earlier to be able to enjoy the Games.

Table 10.24 Average start time of commuting trips before and during the Games.

| | Average start time of commuters who changed to an earlier travel time | | Average start time of commuters who changed to a later travel time | |
|---|---|---|---|---|
| | Outward | Return | Outward | Return |
| Before the Games | 07:40 | 17:15 | 08:15 | 18:00 |
| During the Games | 07:15 | 16:15 | 09:00 | 18:45 |

*Source: TfL Personal Travel Panel Survey.*
*Base: 495 respondents.*

### Understanding changes to business journeys

This section will focus on changes to business journeys undertaken in Greater London before and during the Games. Business journeys make up 7 per cent of journeys per day. The TDM and Active Travel programmes gave the same messages to travellers about how to change their business journeys as commuting journeys. 1,647 respondents to the TfL Personal Travel Panel Survey undertook business journeys in London prior to the Games.

### Reduction in business journeys

Before the Games, 60 per cent of employed respondents made business journeys in Greater London; this decreased to 23 per cent during the Games. Around half of those who did not make a business journey during the Games normally make business journeys at least once a fortnight, and so would have been expected to make a business journey during the Olympic period in normal conditions.

Of those who did choose to make a business journey during the Games, there was a reduction in the average number of business journeys made per week from 2.2 to 2.0 journeys. In total, 39 per cent of normal business travellers reduced their travel during the Games.

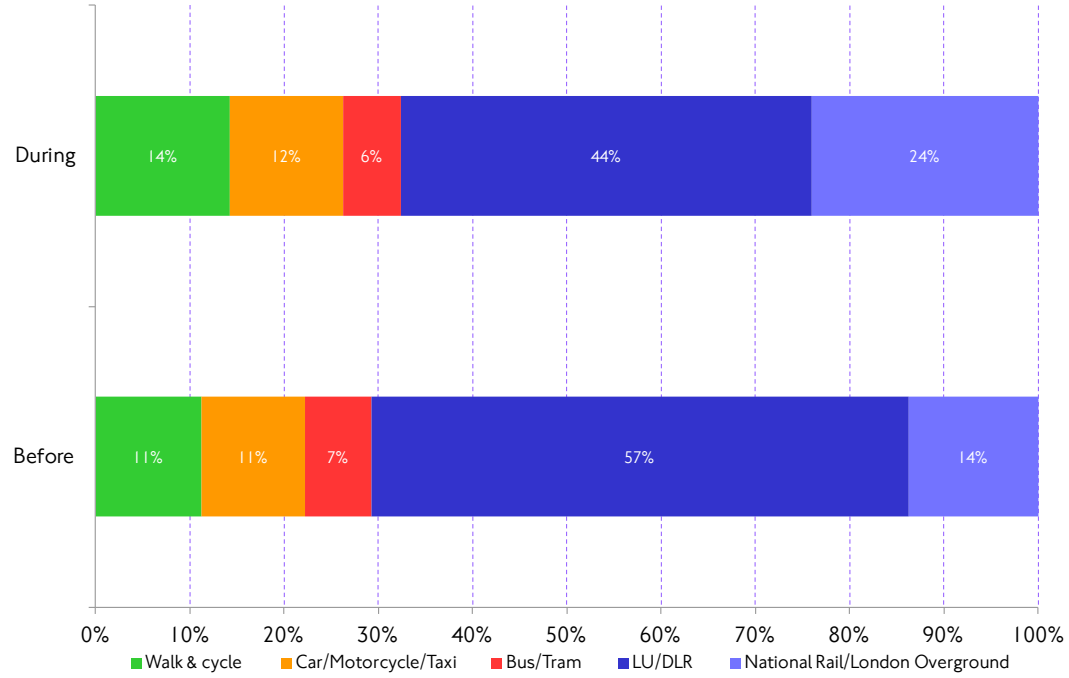
The substantial decrease in business travel may indicate that business journeys are more discretionary than commuting journeys or that they can be more easily re-scheduled. It may also be a knock-on impact of the changes to commute travel, with meetings cancelled because attendees are working at home or at a different location to normal.

There was a small increase in the use of information and communications technology: 7 per cent of business travellers during the Games used telephone conferencing more during the Games than they had done previously, 4 per cent used instant messaging more and 2 per cent used video conferencing more.

Sixty-five per cent of normal business travellers made a change to their journeys and 35 per cent travelled as normal, six per cent used an alternative route, six per cent a different mode of transport and seven per cent changed the time of their journey by an hour or more.

Figure 10.74 shows the mode share before and during the Games of business travellers. This shows mode shift away from London Underground and the DLR and towards National Rail, walk and cycle.

Figure 10.74 Mode share of business trips before and during the Games.




*Source: TfL Personal Travel Panel Survey.*
*Base: 755 respondents.*

### Understanding changes in travel for non-work purposes

This section focuses on changes made to journeys for shopping, leisure, personal business and other purposes during the Games. Journeys for these purposes account for 76 per cent of all journeys in London on an average day. A total of 2,324 respondents to the TfL Panel Survey made shopping, leisure, personal business and other journeys during the Games.

Between four and five in ten of those travelling for non-work purposes made a change to their travel, most of whom reduced their regular travel. This may in part reflect changes in leisure activities as a result of the Games, with Londoners for example choosing to take part in Games-related activities or stay at home to watch the Games rather than their normal shopping and leisure habits. The choices made are quite different to those for commute and business travel, with changing mode the most (rather than least) popular change. Nevertheless, relatively few made any change to journeys made other than reducing their travel.

Generally, when respondents changed their mode of travel for these journeys there was an increase in walking and cycling journeys and a decrease in the use of London Underground/ DLR, although this did vary by journey purpose.

Table 10.25 Changes to travel for shopping, leisure, personal business and other purposes during the Olympic Games, of those who would normally have made a journey during the period.

| | Reduced | Re-timed | Re-routed | Re-moded | Many any change |
|---|---|---|---|---|---|
| Shopping | 30% | 7% | 5% | 8% | 44% |
| Leisure | 25% | 5% | 7% | 9% | 42% |
| Personal business | 41% | 4% | 6% | 6% | 54% |

*Source: TfL Personal Travel Panel Survey.*
*Base: 1,526 shoppers, 1,790 leisure travellers, 1,052 personal business travellers.*

## 10.19 Operational performance of the public transport networks – a summary

During Games time TfL's public transport networks operated more services and carried more people than ever before, They also did this with levels of reliability that were typically higher than the generally excellent levels more usually attained.

Table 10.26 brings together and summarises the key measures of service performance during Games time. These are set against appropriate comparison baselines in the table (as stated).

Table 10.26 Summary of operational performance for the principal transport networks during Games time.

| | Baseline or other comparison | Olympics | Paralympics |
|---|---|---|---|
| **London Underground** | | | |
| Scheduled place-kilometres | 4,803,758 | 5,249,048 | 5,160,852 |
| Actual place-kilometres | 4,603,923 | 5,098,194 | 5,082,787 |
| % train kilometres operated | 97.1 | 98.0 | 99,0 |
| % days 'good service' operated | 71 | 80 | 89 |
| Customer satisfaction score (out of 100) | 79 | 83 | 83 |
| **DLR** | | | |
| Planned vehicle kilometres | | | |
| Departure score (%) | 97.6 | 98.9 | 98.5 |
| Reliability score (%) | 97.5 | 99.1 | 98.7 |
| **London Overground** | | | |
| PPM Network (%) | 96.6 (2011 summer) | 98.2 | 98.5 |
| PPM North London Line ((%) | 94.1 (2011 summer) | 98.4 | 98.2 |

| | | | |
|---|---|---|---|
| **National Rail** | | | |
| National Rail (Javelin only) – Public Performance Measure (%) | 94.9 (2011/Olympics)<br>89.3 (2011/Paralympics) | 97.3 | 94.8 |

*Source: TfL Group Planning, Strategic Analysis.*

## 10.20 Air quality

Weather conditions in London during Games time were generally favourable for air quality. Concentrations of $PM_{10}$ (particulate matter) and $NO_2$ (nitrogen dioxide) were comparable to those of equivalent (non-Games) period in summer 2011, albeit in the context of prevailing levels of pollution in London that, for $NO_2$, exceed air quality objectives. However, a severe Ozone ($O_3$) episode affecting much of Northern Europe did develop between 23 and 26 July 2012, immediately prior to the first day of the Olympics. A less severe episode developed over the last few days of the Olympics. These events are not atypical for the Summer period, being caused by the action of sunlight and high temperatures on pollution emitted from vehicles and industry, the reactions taking place over several days as air travelled over continental Europe, gathering pollution, before reaching London. These episodes were not directly linked to the Games or related traffic management arrangements. As suggested by modelling undertaken prior to the Games, there is no clear evidence from the daily concentration data of a differential effect – either favourable or adverse – from the Olympic and Paralympic Route Networks and related traffic management arrangements on air quality in London.

**TfL's air quality impact assessment of the ORN and PRN and related traffic management proposals**

TfL published an air quality impacts assessment of the Olympic and Paralympic Route Network proposals and related traffic management arrangements in March 2012 (available at: http://www.tfl.gov.uk/assets/downloads/corporate/tfl-orn-air-quality-report-march-2012.pdf). This quantified changes in emissions of local air quality pollutants $NO_x$ (oxides of nitrogen), $NO_2$ (nitrogen dioxide) and $PM_{10}$ (particulate matter) arising from the projected changes in traffic volumes, composition and speed, reflecting the ORN and PRN proposals. It compared projected Games time traffic with a baseline that reflected a non-Games summer 2012. It also described air quality model runs, based on these emissions changes, which quantified changes to ambient air quality (pollutant concentrations) in relation to UK air quality objectives for these pollutants.

The modelling used a 'worse case' set of assumptions for ORN and PRN traffic change, and produced outputs that could be examined at the local scale. In line with conventional practice, the air quality modelling used a like-for-like set of meteorological inputs that were reflective of 'typical' summer weather conditions in London, although obviously the actual weather experienced during Games time would be a major determinant of out-turn air quality, this being the primary driver of short-term variations in ambient air quality.

The conclusion from this work was that the impacts of the proposals on emissions and concentrations atmospheric pollutants would be small in scale and marginally beneficial overall. This was the logical outcome of less traffic on the ORN and PRN themselves (given that these were optimised for GFVs at lower expected volumes than prevailing general traffic on these roads), combined with less traffic throughout London as a whole, reflecting the area-scale traffic reduction assumptions arising from TDM measures. Table 10.27 shows the projected impact of the proposals on

emissions, both at the Greater London scale on an a annual-total basis (for comparability with other estimates), and also looking more specifically at impacts for the month of August 2012 (notionally reflecting the Games period) for the part of London most directly affected - the area subject to ATM, broadly corresponding to central and Inner London.

Table 10.27 Projected changes in emissions of local air quality pollutants for combined 2012 Games traffic management arrangements.

| | Greater London/annual totals (tonnes) | | | Inside ATM area/August 2012 totals (tonnes) | | |
|---|---|---|---|---|---|---|
| | 2012 non Games | 2012 with Games | Difference (%) | 2012 non Games | 2012 with Games | Difference (%) |
| $PM_{10}$ all sources | 2184 | 2179 | -0.2 | 71 | 68 | -3.5 |
| $PM_{10}$ all road traffic | 1201 | 1196 | -0.4 | 38 | 36 | -6.4 |
| $PM_{10}$ exhaust only | 470 | 468 | -0.3 | 24 | 22 | -6.9 |
| Oxides of nitrogen ($NO_x$) all sources | 42,066 | 42,012 | -0.1 | 14 | 14 | -5.6 |
| $NO_x$ road traffic | 15,175 | 15,120 | -0.4 | 517 | 494 | -4.3 |

*Source: TfL Group Planning, Strategic Analysis/ Kings College Environmental Research Group.*

The assessment also contained maps showing projected changes in pollutant concentrations in relation to the relevant EU limit values for air quality.

For $PM_{10}$, the majority of roads in London were projected to see relatively small reductions in concentrations (and hence days when concentrations exceeded Air Quality Objectives). This also applied to the majority of the ORN and PRN, reflecting Games Family traffic at lower than prevailing daily flows. In some cases, largely on roads around the ORN and PRN that were projected to see diverted traffic, together with parts of the networks in the vicinity of the Olympic Park, concentrations were projected to increase, although in no case was this change material in relation to London's projected compliance with air quality objectives.

For $NO_2$, the projected pattern of change was broadly similar to that for $PM_{10}$, although, unlike $PM_{10}$, London in 2012 was not projected to be in a state of compliance with the relevant air quality objective.

Although these projected impacts were largely benign overall, TfL took a precautionary approach by arranging mitigation, principally in the form of a number of cleaner buses and dust suppressant (Calcium Magnesium Acetate) application for sensitive areas, the operation of cleaner buses continuing indefinitely beyond the Games.

### Actual air quality across summer 2012

Ambient air quality is measured at over 100 sites across London, data for most of these being publicly-available via the London Air Quality Network (LAQN, see: http://www.londonair.org.uk). This section looks at actual trends over summer 2012, which reflect a combination of factors including the weather. It does not constitute a

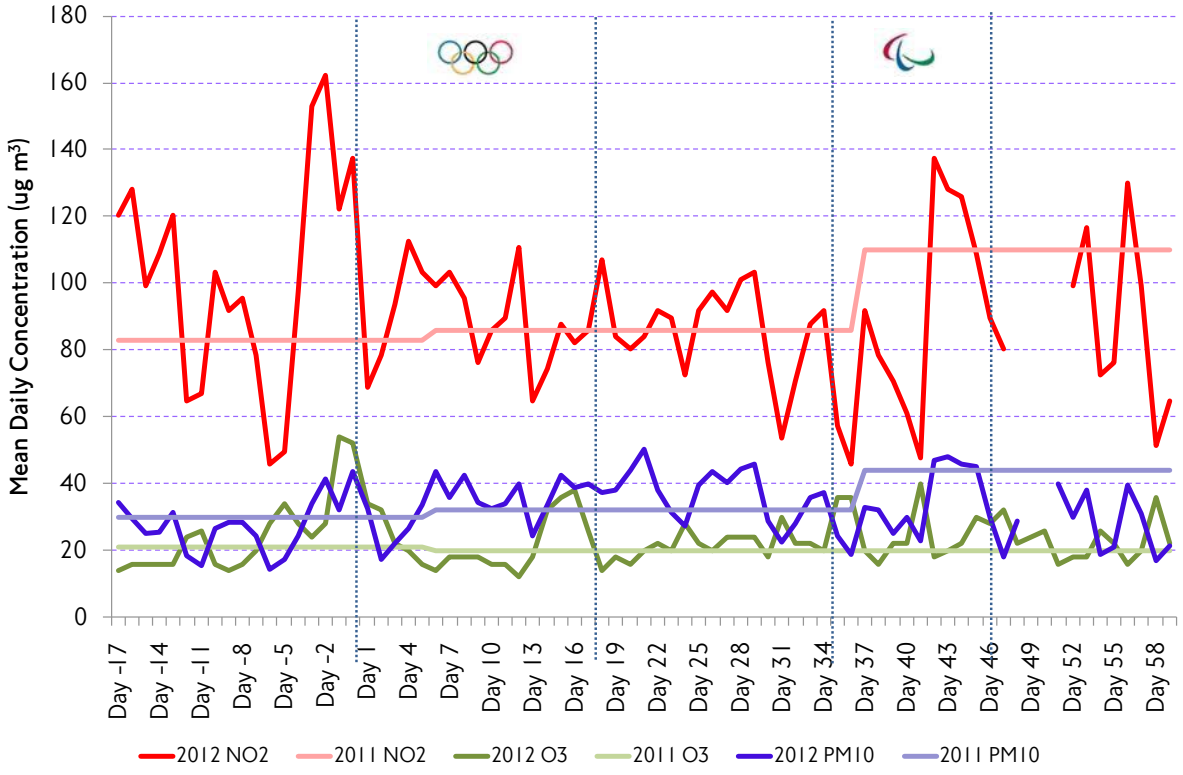
full analytical study of the specific impacts Games time traffic management on air quality in London.

**Monitoring sites**

This section looks at actual measured air quality across summer 2012. Four 'indicator groups' of sites are chosen to illustrate trends. The first of these is the Marylebone Road kerbside site, located opposite Baker Street station. Marylebone Road was a part of the ORN and PRN and had a pair of dedicated Games Lanes in place, although these were not always operational. Being a 'kerbside' site, readings at this location would be expected to fairly directly reflect road traffic sources. The second site is in the borough of Tower Hamlets adjacent to the A12 trunk road as it emerges from the Blackwall Tunnel. This 'roadside' site, set some distance back from the carriageway, would again be expected primarily to reflect road traffic emissions, although to a less direct degree than Marylebone Road. The A12 at this location was a key part of the ORN and PRN leading directly to the Olympic Park, with dedicated Games Lanes provided. The third indicator group comprises a selection of representative roadside sites (with values averaged over the sites) in Inner London, these again broadly reflecting road traffic emissions. Finally, there is a set of representative Outer London 'background' sites. Sited away from major roads and in parts of London that usually see relatively low levels of pollution, these sites would give an indication of trends in 'background' air quality – an important factor in the development of pollution episodes.

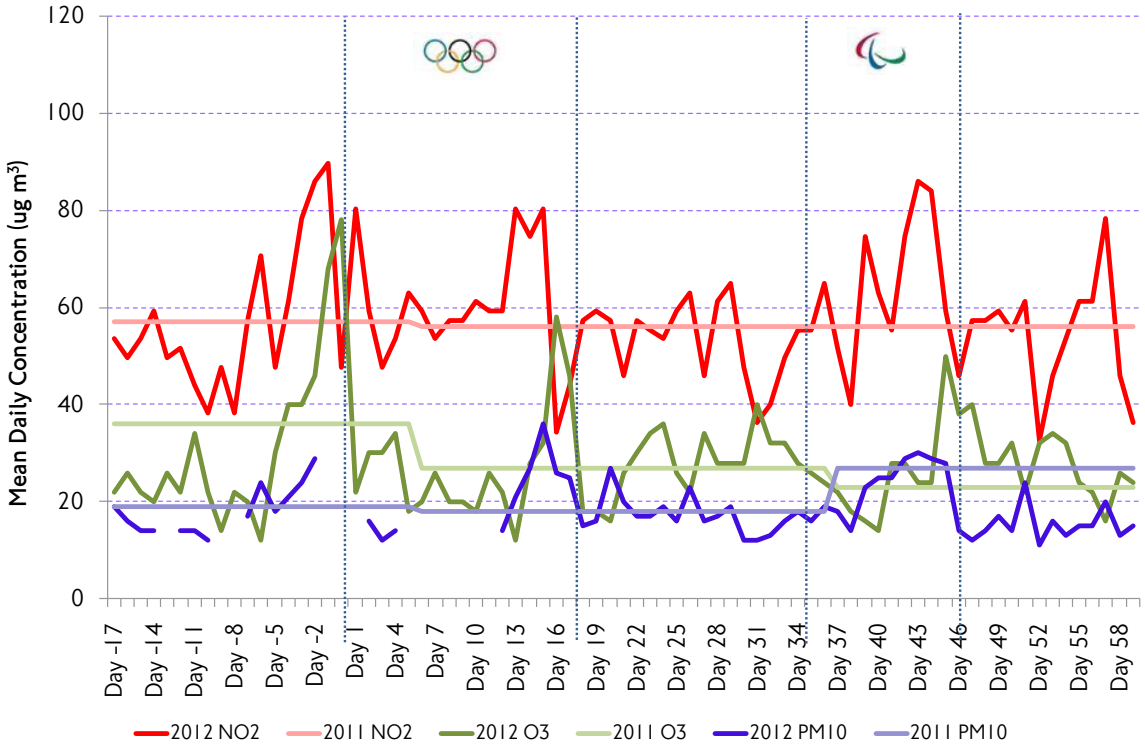
Results from these sites are shown by figures 10.75 to 10.78. Each graphic plots daily average concentrations against average monthly concentrations for the equivalent period in 2011. Monthly concentrations for 2011 are used for clarity, although it should be recognised that, as in 2012, the average values for 2011 encompass considerable daily variation.

Figure 10.75 Observed air quality trends across summer 2012 (provisional data). Marylebone Road kerbside site (central London, ORN and PRN).



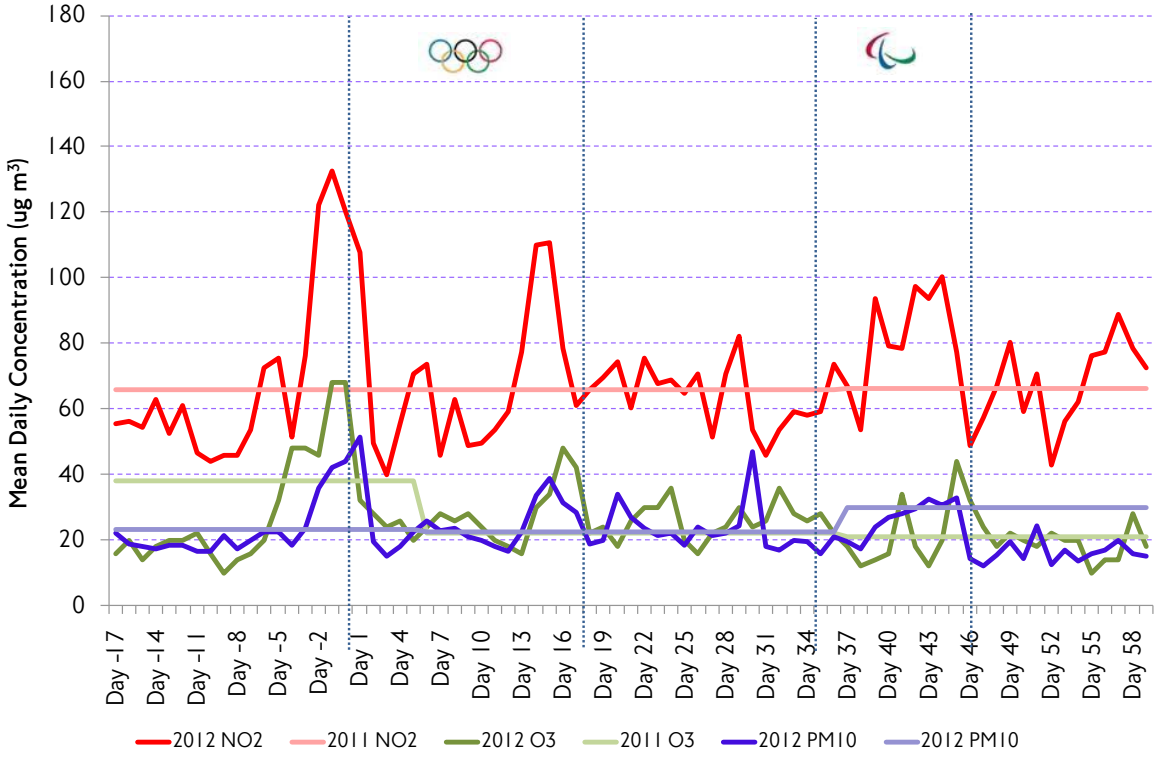

*Source: London Air Quality Network.*

Figure 10.76 Observed air quality trends across summer 2012 (provisional data). Tower Hamlets (A12 Blackwall) roadside site (Inner London, ORN and PRN).



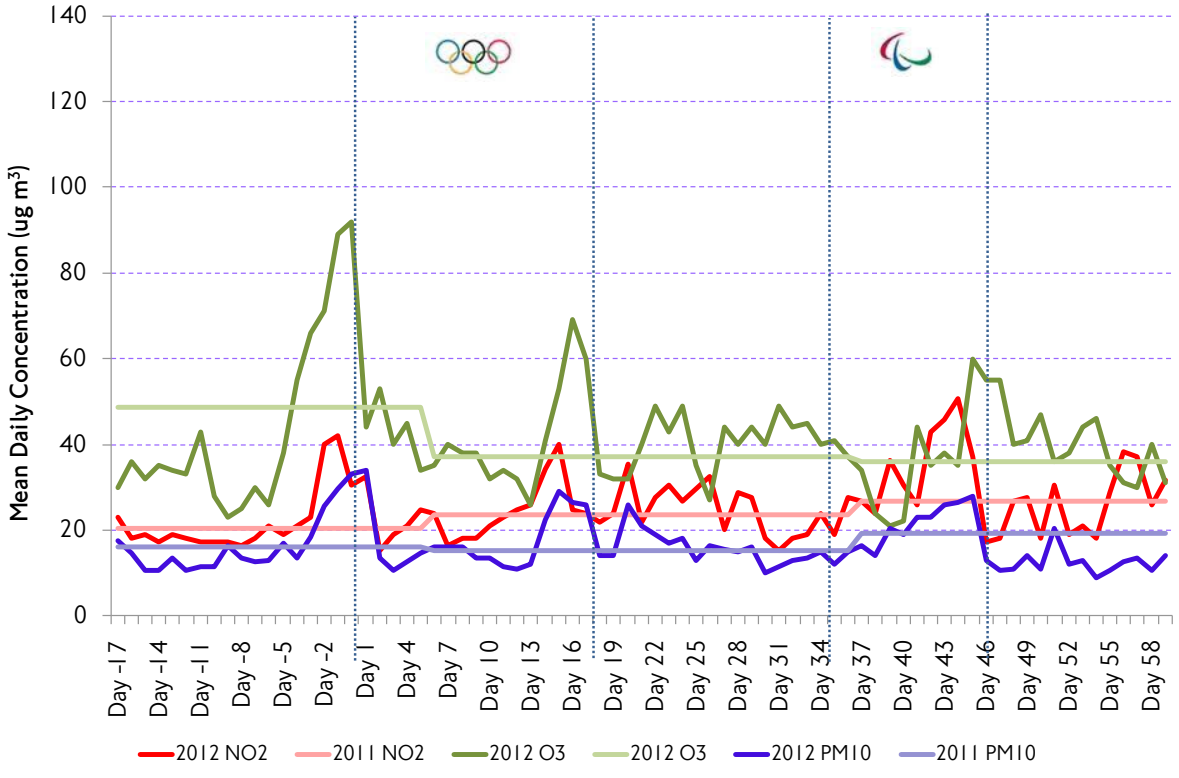

*Source: London Air Quality Network.*

Figure 10.77 Observed air quality trends across summer 2012 (provisional data). Inner London representative roadside sites.




*Source: London Air Quality Network.*

Figure 10.78 Observed air quality trends across summer 2012 (provisional data). Outer London representative urban background sites.




*Source: London Air Quality Network.*

### Ozone ($O_3$)

Ozone is a secondary pollutant that forms in the atmosphere from other gases. This reaction is driven by sunlight, and therefore mean ozone concentrations are usually highest during May, June and July, when the days are longest. Easterly winds transport ozone and other precursor pollutants over the UK from Continental Europe. During periods of warm, sunny weather, this trans-boundary ozone combines with ozone generated from pollutants emitted from within London to cause episodes, often called 'summertime smog'. In the short term, ozone is destroyed by pollution freshly emitted from vehicle exhaust. For this reason, concentrations at the roadside tend to be relatively low.

Across all four indicator groups, the highest ozone concentrations are found in the Outer London background group, as would be expected. Two ozone episodes – before the start and towards the end of the Olympics – are clearly visible. These were caused by the action of sunlight and high temperatures on pollution emitted from vehicles and industry, the reactions taking place over several days as air travelled over continental Europe, gathering pollution, before reaching London. These episodes were therefore not directly linked to the Games or related traffic management arrangements.

### Nitrogen dioxide ($NO_2$)

Nitrogen dioxide can be emitted directly from vehicle exhaust ('primary $NO_2$') or form in the atmosphere ('secondary $NO_2$'), principally from a reaction between nitric oxide (NO) and ozone. While cleaner engines and emissions control technology have been successful in reducing levels of NO in London, annual mean $NO_2$ concentrations remain above the UK Air Quality Objective in many areas. This has been blamed, in part, on the increasing popularity of diesel vehicles, which emit more primary $NO_2$ than petrol vehicles.

Looking at the figures, again as would be expected, highest $NO_2$ concentrations were observed at Marylebone Road, with prevailing concentrations about 50 per cent higher than the UK air quality objective (40ug/$m^3$). Lowest concentrations were found at background sites in Outer London, these typically being below the air quality objective. Under certain weather conditions, concentrations of $NO_2$ are related to ozone, as this combines with NO from vehicles to create secondary $NO_2$, with higher ozone concentrations facilitating this reaction. It is therefore possible to see a distinct peak in $NO_2$ concentrations corresponding to the first of the 2012 Games time ozone episodes described above. Looking across the actual Olympic and Paralympic Games periods, the variability in daily concentrations is indistinguishable from that which would be expected under contemporary non-Games conditions, and there is no visible differential impact from the ORN and PRN and related traffic management arrangements.

### Particulate matter ($PM_{10}$)

Particulate matter comprises a mix of natural and man-made substances from a variety of sources. Particles can be formed by combustion (vehicular, industrial or natural), abrasion (tyre and brake wear) and chemical reaction (organic aerosols). $PM_{10}$ refers to particulate matter in the atmosphere that is less than 10ug in diameter. It incorporates $PM_{2.5}$ (fine particles) between 2.5 and 10ug in diameter. The composition of a mass concentration of particulate varies according to the weather

and local emissions, with easterly winds typically bringing fine secondary aerosols and limiting the dispersion of locally-generated particulate.

Across all indicator site groups, $PM_{10}$ concentrations showed relatively little variation across Games time. Prevailing concentrations at Marylebone Road remained below the Air Quality Objective level of 50ug/$m^3$, although as would be expected this site recorded the highest concentrations. Concentrations at other site groups were correspondingly lower. As with $NO_2$, there is no visible differential impact from the ORN and PRN and related traffic management arrangements.

## 10.21 Games time transport – lessons learned and Legacy

A combination of several factors made the Games a transport success. Among the most significant were:

- **An integrated transport system** - TfL's unique breadth of responsibilities in the context of a host city, plus measures such as the London spectator Travelcard, multi-agency co-ordinated operations and customer communications all helped to greatly improve traveller experience.
- **Outstanding levels of operational performance** – transport reliability during the Games was strong, at 98 per cent or over on the Tube, DLR and London Overground, continuing the improving performance of recent periods, and reflecting enhanced maintenance and other measures for Games time,
- **Exceptional customer experience** - with extra staff and volunteers, eye-catching magenta signage, and integrated real time customer information, transport operators provided an exceptional customer experience for spectators, Games Family and regular travellers over the summer.
- **Effective management of the road network** - TfL balanced the needs of Games Family and regular road users effectively, through active traffic management, the design of robust Olympic and Paralympic Route Networks, and by opening Games Lanes (for GFVs only) to normal traffic when they were not needed.
- **Successful communication strategy and Travel Demand Management** - with an integrated communications and travel demand management strategy, travellers were informed in real time about the best ways to use the transport system, and by following advice to avoid the busiest times and places, kept the transport system moving despite record passenger numbers.
- **Effective freight planning and operations** - following a comprehensive engagement programme, advice and support from the Traffic Commissioners and the development of tools such as the Freight Journey Planner, freight operators and businesses adapted during the Games, keeping London stocked and serviced and demonstrating innovative practices such as quieter out-of-hours deliveries.
- **More walking and cycling across London** - efforts to encourage people to walk and cycle during the Games were successful, with typically 8-9 per cent more walkers across the River Thames and 12 per cent (Olympics) and 25 per cent (Paralympics) more cyclists here than would otherwise have been expected.
- **A more accessible transport system** - efforts were made to make the transport network as accessible as possible. New lifts were installed, accessible shuttle services were provided, manual boarding ramps were used and new audio/visual displays were provided. Extensive alterations to improve accessibility were made to Green Park and Southfields stations ahead of the Games. This was in addition to an already fully accessible DLR, bus network and taxis.

### Key elements of the Games Transport Legacy

As London looks back on a very successful Games, attention now turns to securing their Legacy. The principal transport aspects of this Legacy will be:

- Improved transport capacity and reliability – Games related new infrastructure providing transport services in East London for many years to come.
- Better public transport and road network operations – including continuing use of 'rapid response' arrangements on the Tube.
- A more accessible transport system – with both specific and general improvements either put in place for, or piloted during, the Games.
- Better partnership working among transport providers – using Games-time arrangements such as the Transport Co-ordination centre for future major events and incidents.
- Harnessing the opportunities and lessons learned from Games time Travel Demand Management initiatives – encouraging better journey planning to avoid travel hot-spots and more effectively use the full capacity provided by the transport networks.
- Building on the success of the Travel Ambassador and Incident Customer Service Assistant volunteering programmes during the Games - a volunteering strategy is currently being developed by TfL.
- Continued engagement with freight operators and businesses, including maintaining the Freight Forum, to build on innovative and flexible freight practices employed during the Games. Twice as many freight operators as usual undertook out of hours deliveries during the Games, and a quarter of those who introduced or increased out of hours deliveries intend to continue in the future.
- A comprehensive review of signage on the TfL network in light of the success of the integrated magenta signage scheme used during the Games. The review is considering the end-to-end customer experience of signage in key interchange locations, the quality of accessibility signage across the network, and the possibility for temporary or permanent Games-style signs to improve way-finding.

Travel in London and related reports will continue to explore lessons from the London 2012 transport experience, and TfL will continue to develop and embed beneficial transport policy and operational initiatives based on these for the future.