

Transport for London



Environment Report 2006



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Commissioner's foreword

A clean, healthy environment is crucial for London's future, alongside a successful economy and an inclusive society. This report focuses on Transport for London's (TfL's) work to deliver environmental improvements across the Capital's transport system, including actions to address climate change.

Climate change is a major challenge, with potentially disastrous environmental, economic and social implications. Addressing climate change is a priority for TfL, both in terms of reducing transport-related greenhouse gas emissions, particularly carbon dioxide (CO₂), and ensuring that London's transport system can cope with changing weather conditions. In 2006, TfL developed strategies to tackle the climate change impacts of transport. Simultaneously, solutions were considered that will enable the transport system to adapt to the consequences of a changing climate, including options for cooling London Underground (LU).

TfL is actively seeking to reduce the environmental impact of its own operations and transport in London. Congestion Charging has achieved reductions in CO₂ emissions and air pollution since its introduction, while the new London Construction Consolidation Centre (LCCC) has already demonstrated environmental benefits in its first few months by reducing freight traffic. In 2005/06, we invested significant amounts to support walking and cycling and continued to manage demand for travel through a programme of incentives and information. Since TfL was formed in 2000, there has been a modal shift



of five per cent from car usage to public transport, walking and cycling, saving around 500,000 car journeys per day and an estimated 210,000 tonnes of CO₂ emissions per year.

In 2005/06, 18 per cent of the electricity we used was from renewable energy sources, and trials of low emission technologies, such as hydrogen fuel cell and hybrid diesel-electric vehicles, continued. Innovative paving which absorbs pollution from the atmosphere was installed on a central London street. TfL's efforts to reduce, reuse and recycle also continued, with the use of recycled rubber tyres in level crossing installations and the expansion of newspaper recycling schemes at LU stations.

TfL has been looking further ahead to identify its priorities for tackling climate change and improving the environment over

the next 20 years, as part of the development of the Transport 2025 vision. Plans for the near future include extending the Congestion Charging zone and a London-wide Low Emission Zone (LEZ) that would require heavy goods vehicles, buses, coaches, vans and minibuses to meet minimum emissions standards. TfL's £10bn Investment Programme includes major schemes such as LU improvements, and rail extensions and capacity increases, which will enable more people to switch from the car to public transport, reducing congestion and improving London's environment.

While TfL recognises that there is still a long way to go to make London's transport system truly sustainable, it is laying the groundwork for this.

A handwritten signature in blue ink, appearing to read 'Peter Hendy'.

Peter Hendy
Commissioner
TfL



Section 1 – Summary and introduction

1.1 Summary

TfL is committed to supporting the Mayor's vision for sustainable development in London. Environmental improvement is an essential element of sustainable development, alongside social inclusion and economic growth. As the integrated authority responsible for transport in the Capital, TfL has a major role to play in delivering the Mayor's environmental strategies and underpinning sustainable development.

Transport is one of the main sources of CO₂ emissions in London and TfL is focusing its efforts on reducing the contribution of transport to climate change, while enabling the transport system to adapt to the changing weather conditions that are anticipated. Reduction of transport related air pollution and noise are also high priority objectives, and TfL has a role to play in reducing the impacts of the transport system on the built environment, resource and water consumption, waste, and biodiversity in the Capital.

TfL is working to address climate change and the other environmental impacts of its operations, while enhancing the public transport network so that it remains a safe, reliable and economic alternative to private motor vehicles. It is actively managing travel demand and encouraging Londoners to use more sustainable modes of transport, particularly walking and cycling. Congestion Charging has had a demonstrable impact on air quality and CO₂ emissions in the Charging zone, by affecting how people travel. TfL is also developing the London Freight Plan, and projects like the LCCC, to encourage a shift away from transporting freight by road towards more sustainable alternatives, while ensuring that goods are distributed efficiently.

Increasing the frequency, length and geographical scope of public transport services is expected to have a beneficial impact on the environment by encouraging a shift away from private motor vehicles. Since TfL was formed in 2000, a modal shift of five per cent has been achieved, saving 50,000 car journeys per day. However, it is important to note that increasing public transport services will also impact the environment, until suitable environmentally friendly technologies such as alternative fuels can be implemented on a large scale.

Progress against TfL's environmental objectives is monitored using a series of key performance indicators (KPIs). The performance headlines for 2005/06 are summarised in table 1, alongside key achievements and plans for the future. As environmental KPIs were introduced for the first time in 2003/04, reporting processes are still improving and data have been included on some operations and activities for the first time this year. For the purpose of identifying trends, comparisons have been made between 2004/05 and 2005/06 performance on a like-for-like basis where possible.

TfL will continue to place environmental improvement, particularly climate change mitigation, high on its agenda. Adapting to the expected results of climate change will also be a key challenge. Extension of the Congestion Charging zone and introduction of a London-wide LEZ will help to reduce the impacts of road transport, while the Investment Programme will continue to make public transport, walking and cycling more attractive alternatives to the car.

TfL will continue to monitor and seek improvements to its own operational impacts on the environment, and the wider impacts of transport in London. In 2006/07, TfL will develop plans to comprehensively embed sustainability into its planning, projects and operations, and work towards developing sustainability reporting.

TfL is proud to be supporting the Mayor's vision of a sustainable London and will continue to develop plans and activities to help deliver its contribution towards that vision.

Table 1: TfL's environmental performance headlines

Objective	Performance during 2005/06	Achievements and future plans
<p>Reduce greenhouse gas emissions</p>	<ul style="list-style-type: none"> • CO₂ emissions increased by 2 per cent • Energy use in head office buildings decreased by 0.4 per cent per employee, but increased by 11 per cent per square metre of floor space • Proportion of electricity procured from renewable energy sources increased from 15 to 18 per cent 	<ul style="list-style-type: none"> • Preparation of a Climate Change Action Plan for TfL commenced. TfL is also contributing to a plan for London as a whole • More efficient use of energy in LU stations was encouraged. Future campaigns are planned for other TfL locations • Hydrogen fuel cell and hybrid diesel-electric bus trials continued, leading to plans to implement both technologies on a larger scale • Renewable energy was procured through electricity contracts and renewable energy technologies were installed on TfL sites. Growth in both areas will be pursued in future

Table 1: TfL's environmental performance headlines – continued

<p>Reduce pollutant emissions to air</p>	<ul style="list-style-type: none"> • Emissions of oxides of nitrogen (NO_x) decreased by 0.3 per cent • Fine particulate (PM₁₀) emissions decreased by more than 20 per cent • Sulphur dioxide (SO₂) emissions increased by 13 per cent 	<ul style="list-style-type: none"> • Vehicle technology improvements, such as fitting diesel particulate filters to buses, continued • TfL assisted London boroughs' activities to support air quality improvements, including trials of paving slabs which absorb NO_x from the atmosphere • Plans were developed to introduce a London-wide LEZ in 2008, for public consultation in 2006
<p>Reduce transport-related noise</p>	<ul style="list-style-type: none"> • LU noise complaints were down by 2 per cent • 11 per cent of LU track has been continuously welded • 70 per cent of the Transport for London Road Network (TLRN) has been covered with lower noise surface material 	<ul style="list-style-type: none"> • LU and its Public Private Partnership (PPP) suppliers managed the noise impacts of increased activity caused by the major investment programme • A Traffic Noise Action Programme started to be developed for the TLRN • Buses that are more than 2dB(A) lower than the legal noise limit will start being introduced during 2006/07
<p>Reduce resource consumption and improve green procurement</p>	<ul style="list-style-type: none"> • The proportion of recycled paper purchased increased to 19 per cent • The proportion of recycled toner cartridges purchased increased to 23 per cent • Total amounts of both paper and toner cartridges consumed increased 	<ul style="list-style-type: none"> • The Greater London Authority's (GLA's) Sustainable Procurement Policy and the Mayor's Green Procurement Code continued to be integrated into TfL's procurement practices • Recycled materials were used where practicable, such as flooring materials made from recycled rubber tyres • Procurement practices will continue to be improved, including building requirements into contracts with suppliers

Table 1: TfL's environmental performance headlines – continued

<p>Maintain and, where possible, enhance the quality of London's built environment</p>	<ul style="list-style-type: none"> • The cleanliness and condition of the built environment managed by TfL improved • The quality of the street environment on the TLRN was judged as satisfactory 	<ul style="list-style-type: none"> • TfL will continue to measure envirocrime (litter or graffiti) on rolling stock and in stations, and tackle the problem by engaging with stakeholders and working with the British Transport Police • It will also work with boroughs, suppliers and stakeholders to improve the design of the streetscape and enhance the quality of the built environment which it manages
<p>Reduce the waste generated through TfL activities, by applying the principles of reduce, reuse, recycle</p>	<ul style="list-style-type: none"> • The amount of commercial and industrial waste decreased by 18 per cent. Twenty-six per cent of it was recycled, up slightly on the previous year • The amount of hazardous waste increased, due to reclassification of waste materials and LU's major investment programme • The amount of construction and demolition waste also increased substantially, due to increasing work on LU. In total, almost 50 per cent of it was recycled 	<ul style="list-style-type: none"> • A paper and newspaper recycling scheme introduced by LU and its PPP suppliers was expanded, and plans developed to roll it out across the network • In partnership with the boroughs, TfL is considering the introduction of a demonstration recycling facility for road-related construction waste, to enable it to be used as footway base material and trench backfill

Table 1: TfL's environmental performance headlines – continued

<p>Promote the sustainable transport of waste</p>	<ul style="list-style-type: none"> • Suitable KPIs will be developed once the London Freight Plan has been finalised 	<ul style="list-style-type: none"> • The London Freight Plan was drafted for public consultation in mid-2006 • The LCCC performed well in its first six months, making deliveries more efficient and reducing environmental impacts substantially
<p>Maintain and, where possible, enhance the quality of London's natural environment</p>	<ul style="list-style-type: none"> • Most of LU's open land holdings have been habitat surveyed • The Major Projects team undertake biodiversity surveys as part of environmental impact assessments 	<ul style="list-style-type: none"> • LU and its PPP suppliers started to develop a Biodiversity Action Plan • Work commenced on a Highway Asset Management Plan, which will include biodiversity objectives • A comprehensive ecological survey was undertaken for the proposed West London Tram route
<p>Reduce consumption of water resources and implement efficiency measures</p>	<ul style="list-style-type: none"> • Water consumed per million km travelled by passengers increased by 2.4 per cent • Water consumed in head office buildings per employee decreased by 8.8 per cent 	<ul style="list-style-type: none"> • A target of 9m³ of water consumption per head office employee has been set for 2006/07 to match Government benchmarks • Possibilities are being explored for improving the efficiency of water use in vehicle washes, including recycling water

1.2 Introduction

The Mayor's vision is for London to become an exemplary sustainable world city based on strong and diverse economic growth; social inclusion to allow all Londoners to share in the Capital's future success; plus fundamental improvements in environmental management and use of resources.

To achieve the objectives of economic growth, social inclusion and environmental improvement, the Capital needs an efficient, accessible, secure and clean transport system. TfL is constantly striving to ensure that the Capital's transport system meets these criteria and underpins sustainable development.¹

Climate change is a major challenge to sustainable development, with potentially severe implications for London. The London Plan is the spatial development framework for the Capital. Its recent review had a strong focus on the need to mitigate the effects of, and adapt to, climate change – issues of great relevance for the transport sector.

The Mayor has produced five environmental strategies, which set out his priorities and proposals for making London a cleaner, greener, more sustainable city. In addition to energy and air quality, they cover ambient noise, biodiversity and waste. The Mayor's Transport Strategy, Cycling Action Plan and Walking Plan also have strong links to the delivery of the Mayor's environmental objectives.

TfL is working to reduce the environmental impact of its operations while enhancing the public transport network so that it remains

a safe, reliable and economic alternative to private motor vehicles. It is increasing activity to manage travel demand and encourage Londoners to use more sustainable modes of transport, particularly walking and cycling, and to encourage a shift away from transporting freight by road towards more sustainable alternatives. In practice, TfL is influencing travel demand by implementing fiscal and physical measures, engaging in land use policy and planning decisions, and providing incentives and information.

This report summarises the work that TfL is undertaking to address climate change and improve the environment. It looks at changing demand for transport, and describes TfL's approach to environmental management and its environmental performance during 2005/06.

LU has produced its own environment report, and many of TfL's partners and suppliers also produce reports that contain information relevant to London's transport system.

TfL's financial and operational performance is described in the Annual Report,ⁱ while proposals for future investment are contained in the Investment Programme and the Business Plan.ⁱⁱ Performance against some of TfL's broader social responsibilities is included in the Mayor's Annual Equalities Report.ⁱⁱⁱ

Box 1: TfL's operations



TfL is the integrated authority responsible for London's transport system, which includes:

- **London Underground** – LU operates the trains, runs the stations and manages a programme of maintenance and upgrades delivered by PPP suppliers
- **Surface Transport** – TfL manages London Buses; Dial-a-Ride, a door-to-door service for disabled people; and Victoria Coach Station. London River Services manages piers on the River Thames, and the Public Carriage Office regulates taxis and private hire vehicles. TfL is also responsible for managing the Croydon Tramlink concession.

- **Streets** – TfL manages the 580km TLRN, all of the city's 5,100 traffic signals and Congestion Charging. It also implements walking, cycling and road safety initiatives
- **London Rail** – TfL manages Docklands Light Railway (DLR), and will take on management of part of the National Rail network in future as London Overground

TfL is one of the GLA's functional bodies, accountable to the Mayor of London. Its corporate functions include Group Procurement; Group Property and Facilities, which runs the head office buildings; the Major Projects team; and Borough Partnerships.



Section 2 – Changing demand for transport

2.1 Changing demand for transport

Managing demand for transport and encouraging a shift to more sustainable modes are fundamental to protecting and enhancing the environment.

London's population and economy are growing and, together with lifestyle changes, this growth is driving increasing demand for transport. On an average day in 2005, Londoners made 27.2 million journeys, an increase of 100,000 journeys per day compared to the previous year and seven per cent more than during 2000.^{iv} Figure 1 shows which modes of transport were used for these journeys.

The daily modal shares described in figure 1 conceal some interesting travel patterns, which are revealed when the modal shares are examined for journeys in different parts of London at different times of day. For example, only eight per cent of the Capital's residents

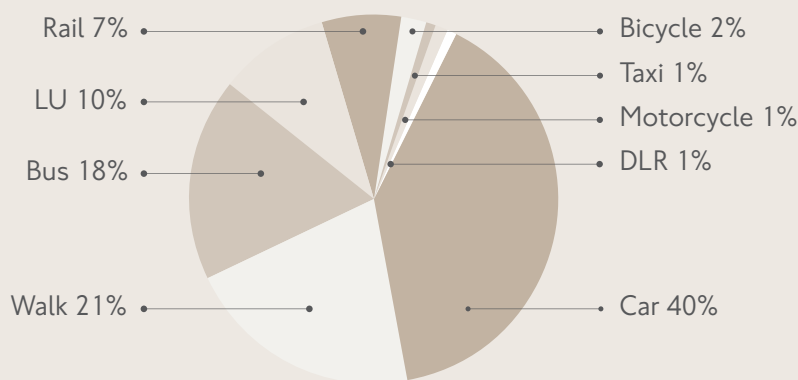
travel into central London by car during the morning peak, whereas 50 per cent of trips into and within outer London throughout the day are made by car.

TfL's activity to encourage more people to use public transport has seen year-on-year improvements. Since TfL was formed in 2000, there has been a modal shift of five per cent from car usage to public transport, walking and cycling, saving around 500,000 car journeys per day, and an estimated 210,000 tonnes of CO₂ emissions per year.²

Table 2 compares the number of passenger journeys on TfL's various modes in 2005/06 with figures for 2004/05. A detailed table of passenger journeys and km travelled during both years is presented in table A.1, appendix A.

The number of bus passenger journeys in 2005/06 was one per cent higher compared to the previous year. This follows a period of significant growth since 1999, during which bus passenger journeys increased

Figure 1: Modal shares of daily journeys in London (2005)



Source: Figures in Table 1.1.1, London Travel Report 2006^{iv}

Table 2: Number of passenger journeys on public transport, by mode

Transport mode	Passenger journeys, 2005/06 (million)	Change since 2004/05
Buses	1,816	+1%
LU	971	-0.5%
DLR	53	+6%
Croydon Tramlink	22.5	+3%
London River Services	2.1	+3%
Dial-a-Ride	1.2	-2%

by 40 per cent. There was a small decrease of 0.5 per cent in passenger journeys on LU during 2005/6, as a result of service disruption and a short-term shift to other modes of transport following the 7 July bombings.

DLR saw an increase of six per cent in passenger journeys compared with the previous year, supported by extended routes that opened in December 2005. Croydon Tramlink and London River Services each saw increases of three per cent during the year, while Dial-a-Ride journeys decreased by two per cent.

Substantial growth in London's population and economy is expected to continue over the next 20 years. The Transport 2025 vision, published by TfL in November 2006, indicated that by 2025 and additional four million journeys could be made every day in London. It also set out TfL's thoughts on how this future increase in travel could be managed in a socially and environmentally sustainable manner.^v

The goal of a more sustainable transport system can be achieved by a combination of:

- Getting the best out of the existing public transport system
- Investing in new public transport capacity
- Promoting and improving facilities for walking and cycling
- Managing demand for travel
- Reducing the impacts of freight distribution

2.1.1 Getting the best out of the existing public transport system

Maximising the efficiency of the existing public transport system is an important goal for TfL. It will contribute to reducing the environmental impacts of transport by ensuring that services operate efficiently and assets are well maintained. It will also make public transport services more reliable and attractive, in turn encouraging more people to make the shift away from car use.

The LU renewal programme, being delivered in partnership with the PPP suppliers Metronet and Tube Lines, is upgrading stations and infrastructure, and improving the rolling stock. In 2005/06, the rebuild of Wembley Park station was completed, and refurbished trains started to be delivered on the District line.

Improving public transport interchanges is a priority for TfL. In 2005/06, the Finsbury Park Transport Interchange Project delivered better accessibility, security, information and facilities for passengers. Progress was also made on a state-of-the-art bus station at Edmonton Green. The new Western Ticket Hall at King's Cross was opened in summer 2006, which offers improved accessibility to the Underground and increased capacity in time for the opening of the Channel Tunnel Rail Link and the new Thameslink station.

TfL invested £290m in a range of Surface Transport and Streets initiatives during 2005/06, including a new bus radio and information system, accelerated renewal and improvements on the TLRN, and bus priority measures.

2.1.2 Investing in new public transport capacity

TfL is investing in new public transport capacity, by delivering major projects and developing detailed proposals for future improvements.

A seventh car was added to every Jubilee line train at the beginning of 2006, increasing passenger capacity by 17 per cent, and four new trains were also added. Capacity on the Underground will benefit further as work implemented with the PPP suppliers continues.

The new DLR line to London City Airport was opened during 2005/06 and around 10,000 people are now using the service every week day. Work is underway on an extension of the DLR to Woolwich Arsenal and an upgrade to provide three-carriage trains on the DLR – both are due for completion by 2009. An extension to Stratford International railway station is also planned, for completion during 2010.

TfL is working in partnership with the Department for Transport to develop Crossrail, which will run from west to east London, connecting Heathrow and Maidenhead with major stations in central London, all the way through to Shenfield and Abbey Wood. The East London Line is being extended to West Croydon in the south and Dalston Junction in the north. These improvements, which will be completed in time for the 2012 Olympics, are part of plans to create an orbital rail route around London.

Croydon Tramlink is potentially being extended to Crystal Palace. Proposals are also being developed for the Cross River Tram, which could connect King's Cross with Brixton and Peckham, and the West London Tram, which could run between Shepherd's Bush and Uxbridge. Bus services will be improved in the Thames Gateway area by the East London Transit and Greenwich Waterfront Transit projects, which will be linked via the proposed Thames Gateway Bridge.

2.1.3 Promoting and improving facilities for walking and cycling

Encouraging people to walk and cycle by providing information, support and better

Box 2: Cycles are secured at Finsbury Park



The new Finsbury Park Cycle Park, opened in March 2006, enables north Londoners to cycle to Finsbury Park, leave their bicycles in secure and weatherproof surroundings and continue their journeys by bus, rail or Tube.

The facility, at one of the busiest transport interchanges outside central London, is an important part of TfL's £11.3m Finsbury Park Transport Interchange Project.

The cycle park is staffed during peak hours and provides secure parking for 125 bicycles,

using a new smartcard operated lock system that TfL is piloting at the facility. Users will be able to use the cards to access the cycle park 24 hours a day, with staff on hand to provide and top-up cards at peak hours during the week, and throughout the day at weekends.

Located on Stroud Green Road, the cycle park is adjacent to both Station Place bus station and Finsbury Park. It provides cyclists with direct access to the park and the London Cycle Network.

facilities, is an important element of promoting a shift to more sustainable modes. Cycling in London is growing fast, with 72 per cent more cycling on London's major roads in 2005/06 compared with 2000 levels. This is close to the target of an 80 per cent increase by 2010, set out in the Cycling Action Plan.

TfL's cycling budget increased from £12m in 2004/05 to £19.2m in 2005/06. This was to enhance a work programme which included new cycle routes and parking facilities, cycle training, information, promotional events and incentives. The completion of the secure cycle park at Finsbury Park was a significant

Box 3: Congestion Charging contributes to emissions reductions



The changes in traffic flow and speeds that have resulted from the central London Congestion Charge have contributed to a reduction in harmful emissions. TfL has revised the estimates presented last year by taking into account wider improvements to vehicle technology and non-exhaust emissions (including particulate emissions from tyre and brake wear).

This revised assessment now suggests that between 2002 and 2003, Congestion Charging reduced NO_x emissions by eight per cent, PM₁₀ by six per cent and CO₂ by 16 per cent within the charging zone. On the Inner Ring Road, emissions of NO_x were unchanged, but there was a three per cent increase in PM₁₀ and a five per cent reduction in CO₂

emissions. Provisional estimates for 2004 suggest that emissions continued to reduce.

It is difficult to measure the impact of emission reductions on measured concentrations of pollutants, as air quality strongly reflects patterns in the weather and background pollution. However, data show that PM₁₀ concentrations measured within the Congestion Charging zone started to fall below the average concentrations measured at roadside sites across inner London for the first time from mid-2005. NO_x levels continued to show a slight downward trend, although NO₂ concentrations across all sites showed little change (these trends are explained further in the Congestion Charging Fourth Annual Monitoring Report).^{vi}

achievement (see box 2). TfL also published the London Cycle Design Standards, which provide advice on the design of cycle infrastructure, and a guide to setting up workplace bike pools. In spring 2005, the first TfL television campaign to promote cycling was launched. Over the past year, TfL provided funding to cycle response teams in the police, ambulance and St. John Ambulance services. It also granted sums of up to £5,000 to 36 community groups as part of the new cycle community grant scheme, which supports projects that promote cycling among diverse communities and hard-to-reach groups.

Over the next year, further work will be carried out as part of the London Cycle Network Plus programme, and additional cycle training and parking programmes will be implemented in partnership with the London boroughs.

2.1.4 Managing demand for travel

Travel demand management (TDM) aims to change travel behaviour, in particular encouraging a shift away from car use to more sustainable modes. It can also be used in certain situations to encourage people to change the extent or frequency of travel, or to switch from overcrowded public transport services, either by travelling at a different time or by walking or cycling instead. TDM policies need to be complemented by improvements in public transport and facilities for walkers and cyclists. In practice, TDM combines 'hard' fiscal and physical measures, land use policy and planning, and 'soft' incentives and information.

Hard TDM can be used to dissuade people, through price, regulation or physical intervention, from using a car in periods or areas

of crowding or congestion. Congestion Charging is an important element of hard TDM, which has achieved environmental benefits in central London by changing people's travel behaviour (see box 3). The proposed western extension to the Congestion Charging scheme is expected to deliver similar benefits to those achieved in central London.

2.1.5 Reducing the impacts of freight distribution

In addition to promoting travel related modal shift, TfL has a Freight Unit which is dedicated to sustainable distribution. This includes promoting a progressive shift of freight, including waste, from road to more sustainable modes such as rail and water. The LCCC (see box 4) is a pioneering project in Bermondsey which the unit is conducting in partnership with several major property development and construction companies.

Consolidation forms a key proposal in the draft London Freight Plan, which is currently under review following a consultation period that ended on 5 September, 2006. Other proposals in the plan that will reduce CO₂ emissions in the Capital include:

- Training on driver skills and logistics planning
- Freight Operator Recognition Scheme, an innovative new scheme to improve operator and driver standards (see www.tfl.gov.uk/fors)
- Journey planning systems
- Greater use of sustainable modes, such as water or rail
- Adoption of alternative fuels and technologies

Box 4: London's first construction industry distribution centre is cutting CO₂ emissions and delivery journey times



The LCCC was launched in January 2006 in south Bermondsey. Materials and equipment can be delivered to the 5,200 square metres centre in bulk, for local distribution to individual construction sites in the quantities needed. This approach allows for greater certainty of supply and is proving to be the key to more efficient distribution, lower congestion and reduced emissions among construction traffic in central London.

In the first six months of operation, the LCCC has seen

- CO₂ emissions lowered by 73 per cent, from 11,985kg to 3,175kg

- Delivery journey times cut by up to two hours
- The number of deliveries needed reduced from around 1,500 to 395
- Delivery accuracy rise to 95 per cent, up from the construction industry average of 50 per cent
- Traffic flows maintained around major construction sites, reducing congestion

The centre, which is servicing four major construction projects, is funded by TfL, Wilson James and users of the facility such as Stanhope Plc and Bovis Lend Lease.



Section 3 – Environmental management

3.1 Environmental management

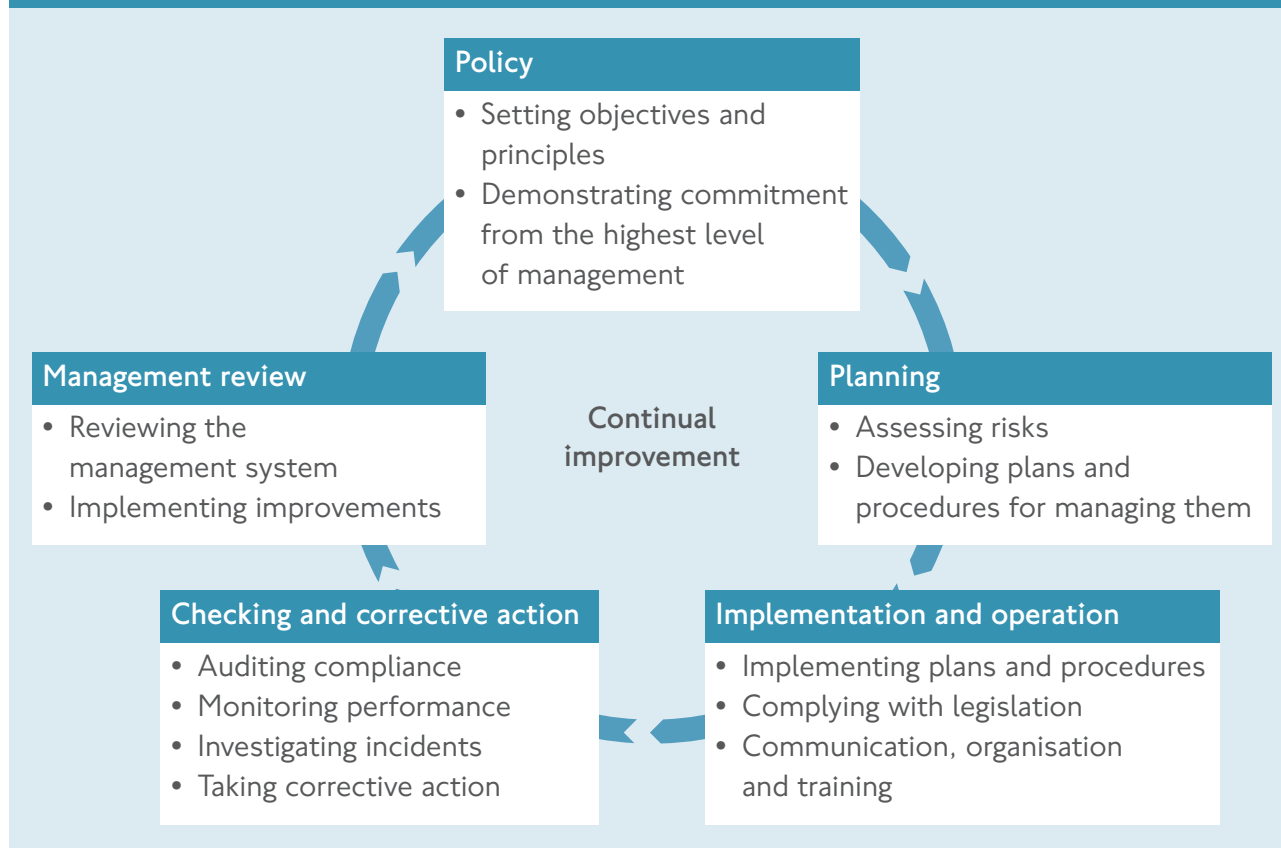
3.1.1 Environmental management systems

TfL is committed to continual improvement of its environmental performance and is developing and implementing integrated health, safety and environmental management systems across the organisation to assist in delivering this.

The management systems follow internationally recognised standards of good practice, including ISO 14001, with the basic structure shown in Figure 2.

During the past year, TfL’s Major Projects team finalised an environmental management system, which will apply to both project and office based activity. The East London Line team also has an environmental management system, and will require its major contractor to implement one. LU completed a review

Figure 2: Structure of TfL’s health, safety and environmental management systems



Box 5: Network management planning enables better environmental management

The new network management planning approach started at the beginning of 2006 with five demonstration projects that cover approximately 40km of the TLRN. The projects will develop and test a methodology for all-inclusive corridor planning.³ Network management planning will take a holistic view of all the maintenance and improvement needs for a corridor, such as road safety, walking, cycling, accessibility and bus priority measures. The works will then be planned and implemented together as an integrated project.

A key environmental benefit of this new approach is the focus on larger sections of the TLRN, which improves TfL's ability to undertake environmental assessment, including the consideration of cumulative environmental effect and mitigation of any adverse effects.



Mike McCrory, Director of Road Network Development, said: 'We are excited about network management planning and the opportunities that this new approach presents for addressing environmental and urban realm priorities on the TLRN.'

of its health, safety and environmental management system, including a thorough appraisal of the environmental content.

Environmental management systems are being implemented across the surface public transport modes, and by Streets. Network management planning, which is currently being trialled, facilitates effective environmental management for Streets projects (see box 5).

3.1.2 Setting objectives and monitoring performance

TfL has set environmental objectives, which support the overall aim of continual improvement and are aligned to the Mayor's environmental strategies. They have been prioritised into three tiers, which reflect their importance to TfL and the level of influence and control TfL has. KPIs have been identified

Table 3: TfL's environmental objectives and KPIs

Tier	Objective	KPI
1	Reduce greenhouse gas emissions	<ul style="list-style-type: none"> • Amount of CO₂ emissions • Amount of energy consumed in head office buildings • Proportion of electricity obtained from renewable sources
1	Reduce pollutant emissions to air	<ul style="list-style-type: none"> • Amount of NO_x emissions • Amount of PM₁₀ emissions • Amount of SO₂ emissions
1	Reduce transport related noise	<ul style="list-style-type: none"> • Number of noise related complaints relating to LU • Percentage of LU track continuously welded • Percentage of TLRN with lower noise surface material • Number and percentage of buses in fleet at least 2dB(A) quieter than the legal requirement
2	Reduce resource consumption and improve green procurement	<ul style="list-style-type: none"> • Number of toner cartridges purchased and proportion that are recycled cartridges • Amount of paper purchased and proportion that is recycled paper
2	Maintain and, where possible, enhance the quality of London's built environment	<ul style="list-style-type: none"> • The amount of envirocrime observed or perceived • The cleanliness and condition of the built environment for which TfL is responsible • The quality of the street environment
2	Reduce the waste generated by TfL activities, by applying the principles of reduce, reuse, recycle	<ul style="list-style-type: none"> • Amount of commercial and industrial waste produced and the proportion recycled • Amount of hazardous waste produced and the proportion recycled • Amount of construction and demolition waste produced and the proportion recycled

Table 3: TfL's environmental objectives and KPIs (continued)

Tier	Objective	KPI
2	Promote the sustainable transport of waste	<ul style="list-style-type: none"> None adopted yet, as TfL is awaiting the completion of the London Freight Plan
3	Maintain and, where possible, enhance the quality of London's natural environment	<ul style="list-style-type: none"> Percentage of TfL open land holdings which have been habitat surveyed for biodiversity
3	Reduce consumption of water resources and implement efficiency measures	<ul style="list-style-type: none"> Amount of water consumed

and are used to monitor progress. Table 3 summarises these objectives and KPIs.

Environmental performance reports are reviewed by the Safety, Health and Environment Committee on behalf of the TfL Board. To share best practice on reporting and other aspects of environmental management, an Environmental Liaison Group brings together people with these responsibilities from across TfL.

The following sections look at the key areas of environmental interest for TfL, with particular reference to the objectives and KPIs. They include highlights of what has been happening over the past year at TfL to improve performance, and a summary of what is coming up.

Environmental reporting KPIs were used by TfL for the first time in 2003/04 and reporting procedures are still evolving. Additional transport modes and business units have been captured each year to date, for example private hire vehicles have been

included for the first time this year.

The effectiveness of data collection is also still improving. Care therefore needs to be taken when considering trends in environmental performance over time. An attempt has been made in the report to highlight the effects of changes in the scope or effectiveness of data collection from year to year, and reveal actual performance trends where possible. For clarity, detailed data tables have been included in appendix A.

As part of an ongoing process to strengthen environmental reporting and promote continual improvement, the objectives and KPIs will be reviewed and redefined as appropriate.



Section 4 – TfL's environmental performance

4.1 Climate change

There is now broad international consensus that climate change is a major challenge which urgently needs to be addressed. The principal cause is the emission of greenhouse gases from human activities. Of the six major greenhouse gases, CO₂ is of particular concern due to the large quantities emitted. CO₂ arising from human activities is primarily generated by burning fossil fuels.

If left unaddressed, climate change could be the single biggest problem facing humanity over the coming decades. Flooding, storm damage, overheating, subsidence and water shortages are all potential consequences of climate change, which could have severe implications for London. The value of land and property in London at risk of tidal flooding from the Thames has been estimated at £80bn. This is currently protected by the Thames Barrier, however, rising sea levels and storm surges would gradually reduce the degree of protection this affords.^{vii}

In addition to reducing CO₂ emissions from transport to mitigate the impact of climate change, adapting to the expected results of climate change will be a key challenge for TfL. The transport system will need to cope with the potential impacts of climate change, such as more frequent flooding incidents and higher temperatures.

4.1.1 London's CO₂ emissions and targets for reduction

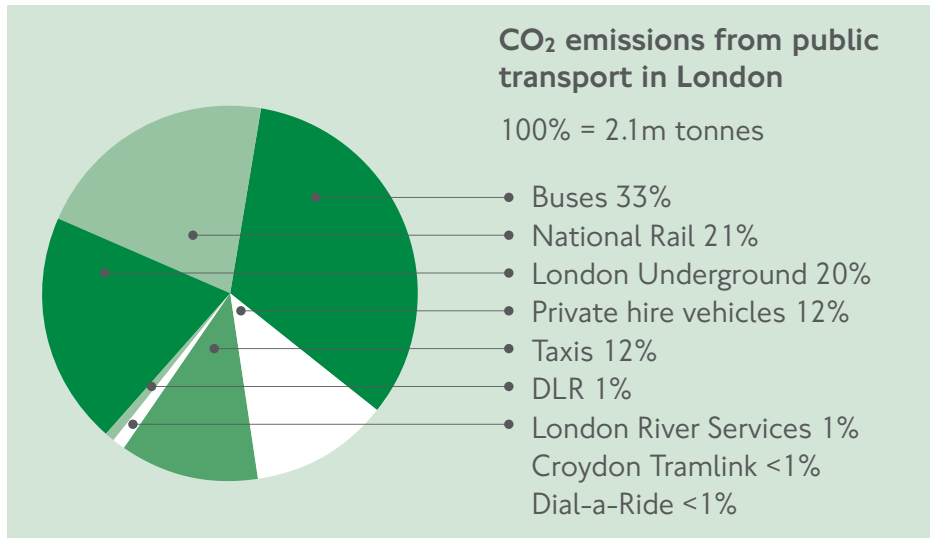
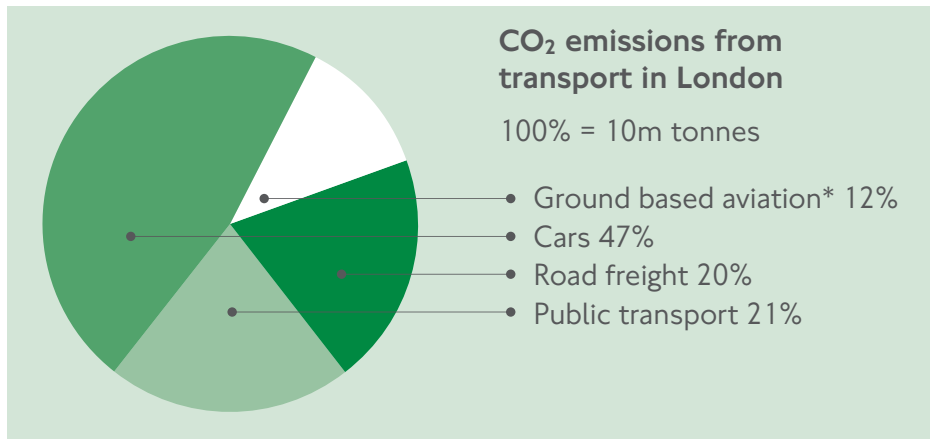
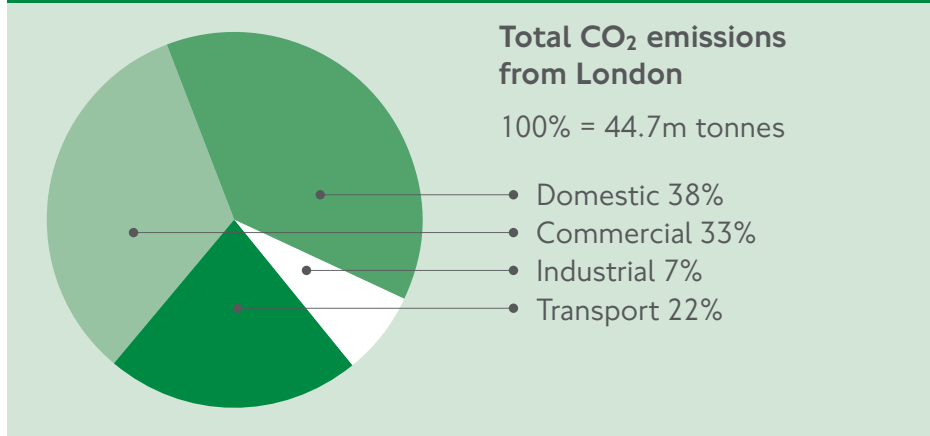
The Mayor has announced a series of five-yearly CO₂ reduction targets for London in the lead up to 2025. The 2010 target is a 15 per cent reduction in CO₂ compared to 1990 levels. The targets aim to put the Capital on a trajectory to meet the UK's longer-term aspiration of a 60 per cent reduction in CO₂ by 2050.

Transport is a significant contributor to CO₂ emissions in London, as shown in figure 3.

TfL will be working to ensure that the transport sector contributes as much as practicable to achieving the Mayor's targets. This will be challenging for the transport sector, as current CO₂ emissions from transport in the city are approximately equivalent to those of 1990 and without intervention, they could rise for the next 10-15 years as London's population grows. Projects that are able to achieve a significant reduction will take some years to implement.

Public transport can help to reduce CO₂ emissions by providing an alternative to the car. However, increasing capacity to cope with rising demand will increase emissions from public transport services, at least until more efficient technology and cleaner fuels can be implemented on a large scale. TfL is committed to reducing greenhouse gas emissions from the services that it provides and to exerting influence over other transport modes, such as freight and private vehicles.

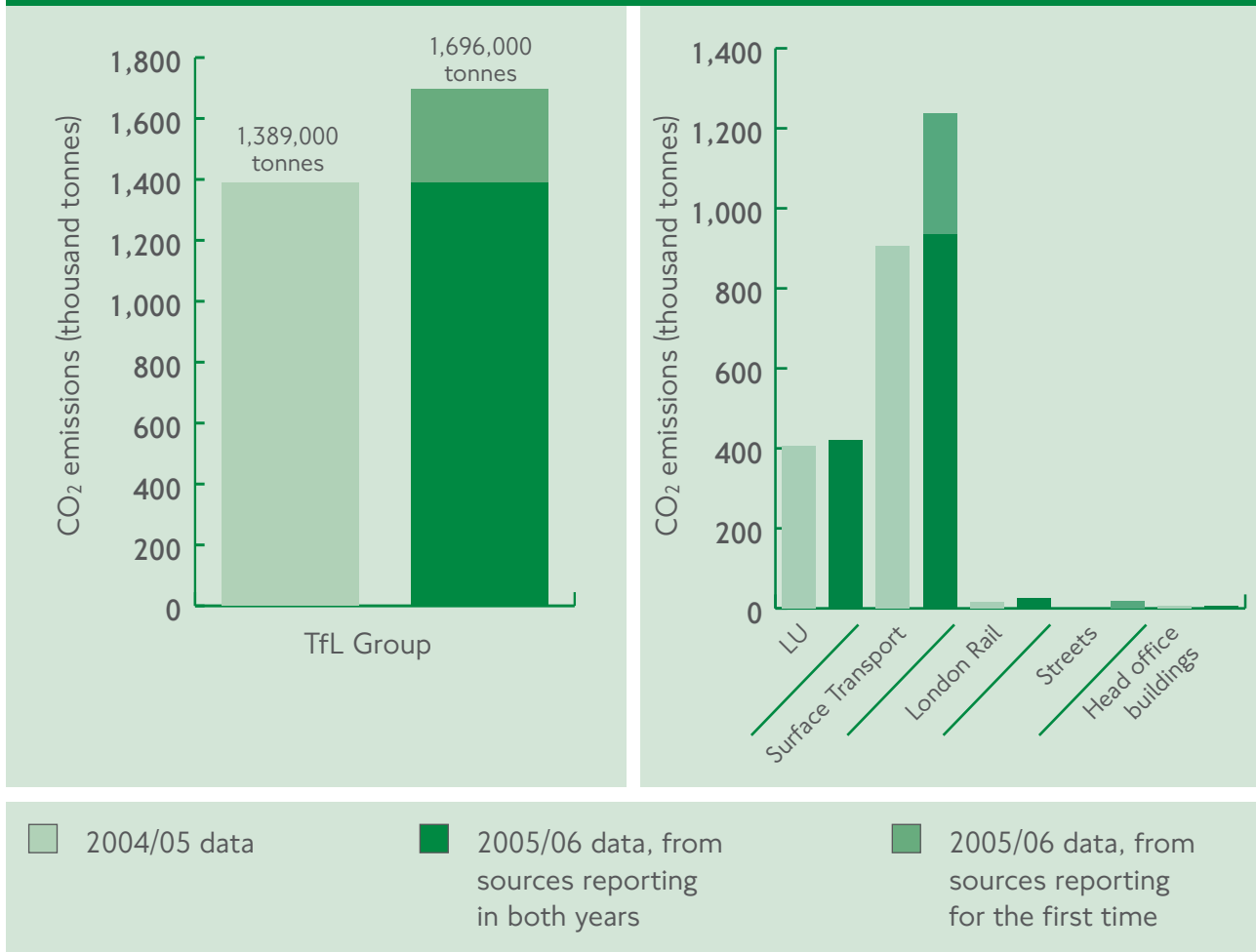
Figure 3: London's CO₂ emissions from all sectors, and contributions from transport modes



Source: Figures for total CO₂ emissions from London and contributions from the domestic, commercial, industrial and private transport sectors are estimates for 2006, based on London Energy and CO₂ Inventory data for 2003. Figures for public transport are based on actual emissions for 2005/06.

*Ground based operations at London's airports (Heathrow, London City Airport, Gatwick, Luton and Stansted), including landing and take-off cycles.

Figure 4: CO₂ emissions



4.1.2 TfL's CO₂ emissions and energy consumption

TfL uses three KPIs to monitor progress in reducing its contribution to climate change:

- The quantity of CO₂ emissions from all of TfL's activities
- Annual energy use in head office buildings
- The proportion of electricity used by TfL's activities purchased from renewable sources

Reported CO₂ emissions during 2005/06 are shown in figure 4, including a comparison with the figures from the previous year. A detailed table of figures for CO₂ emissions during 2004/05 and 2005/06 is presented in table A.2, appendix A.

Emissions of CO₂ from the production of the electricity used by TfL have been included in the emissions reported in figure 4. In 2005/06, they accounted for 27 per cent of TfL's total reported CO₂ emissions. The remaining 73 per cent of

Table 4: CO₂ emissions⁴ by transport mode

Transport mode	CO ₂ emissions (tonnes), total 2005/06	Change since 2004/05	CO ₂ emissions (grams), per passenger km 2005/06 ⁵	Change since 2004/05
Buses	682,508	+5%	103	+7%
LU	419,748	-1%	55	-1%
DLR	19,350	+2%	75	-4%
Croydon Tramlink	5,515	+3%	47	0%
Dial-a-Ride	2,399	+4%	711	+7%
Cars ⁶	4,730,000	-	124	-

CO₂ emissions arose from gas and liquid fuel use.

During 2005/06 reported CO₂ emissions increased across TfL operations by 307,000 tonnes, largely as a result of more comprehensive reporting. CO₂ emissions from private hire vehicles that are licensed by TfL were included for the first time this year, contributing 253,000 tonnes, or more than 82 per cent of the apparent increase. If newly reported emissions are not taken into account, the actual increase in emissions over the year was two per cent, due to the increased frequency and length of services.

Table 4 shows the average CO₂ emissions per passenger km for some of the public transport modes, alongside the average figure for cars in London in 2005/06.

Bus emissions per passenger km increased moderately during 2005/06. More frequent services were operated, resulting in more

fuel use and CO₂ emissions, and although passengers made more journeys, distances travelled fell, resulting in lower passenger km.

Emissions per passenger km decreased slightly for LU and remained the same for Croydon Tramlink. DLR's emissions increased by two per cent compared with the previous year, due to the testing and operation of new lines to London City Airport and King George V station, but emissions per passenger km fell by four per cent.

Emissions per passenger km for Dial-a-Ride increased by seven per cent, most likely as a result of the decreasing fuel efficiency of older vehicles in the fleet. This should improve going forwards, as the fleet benefited from 117 new, smaller Mercedes Vito vehicles towards the end of year.

Although TfL's 50 head office buildings are responsible for only two per cent of TfL's electricity consumption and 34 per cent of gas consumption, there are still opportunities to

Table 5: Energy consumption in head office buildings⁷

Head office buildings	Energy per unit of floor space, 2005/06 (kWh/m ²)	Change since 2004/05	Energy per person, 2005/06 (kWh/person)	Change since 2004/05
Energy consumption	375	+11%	9,802	-0.4%

reduce their CO₂ emissions. Table 5 shows the amount of energy consumed by head office buildings during 2005/06, and the change compared to 2004/05 levels. The figures have been normalised according to the area of head office floor space and the number of people accommodated in head office buildings.

Energy consumption per unit of floor space in head office buildings increased by 11 per cent in 2005/06, compared to the previous year. This increase was due largely to higher building occupancy, as energy consumed per person decreased by 0.4 per cent. Energy consumption from year to year is also influenced by changing weather conditions. In 2005/06 there was greater demand for heating than in 2004/05, due to colder winter temperatures, so energy consumption was higher.

All of the electricity used in head office buildings is supplied from renewable electricity tariffs, and other modes and business units are using renewable energy where practicable. Figure 5 shows the proportion of electricity purchased from renewable sources across the TfL Group, for 2004/05 and 2005/06.

The proportion of electricity purchased by TfL from renewable sources increased from

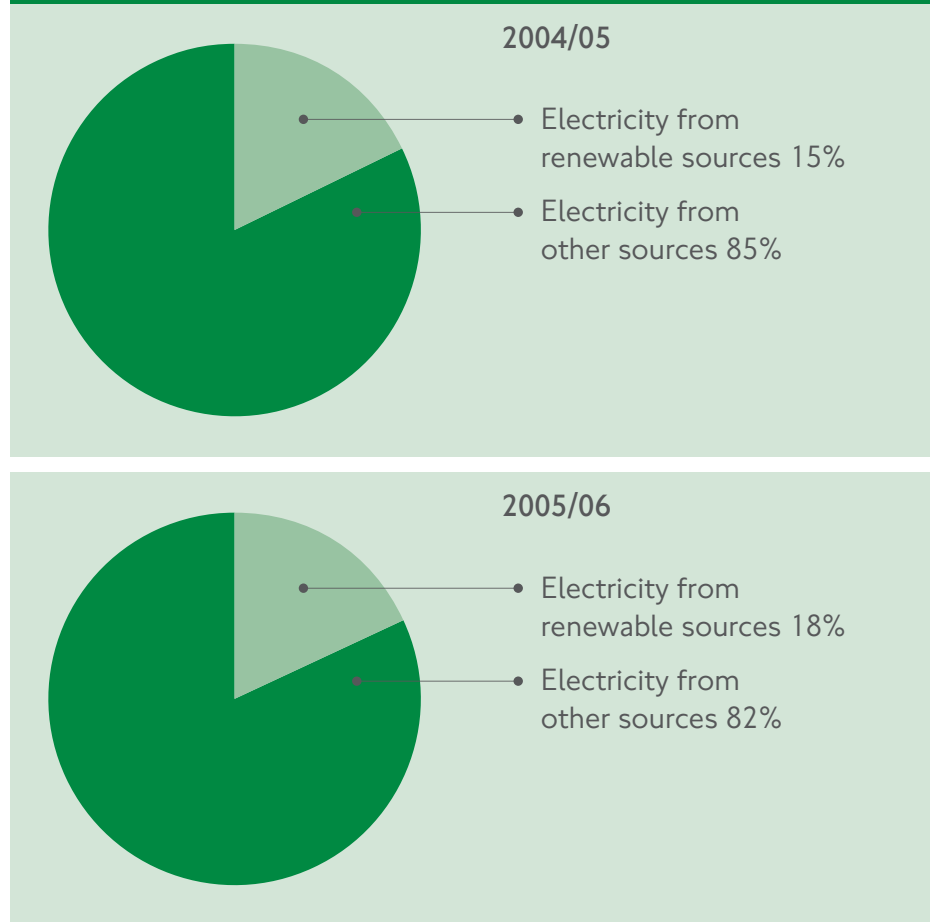
15 per cent in 2004/05 to 18 per cent in 2005/06.

4.1.3 Reducing CO₂ emissions from TfL and transport in London

In line with long-term targets, TfL has been preparing a Climate Change Action Plan, which sets out opportunities to reduce CO₂ emissions from its own operations, as well as transport in London as a whole. Research has been completed to improve understanding of these emissions and identify and prioritise opportunities for mitigation. TfL has also been working with others to develop a London Climate Change Action Plan. This will cover transport as well as other contributors to the city's CO₂ emissions, including the domestic, commercial and industrial sectors and other Functional Bodies of the GLA.

Analysis suggests that transport related CO₂ emissions in London could be virtually halved from current levels by 2050, by promoting behavioural change and energy efficiency, and accelerating investment in new technology. Financial constraints and practical considerations, such as the need to ensure

Figure 5: Renewable electricity consumption



the reliability of new technologies, must be taken into account when determining what can be achieved in practice.

A number of activities have already been implemented, or are planned for the near future.

Behavioural change

By the end of 2005/06, LU had cut energy consumption at its stations by an impressive 25 per cent, through behavioural change

initiatives such as the Stations' Energy Challenge. This is an annual competition that rewards stations saving energy through straightforward measures such as turning off lights and escalators during engineering hours. LU will continue its energy saving initiatives, and will also work with its PPP suppliers, Metronet and Tube Lines, to achieve further improvements.

Bus drivers are being trained to operate their vehicles as fuel efficiently as possible. TfL is

Box 6: Hydrogen and hybrids contribute to improvements in London's bus fleet



Three hydrogen fuel cell buses were introduced on the RV1 route in January 2004 on a trial basis. They proved so reliable that the trial was extended for an additional year, up to January 2007. Sultan Dar, FirstGroup fuel cell bus driver, said: 'Passengers are always asking questions about the benefits of the fuel cell bus and when I tell them, they are always really supportive of the trial. I am very proud to be an essential part of this trial as this technology will benefit our environment substantially – it's something I'll tell the grandkids about!'

Although the hydrogen fuel is currently produced from natural gas, releasing CO₂ at the place where the fuel is made, it is hoped that in the longer term it can be generated from renewable sources. Following the Mayor's endorsement of the London Hydrogen Partnership's Transport Action Plan in November 2005, which aims to have

70 hydrogen vehicles in operation by 2010, London Buses has begun the procurement process for 10 additional hydrogen internal combustion engine or fuel cell buses to be delivered in 2008/09. A depot-based hydrogen refuelling station will also be constructed as part of the programme.

In March 2006, the London bus fleet took delivery of six hybrid diesel-electric, single-deck buses for trial purposes. Powered by an electric motor charged by a small diesel engine, these are cleaner and quieter than conventional diesel buses, offering passengers a smoother and more comfortable ride. TfL is actively pursuing the development and increased deployment of hybrid buses and discussing how to achieve this with vehicle manufacturers and bus operators. To inform this process, hybrid bus trials will be expanded in the near future, adding further single-deck buses and a new double-deck hybrid bus to the fleet.

considering opportunities for wider promotion of energy efficient driving (or eco-driving), including a public campaign.

More efficient technology and renewable energy

Trials of hydrogen buses continued during 2005/06 and hybrid diesel-electric buses were also introduced to the fleet (see box 6). Investment in both technologies will continue, with trial periods kept to a minimum. Accelerated, large-scale fleet replacement will be undertaken where feasible, focusing particularly on increasing the number of hybrid buses in the near future. In parallel, TfL will ensure that all existing diesel buses use a low-blend biofuel mix as soon as possible (95 per cent diesel with five per cent biodiesel). This requires no engine changes.

CO₂ emissions from buses are expected to stabilise around 2008/09, when there will be a greater number of Euro IV buses in the fleet, which are estimated to have five per cent lower fuel consumption. Fuel efficiency is also expected to improve in the Dial-a-Ride fleet of minibuses, with the introduction of 117 new Mercedes Vitos.

A Sustainable Stations Strategy is being prepared for the DLR, which will investigate options for energy efficiency and renewable energy measures at both new and retro-fitted stations. Opportunities for improving energy efficiency will also be considered carefully during ongoing station improvements and line upgrade work on LU. For example, light emitting diode (LED)⁸ lighting is being trialled at LU stations, in addition to traffic lights and bus shelter lights.

TfL has increased the amount of electricity procured through renewable electricity tariffs over the past year (see figure 5). It will

continue to procure renewable electricity in this way, when cost effective, and develop programmes to stimulate renewable electricity generation capacity.



In September 2005, TfL announced plans to roll out the world's largest network of solar powered bus stops. So far, 1,300 solar panels have been installed and TfL aims to have 5,000 in place by April 2010. The solar panels charge batteries, which automatically illuminate the bus stops at dusk, helping waiting passengers to feel more secure while making it easier for bus drivers to see the stops.

Group Property and Facilities is responsible for energy management in TfL's head office buildings, including day-to-day maintenance and refurbishment projects. It is working to reduce energy consumption and improve efficiency, aiming to achieve an eight per cent reduction for 2006/07. Energy management has been scrutinised and audited externally by the Energy Efficiency Accreditation Scheme (EEAS)⁹ since 2003, in common with many public sector and blue chip, private sector companies.

Refurbishment projects are required to undergo Building Research Establishment Environmental Assessment Method (BREEAM)¹⁰ assessments. An annual investment programme is dedicated to environment and sustainability related projects in existing head office buildings. Current projects include upgrades to building control systems, efficient heating and cooling systems, lighting controls and high efficiency motors.

Designs are being finalised for installation of photovoltaic (PV) panels and solar water heating at two TfL head office buildings.

In addition, construction is underway for one of the largest PV installations in the UK on a listed building as part of the refurbishment of London's Transport Museum, a project developed with the assistance of the London Climate Change Agency (LCCA). It is estimated this will reduce CO₂ emissions by between 1,415 and 2,075 tonnes during its predicted lifetime of 60 years.

TfL will continue to install onsite renewable energy technology, where practicable, and work in partnership with groups promoting London-based renewable energy and good quality combined heat and power (CHP) projects (eg, via the LCCA). It will also work with energy suppliers to support new renewable energy projects that might otherwise struggle to find backing.

4.1.4 Adapting to the impacts of climate change

Adaptation measures are an integral part of TfL's Business Plan, with a particular focus on LU and the London bus network.

LU has developed a comprehensive programme of work to address the findings of a London Climate Change Partnership study into the impacts of climate change on transport.

The LU Structures Programme covers the renewal and upgrade of bridges, tunnels, drainage and other structures. It includes investigation and progression of tunnel cooling options to combat higher temperatures caused by a combination of planned service increases, rises in energy consumption, the configuration and condition of existing ventilation equipment and climate change. Potential engineering solutions will be

considered, including cooling derived from CHP stations, wayside resistors, under-platform exhaust, and borehole cooling.

Later projects may include rolling out groundwater cooling to more stations, assessing evaporative cooling and installing the latter if it proves to be acceptable. Full project implementation will include the building of new ventilation plant and structures, which will take five to seven years as a number of new shafts will be required. Air cooling will be installed on new LU sub-surface rolling stock. At the same time, works are starting to upgrade drainage systems on the Underground, which will help to reduce the risk of flooding.

The current London bus tender specification features a number of requirements aimed at reducing temperatures in buses during hot weather. These include tinted windows, roofs painted white, full roof and body insulation, and opening windows. A number of buses have also been retro-fitted with forced air extraction systems and air cooling systems. The feasibility of fitting air cooling systems to all new buses entering the fleet will be considered during 2006/07.

4.2 Air pollution

4.2.1. Air pollution in London and targets for reduction

Air pollution has the potential to significantly impact on people's health and quality of life. London's air quality is the worst in the UK and this poor air quality has been linked to some 1,000 premature deaths and the same number of hospital admissions each year. It also

Box 7: Air pollutants from transport

NO_x are oxides of nitrogen, NO₂ and NO, which are precursors of acid rain and ground level ozone, and can exacerbate breathing difficulties such as asthma. NO_x is released from combustion processes, including the use of fuel for transport, heating and power generation.

PM₁₀ are fine particles less than 0.01mm in diameter, small enough to penetrate deep into the lungs, affecting health of the heart and lungs. They are released from combustion of fuels, particularly diesel, and also arise as dust from construction projects and other processes such as tyre and brake wear.

SO₂ is one of the main causes of acid rain and is linked to breathing difficulties, as well as soil and vegetation damage. It is also a product of fuel combustion, although changes in power generation, the proliferation of low sulphur fuels and improved exhaust treatment technologies have substantially reduced emissions in recent years.^{ix}



Emissions of air pollutants from road transport are covered by Euro standards, which have been tightened on a regular basis and have already resulted in significant reductions in SO₂ emissions. The mandatory introduction of ultra-low sulphur diesel has also meant that SO₂ emissions from road transport are no longer a major concern. SO₂ emissions from boats are still significant, as legal requirements have not yet been applied in the same way as for road transport.

causes or exacerbates health problems, such as breathing difficulties, for a great many more.^{viii}

The most significant air pollutant emissions related to transport in London are NO_x and PM₁₀. SO₂ emissions are a lesser concern, but are relevant for water-based modes of transport (see box 7).

Figure 6 shows average annual NO₂ concentrations across London, highlighting areas with high concentrations in red. According to air quality objectives, NO₂ concentration in the atmosphere should not

exceed an annual average of 40 micrograms per cubic metre. Figure 6 clearly demonstrates that air quality in 2005 was worse than this across a large part of central London and some outlying areas.

The equivalent figures for PM₁₀ are shown in figure 7. While average PM₁₀ concentrations across London were within the objective of 40 micrograms per cubic metre during 2005, the objective is set to tighten to 23 micrograms per cubic metre by 2010, and this is not

Figure 6: Average annual NO₂ concentrations across London in 2005 (micrograms per cubic metre)

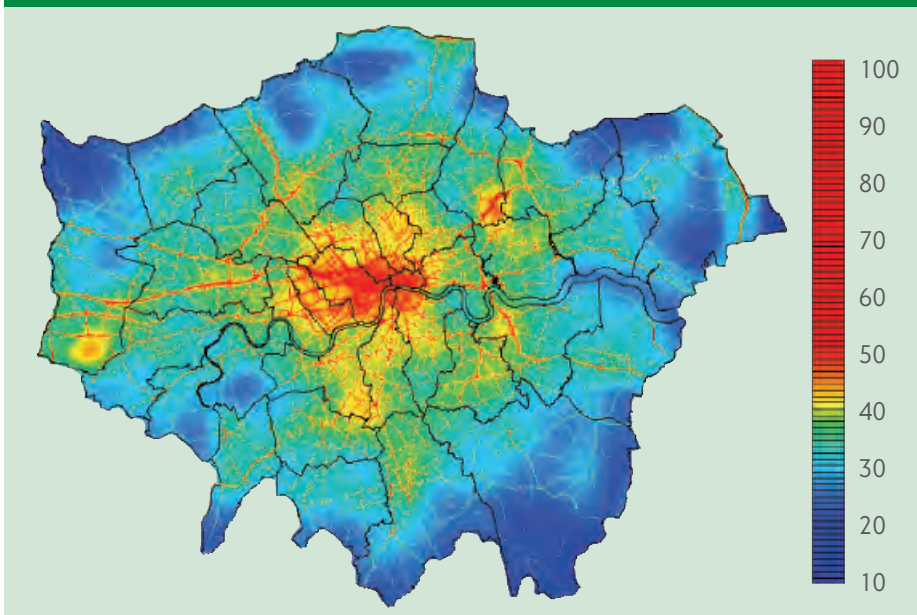
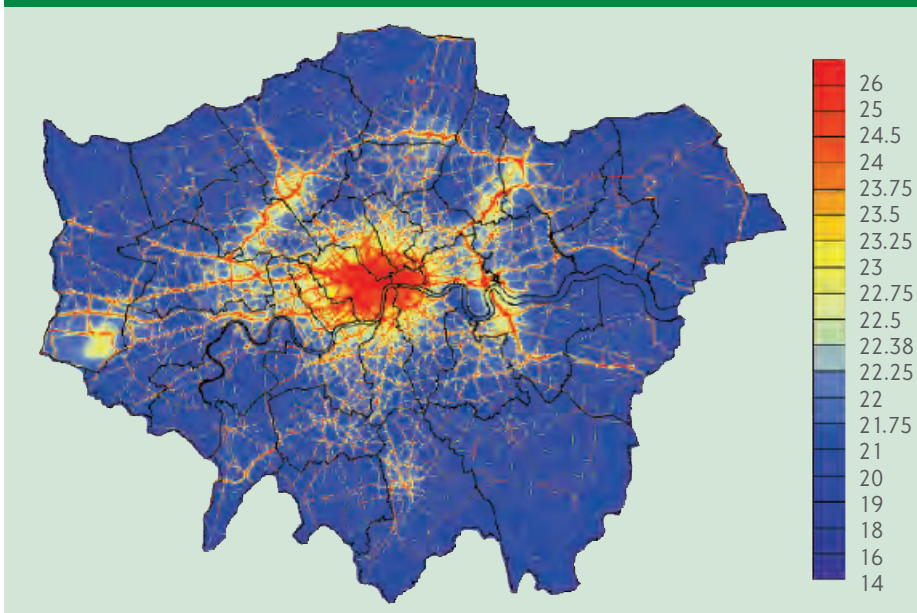
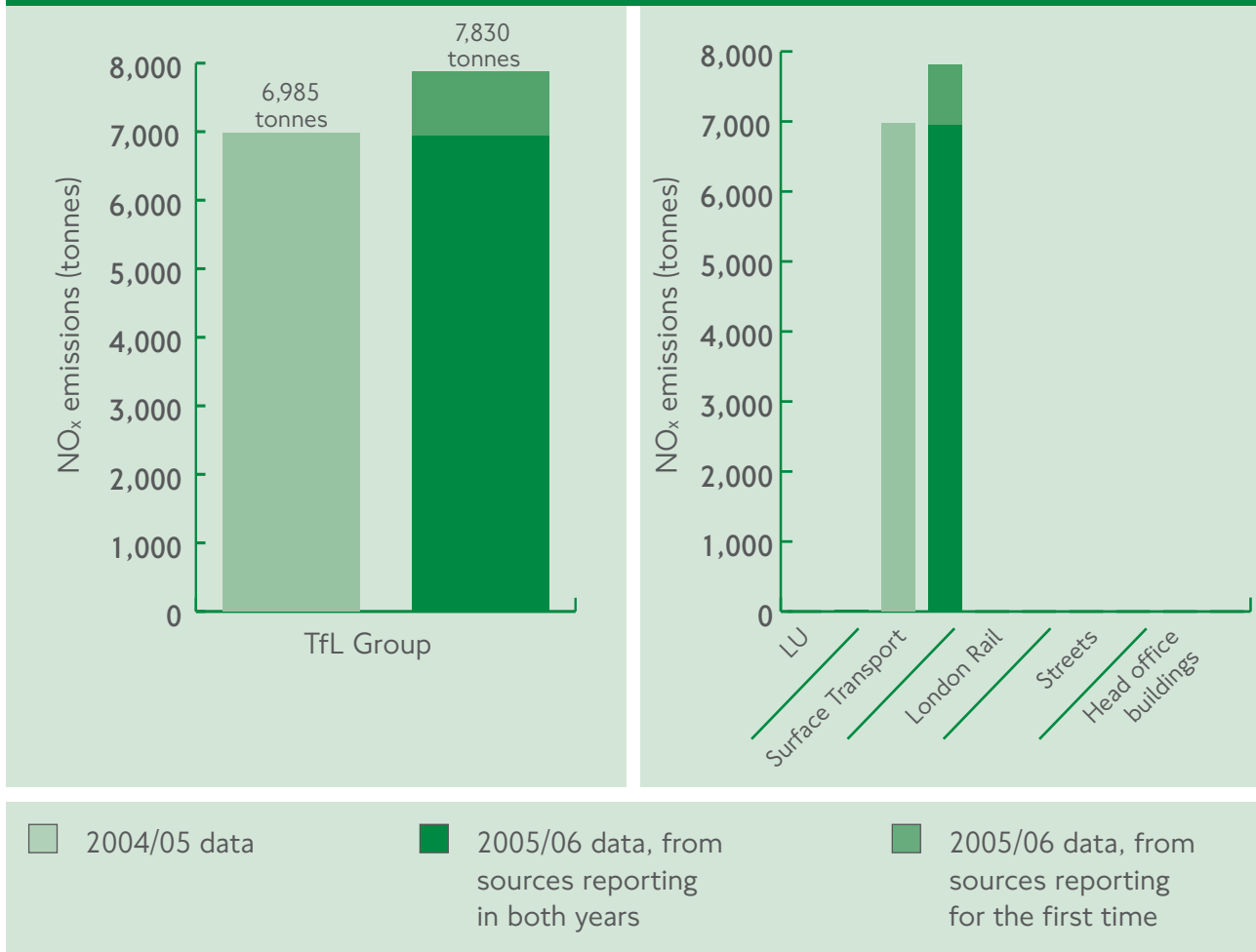


Figure 7: Average annual PM₁₀ concentrations across London in 2005 (micrograms per cubic metre)



Source: Environmental Research Group, King's College London. Figures generated using the 2002 meteorology year.

Figure 8: NO_x emissions



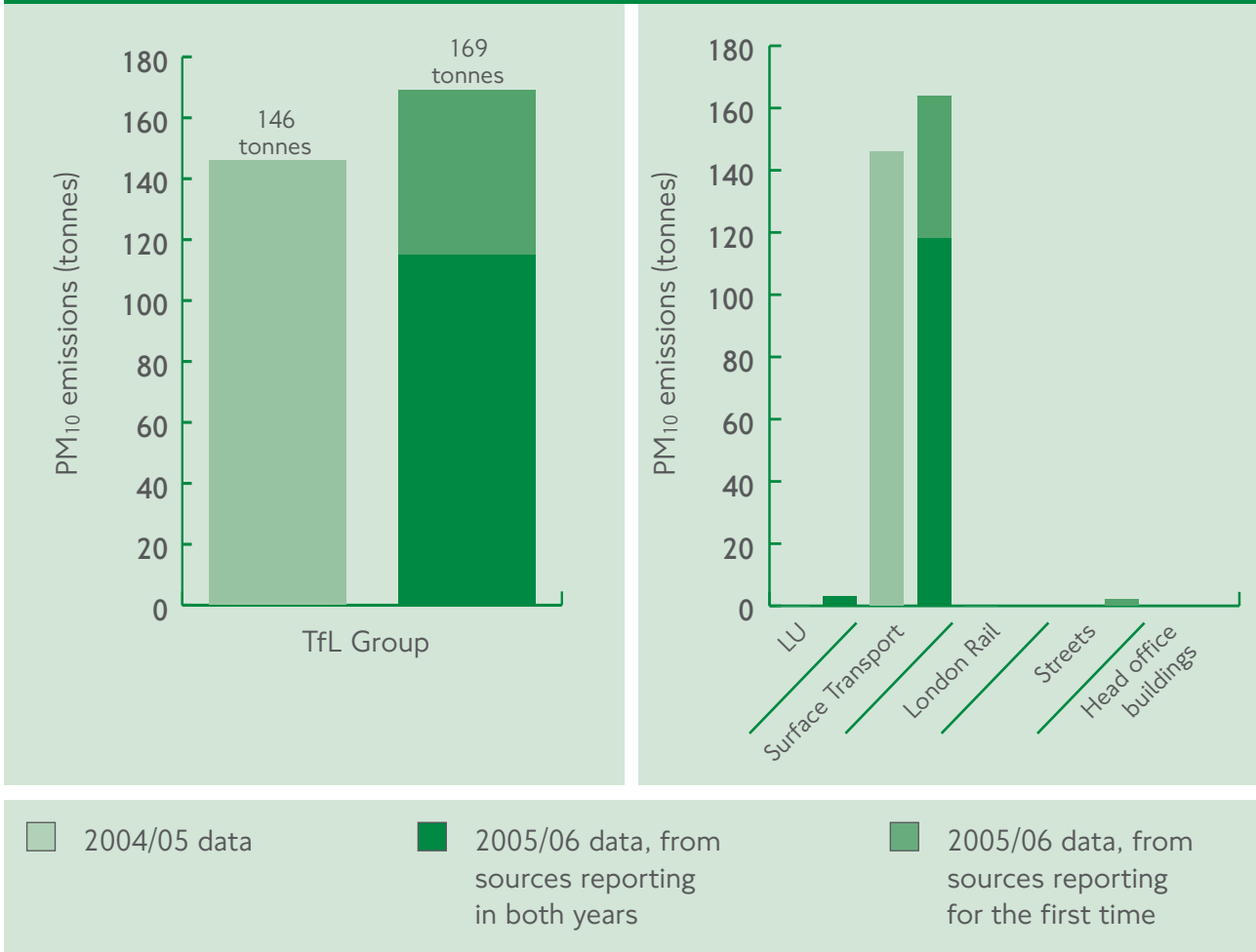
currently met in central London and along some major routes.

The Mayor's Air Quality Strategy contained detailed proposals for improving the Capital's air quality to the point where pollution no longer poses a significant threat to human health. TfL has responded to this by setting an objective to reduce pollutant emissions to air from its own activities and to work to reduce emissions from transport across London.

4.2.2 TfL's air pollutant emissions

TfL has calculated its emissions using emission factors from the National Atmospheric Emissions Inventory, except for buses where TfL has used its own factors to reflect the vehicle mix in the London bus fleet and local driving conditions. Figure 8 describes TfL's NO_x emissions during 2005/06, including a comparison with the figures for the previous

Figure 9: PM₁₀ emissions



year. Detailed figures for TfL's modes and business units are given in table A.3, appendix A.

Total reported NO_x emissions increased by 12 per cent in 2005/06. This was largely due to new reporting, particularly the inclusion of emissions from licensed private hire vehicles, which were responsible for 711 tonnes during 2005/06. Reported emissions from the bus network also apparently increased by two per cent, although this is due to the inclusion of

buses that operate under licences or permits granted by TfL. When performance is compared on a like-for-like basis between 2004/05 and 2005/06, NO_x emissions actually decreased by 0.2 per cent.

Figure 9 describes TfL's PM₁₀ emissions during 2005/06, including a comparison with the figures for the previous year. Detailed figures for PM₁₀ emissions across TfL's modes and business units are given in table A.3, appendix A.

Table 6: NO_x and PM₁₀ emissions from transport modes, normalised for level of service provided

Transport mode	NO _x emissions (g per passenger km), 2005/06	Change since 2004/05	PM ₁₀ emissions (g per passenger km), 2005/06	Change since 2004/05
Buses	0.9	+2%	0.002	-66%
Dial-a-Ride	11	-25%	0.4	-22%
London River Services	45	+10%	0.8	+10%

Together, taxis and private hire vehicles are the most significant contributors to TfL's PM₁₀ emissions, followed by buses. Reported PM₁₀ emissions increased by 16 per cent in 2005/06, compared to 2004/05 levels. This is due mainly to emissions from licensed private hire vehicles being included for the first time. Without the inclusion of the new figures, PM₁₀ emissions decreased by more than 20 per cent, thanks to the installation of diesel particulate filters on buses and taxis.

NO_x and PM₁₀ emissions from some of the key public transport modes are presented in table 6, normalised according to the level of service provided.

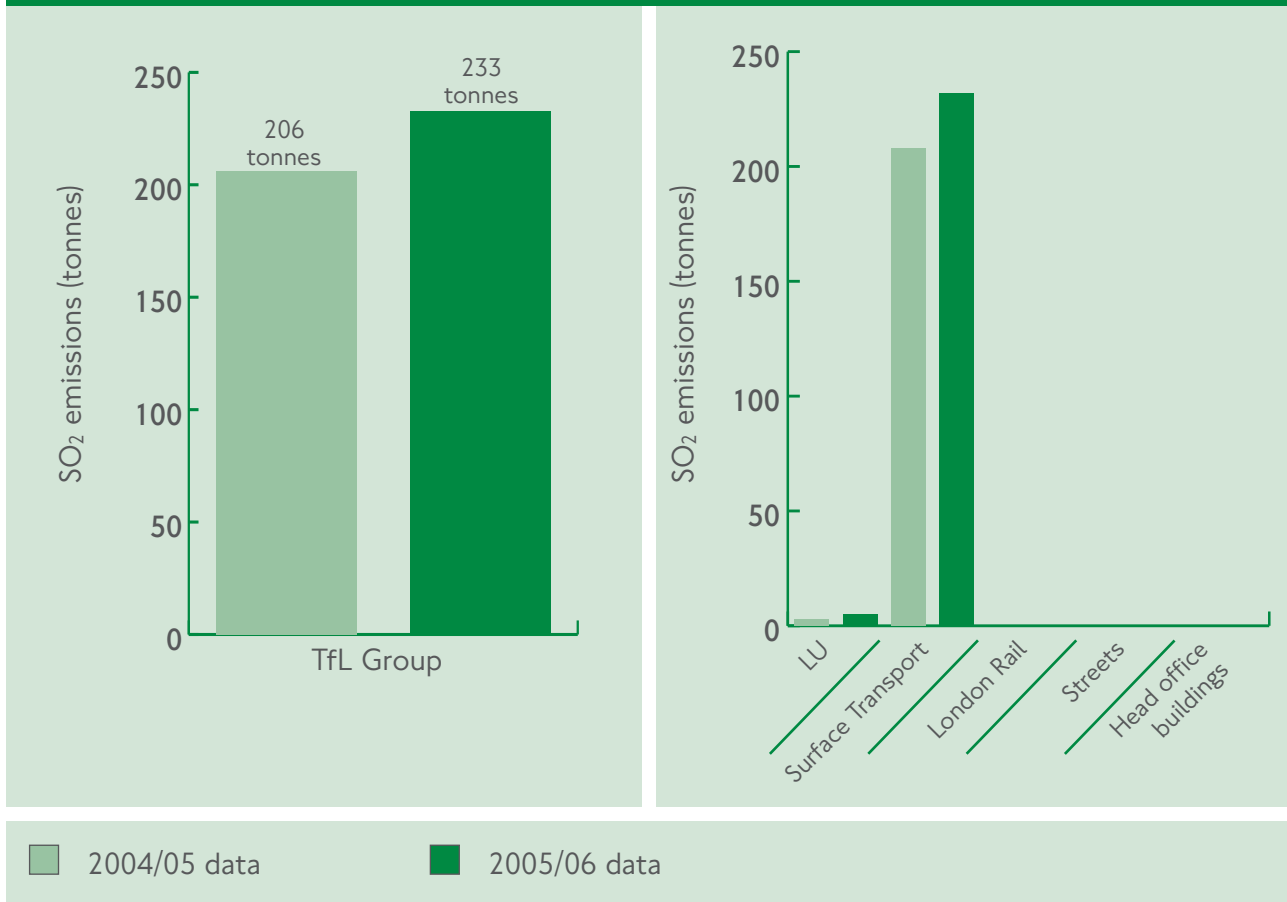
As shown in table 6, NO_x emissions from buses per passenger km rose slightly compared to 2004/05 levels, due to an increase in service provision which was not followed by a corresponding rise in passenger km. For the same reason, emissions per passenger km from London River Services increased by 10 per cent. Emissions from Dial-a-Ride

appeared to decrease. However, this is because emissions data were developed based on the fleet composition during March 2006, after the introduction of more than 100 new vehicles which met more stringent emissions standards. The actual reduction in Dial-a-Ride's emissions over 2005/06 is therefore likely to be much less.

TfL's TDM programme and Congestion Charging scheme support the reduction of traffic in central London, which is having a positive impact on air pollution (see box 3 in section 2.1.4, 'Managing demand for travel').

TfL is continually striving to reduce PM₁₀ and NO_x emissions from the vehicles it controls, as well as encouraging more environmentally friendly modes of transport. It is at the forefront of implementing new technology for buses and realised its target for all 8,000 buses to achieve a minimum Euro II standard and have a diesel particulate filter fitted by the end of 2005. As of March 2006, 59 per cent of buses already complied with the more stringent Euro III standard.

Figure 10: SO₂ emissions



NO_x abatement technology was also trialed on 24 buses, reducing NO_x emissions by up to 65 per cent. NO_x emissions will begin to fall when greater numbers of Euro IV vehicles are introduced to the fleet from 2007/08, with NO_x abatement technology fitted as standard. Trials of hybrid diesel-electric, and hydrogen fuel cell buses, which help to reduce local air pollutant emissions, have also been implemented successfully (see box 6 in section 4.1.3, 'Reducing CO₂ emissions from TfL and transport in London').

TfL runs a support fleet of approximately 350 vehicles and its major suppliers, including Metronet, Tubelines and Streets contractors, use 1,200 more. A number of measures have been implemented to minimise PM₁₀ and NO_x emissions from support vehicles:

- Euro IV compliant commercial vehicles have been introduced ahead of legal requirements
- Some vehicles have been downsized where practicable

- Alternative fuels, including electric vehicles, have been used

Subject to successful trials, TfL is planning to introduce a Global Positioning Radio Satellite vehicle-tracking system to eliminate unnecessary mileage and fuel use by its support fleet. A new environmental policy is being developed for all of TfL's support vehicles, which will help tackle air quality, in addition to CO₂ emissions. TfL will also continue to reduce emissions through its ongoing programme of fitting diesel particulate filters to heavy vehicles, working towards a fleet capable of meeting LEZ requirements.

The oldest and most polluting Dial-a-Ride vehicles have been replaced with 117 new smaller Mercedes Vitos, which meet the stringent Euro IV standard. This vehicle replacement programme will continue up to 2010. Alternative fuels have also been trialled in Dial-a-Ride vehicles to explore opportunities for emissions reductions.

The Mayor's Taxi Emissions Strategy was developed, which required the most polluting taxis to meet minimum emissions standards from summer 2006. By July 2008, all licensed taxis will achieve a minimum standard of Euro III for NO_x and particulate emissions. To allow drivers to recover the full cost of fitting emissions-reducing equipment to their taxis, an environmental charge of 20p was added to every journey as part of the tariff change in April 2005.

Borough activities to support air quality improvements, such as installing electric vehicle recharging points, vehicle emissions testing and improvements to the boroughs' own fleets, continue to be taken forward through the Local Implementation Plan (LIP) funding process. D-NO_x paving, which absorbs and neutralises NO_x from the atmosphere,

has been introduced on a trial basis on a busy London street in partnership with the London Borough of Camden. Air quality monitoring is being undertaken and tests of run-off water will begin in late 2006.

TfL has also been developing proposals, subject to a Mayoral decision, for a London-wide LEZ. The earliest date that this could be implemented is 2008. The proposed scheme is described in more detail in box 11, section 5.1. Borough Partnerships is overseeing the production of the boroughs' LIPs, which includes ensuring that they respond appropriately to the proposed LEZ.

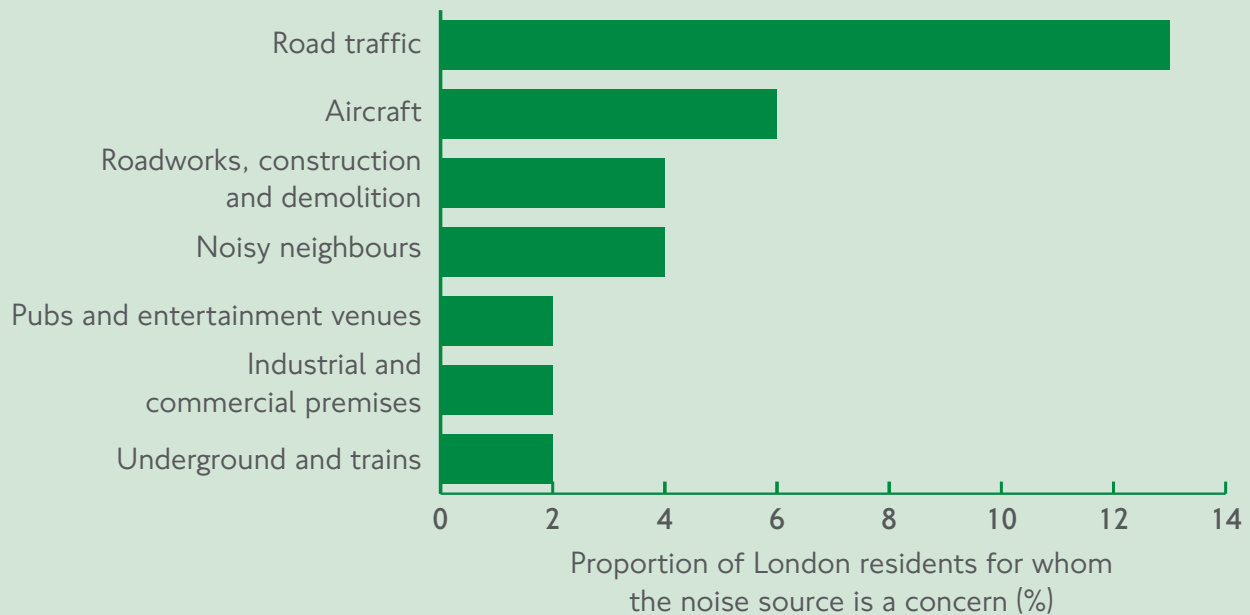
Figure 10 describes TfL's SO₂ emissions during 2005/06, including a comparison with the figures for the previous year. Detailed figures for SO₂ emissions across TfL's modes and business units during 2004/05 and 2005/06 are given in table A.3, appendix A.

Reported SO₂ emissions rose 13 per cent overall in 2005/06, mainly due to increased frequency on London River Services, which is responsible for the vast majority of TfL's SO₂ emissions. All operators currently use marine diesel, but have been asked to examine the practicality of switching to ultra-low sulphur diesel, ahead of regulatory requirements.

4.3 Noise

Noise is increasingly seen as a key quality of life issue as it can disrupt rest or sleep, increase stress, disturb concentration and interrupt conversation or other activity. In a 2003 MORI poll of Londoners, 46 per cent considered noise a problem, with 24 per cent

Figure 11: Sources of noise that are considered a problem by London residents^x



including noise in their two or three top priorities for improving the quality of the environment in the Capital.^x Transport is a significant source of noise in London, as shown in figure 11.

The Mayor's Ambient Noise Strategy recognises the environmental and social significance of noise and describes proposals for tackling it in the Capital. In response to this, TfL has an objective to reduce transport related noise and vibration. Road surfaces, bus engines and LU rails are the main noise sources over which TfL has direct control, and the KPIs have been selected to reflect these. 2005/06 figures are presented in table 7.

The number of noise related complaints received by LU in 2005/06 decreased by two per cent on 2004/05. This decrease has

been achieved in a year with more maintenance and improvement activity and greater train distances operated. However, there is expected to be a rise in noise over the next three to four years as a result of the extensive works to modernise the system. LU and its PPP suppliers will continue to seek to minimise noise, provide advanced warning of planned works to residents and undertake community visits as appropriate.

The other noise performance indicators were introduced for the first time in 2005/6 and the trends in performance will be monitored over the coming years.

Wherever practical, TfL uses road surface materials on the TLRN that have quieter noise properties. The progress with resurfacing the TLRN with lower-noise material demonstrated by the figures in table 7 is expected to continue

Table 7: Progress towards reducing transport related noise

Transport mode or business unit	KPI	Performance, 2005/06	Change since 2004/05
LU	Number of noise complaints	479	-2%
	Proportion of all track continuously welded	11%	N/A*
Streets	Proportion of total TLRN with lower noise surface material	70%	N/A
Buses	Proportion of buses in the fleet >2dB(A) below legal limit	0%	N/A

*Not applicable

over the coming year. Streets is also developing a Traffic Noise Action Programme for the TLRN, taking into account the Department for Environment, Food and Rural Affairs' (Defra's) traffic noise map of London.

The standard of purchasing buses with noise levels at least 2 dB(A) lower than the legal limit was introduced during the year. The first buses to achieve this new standard will start entering the fleet in 2006/07. TfL also specifies quieter 'broadband' reversing alarms on new buses and Dial-a-Ride vehicles.

Many of the activities outlined previously, which address air pollution and greenhouse gas emissions, will also have benefits for noise levels. For example, both hybrid and hydrogen fuel cell vehicles are less noisy than conventional diesel engines, and TDM and freight initiatives will both serve to reduce noise from road traffic.

4.4 Resource consumption

In 2000, Londoners were estimated to have consumed around 49 million tonnes of materials, including almost seven million tonnes of food and 28 million tonnes of construction materials.^{xi} Resource consumption has significant environmental implications in terms of the depletion of natural resources, the emissions associated with extraction of raw materials and production, the distance that goods are transported prior to use and the means of ultimate disposal.

TfL has adopted the GLA Sustainable Procurement Policy and signed up to the highest level of the Mayor's Green Procurement Code.

Figure 12: Group paper consumption

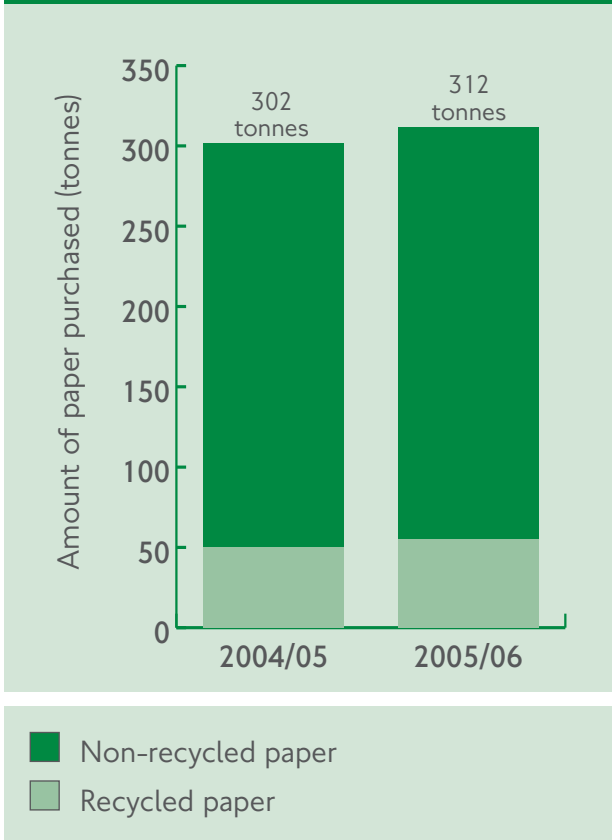
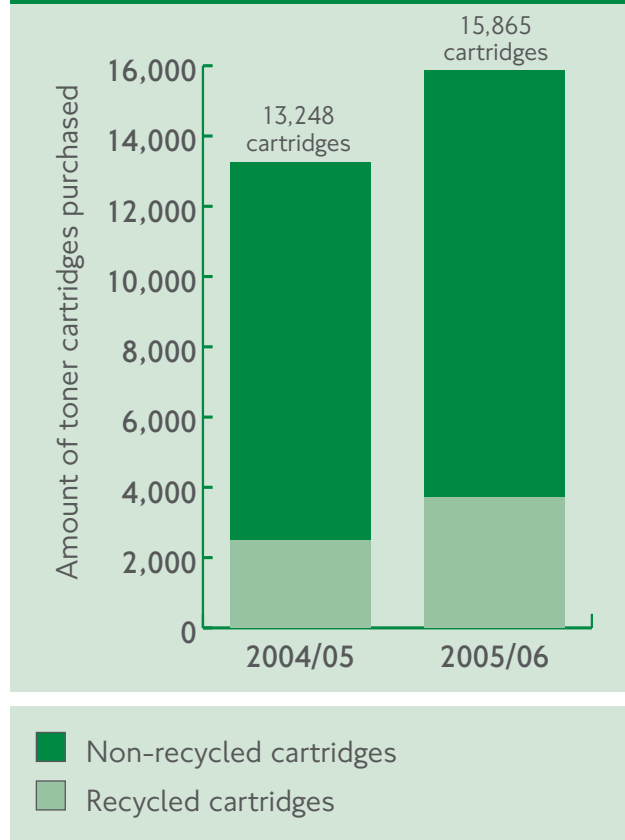


Figure 13: Group toner cartridge consumption



Among a broader range of sustainability criteria, TfL is committed to ensuring that it promotes environmental objectives through procurement. In particular, TfL aims to reduce resource consumption and encourage procurement of recycled products. A significant level of development, modernisation and renewal work is scheduled to occur as part of TfL’s £10bn Investment Programme, which will present substantial opportunities to improve procurement practices.

The Green Procurement Code commits its signatories to setting measurable targets for specifying and buying recycled products.

The Mayor’s Green Procurement Code Purchase Report 2005/06 reveals an increase in the variety of recycled products bought by its signatories. It also shows a rise in expenditure on recycled products of more than 300 per cent compared with 2004/05.

TfL has established an initial set of KPIs for resource consumption, which is currently limited to monitoring use of recycled paper and printer toner cartridges. Progress is shown in figure 12 and figure 13. In the near future, KPIs will be developed that cover a broader range of resources consumed by TfL.

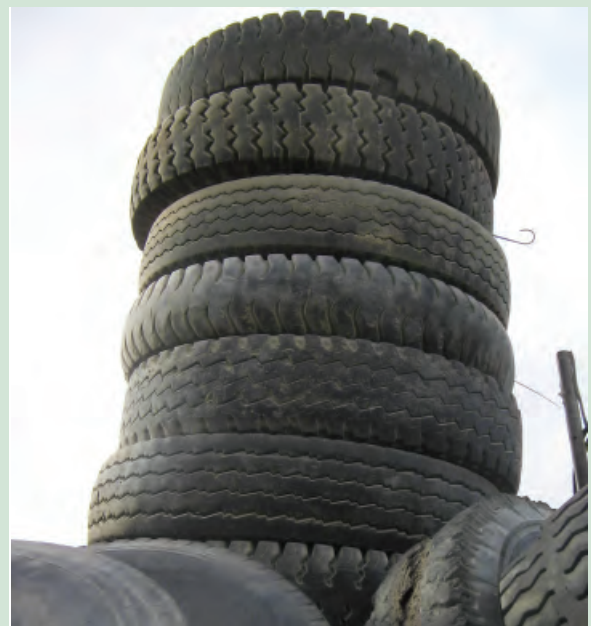
The amount of recycled paper purchased has grown to 19 per cent of the total, although the overall volume of paper purchased has also risen. The proportion of recycled toner cartridges purchased has also grown, reaching 23 per cent in 2005/6. Again, the total number of cartridges purchased has increased. TfL purchases its recycled toner cartridges from the same organisation which collects used cartridges for recycling, so a similar proportion of toner cartridges is being recycled. These figures should continue to increase now that TfL is putting measures in place across the organisation to implement the Green Procurement Code.

TfL will continue to deliver its commitment to the Green Procurement Code by providing baseline data about recycled purchases and setting targets for specifying and buying recycled products.

TfL's Group Procurement team is helping those procuring goods or services across the organisation to identify and incorporate green requirements in future contracts. For example, the East London Line will require its main works contractor to adhere to the principles of the Green Procurement Code and to develop a sustainable design plan to incorporate 'green' measures as much as possible.

LU is continuing to explore opportunities to buy products made from recycled material, and will incorporate further environmental conditions into its contracts for goods and services. For instance, recycled tyres have been used as trackside flooring materials on the LU network (see box 8). The Investment Programme will replace wooden sleepers with longer-life concrete sleepers; continue to procure timber from Forestry Stewardship Council certified, or other

Box 8: Recycled tyres used for trackside floors



Metronet has trialled the use of flooring materials made out of recycled rubber tyres for track access points and walkways.

The rubber panels have other benefits in addition to making use of something that would otherwise be a difficult waste product to dispose of. They have a long life and require little maintenance, reducing the need for frequent replacement. This, in turn, minimises waste, cost and disruption to services.

The recycled rubber panels have been in place on a walkway at the Stonebridge Park depot for two years. Builders and maintenance crews working there have been carrying heavy plant and materials over the walkway during this time, and so far the recycled material has proven to be durable and up to the job.

sustainable, sources; and enforce LU's environmental requirements throughout supply chains.

Efforts are also being made to source sustainable materials for bus infrastructure, including temporary bus stops and shelter roofing products. Streets has committed to using recycled and secondary aggregates for future major construction projects and maintenance works, where economical and practicable, and contractors will be required to report on the quantities of recycled materials used. Borough Partnerships are also coordinating with TfL colleagues to set guidelines governing borough selection, trial and review of recycled materials for streets and footpath resurfacing, and streetscape installations.

During 2005/06, TfL's Major Projects team produced templates for materials management and energy management plans, as part of its Codes of Construction Practice. This means contractors will be required to incorporate waste minimisation principles at a very early stage in projects, designing for efficient use of materials, use of recycled and secondary aggregates and waste minimisation.

4.5 The built environment

As one of the largest landowners in the Capital, TfL has great potential to influence the built environment, through the quality of architecture and the cleanliness and condition of assets. In 1999, English Heritage listed 45 Underground stations as Grade II because of

their 'particular importance, outstanding features and special interest value'.

TfL has made a commitment to maintain and, where possible, enhance the quality of London's built environment. As KPIs, TfL measures the extent of envirocrime observed or perceived on the transport system, the cleanliness and condition of the built environment for which TfL is responsible, and the quality of the street environment.

Performance is measured using mystery shopper surveys (MSS), customer satisfaction surveys (CSS) and the Local Environmental Quality Survey of England (LEQSE). The MSS and CSS award scores of up to 100, based on perception of cleanliness and condition. The higher the MSS and CSS score, the better the performance. The LEQSE is conducted by the environmental charity Capital Standards Group at many sites across London. LEQSE indicators are marked from minus eight to plus eight, with a score between zero and four classed as satisfactory, and from four to eight as good. Performance against these KPIs during 2005/06 is shown in table 8, relative to the figures for 2004/05.

Results for envirocrime and the condition and cleanliness of the built environment have improved, with the exception of the score for London River Services. For the first time in 2005/6, a score for bus stops and shelters was also included and this achieved a satisfactory level.

The LEQSE score, also measured for the first time, was satisfactory. Taking the main LEQ indicators together, such as staining, graffiti and fly posting, the TLRN scores an average of +3.8. The LEQSE results are used to help pinpoint the areas that need more attention.

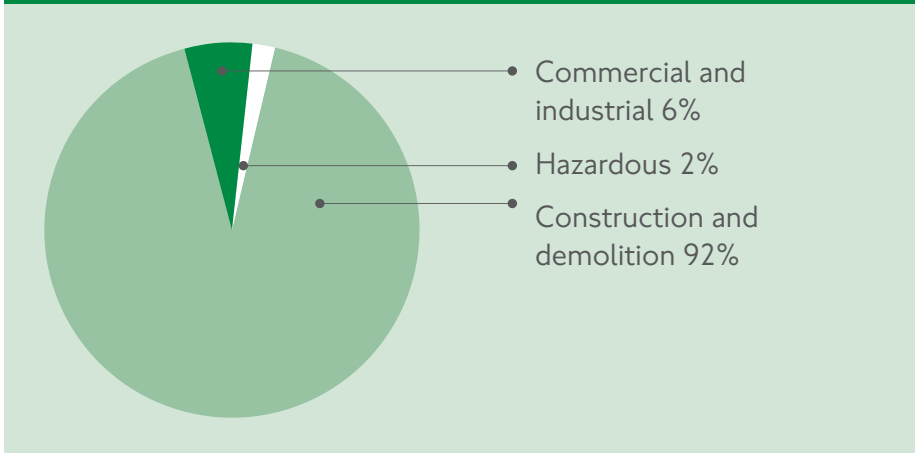
Table 8: Envirocrime, cleanliness and condition of TfL's built environment

Aspect of the built environment	Score for 2005/06	Change since 2004/05
Cleanliness and condition		
Buses (CSS)	77	+1%
Croydon Tramlink (CSS)	85	+3%
London River Services (CSS)	88	-3%
LU (MSS)	67	+2%
DLR (CSS)	93	N/A
Victoria Coach Station (CSS)	77	+5%
Bus stops and shelters (CSS)	77	N/A
Graffiti		
LU stations (MSS)	78	+1%
LU trains (MSS)	72	+3%
Local environmental quality		
Streets (LEQSE)	3.8	N/A

A number of actions are planned or already underway to enhance the built environment:

- TfL will continue to measure envirocrime on rolling stock and in stations, and tackle the problem by engaging with stakeholders and working with the British Transport Police
- The Streets team will work with boroughs and stakeholders to embed environmental guidance in the design of relevant TfL projects
- LU will develop technical guidance on the decorative and architectural repair of features such as brickwork and paint, as appropriate, and provide information to contractors about the preservation of heritage features

Figure 14: Classification of TfL's waste streams



- The impact of TfL infrastructure on the streetscape will continue to be addressed. For example, traffic signal cabinets located underground rather than on the pavement are being trialled, and solutions are being sought to reduce the impact of Congestion Charging street furniture

4.6 Waste management

London produces approximately 16.9 million tonnes of waste every year. Of these, 4.4 million tonnes are municipal waste collected by local authorities from houses and some businesses, 6.4 million tonnes are commercial and industrial waste and 6.1 million tonnes are waste from construction and demolition.^{xii}

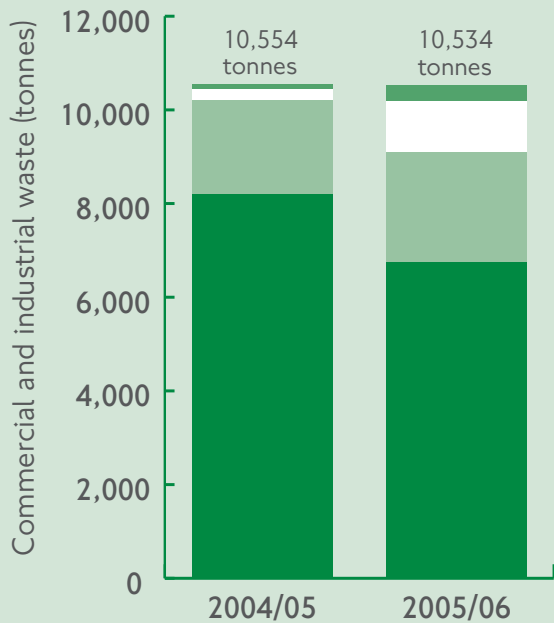
TfL's operations generate commercial and industrial waste, such as office paper, computers and telephone equipment.

Hazardous waste (such as batteries, fluorescent light tubes, filters, drain interceptor sludge and waste oil) and construction and demolition waste are also generated by some activities. Figure 14 shows the proportions of TfL's waste that are classified as commercial and industrial, hazardous, and construction and demolition, based on the quantities measured during 2005/06.

TfL seeks to reduce waste and promote re-use and recycling. To monitor progress against this objective, it has identified as KPIs the amounts of commercial and industrial, hazardous and construction and demolition waste produced, and the proportion of each that is recycled or reused. It is worth noting that a number of transport modes and business units are not yet reporting performance for waste production and recycling – details of omissions are provided in table A.4 to table A.6 of appendix A, for all three waste classifications.

The available data for commercial and industrial waste are shown in figure 15. Detailed figures for

Figure 15: Group commercial and industrial waste



- Waste recycled, by business units reporting in both years
- Waste not recycled, by business units reporting in both years
- Waste recycled, by business units only reporting in one year
- Waste not recycled, by business units only reporting in one year

commercial and industrial waste for each of the transport modes and main business units are presented in table A.4 of appendix A.

Data were included for the first time in 2005/06 for Dial-a-Ride and East Thames Buses depots, taxis and Victoria Coach Station,

Box 9: Newspaper recycling on the Underground

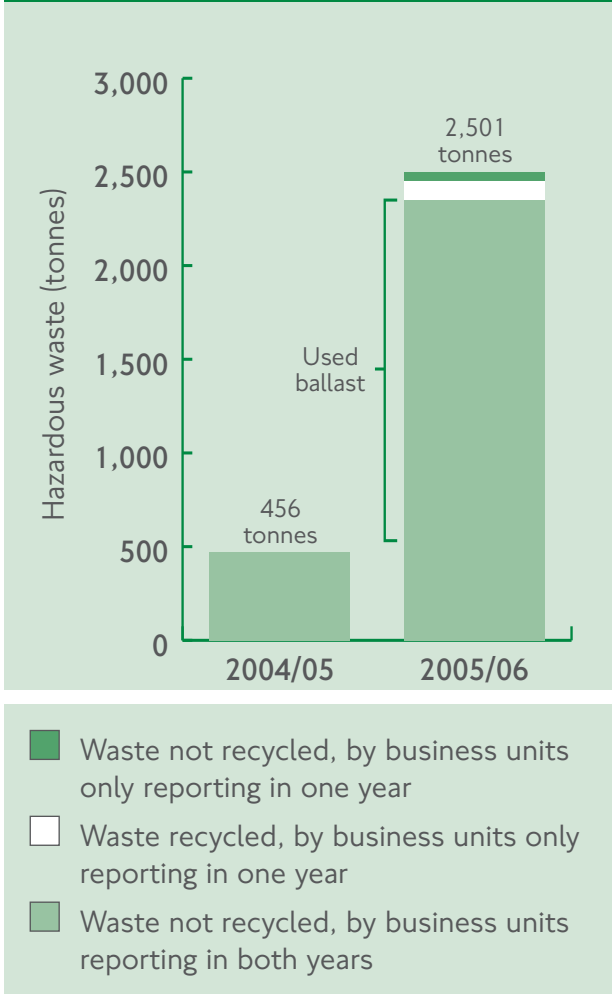


Every day, more than 16 tonnes of rubbish is collected from the LU network by Tube Lines. In 2005/06, Tube Lines expanded its dedicated paper recycling scheme, collecting waste paper from 26 stations and six depots on the Jubilee, Northern and Piccadilly lines. Following expansion of the scheme, approximately four-and-a-half tonnes of waste, mostly newspapers, were collected for recycling on a typical day. Over the year, a total of 527 tonnes of waste paper was collected for recycling.

Newspaper recycling on the Underground will receive a further boost during 2006/07. The paper recycling scheme will be expanded and all stations will be able to set up their own paper recycling scheme.

whereas DLR did not report waste and recycling performance this year. If a like-for-like comparison is made between figures for areas reported on both in 2004/05 and 2005/06, there has been an 18 per cent decrease in the amount of commercial and

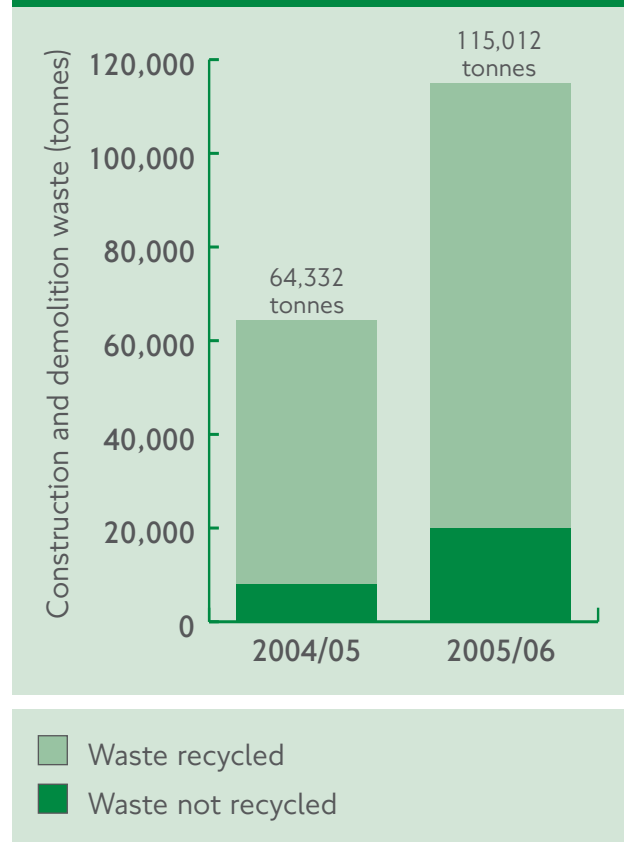
Figure 16: Hazardous waste



industrial waste produced across TfL. Of this, 26 per cent was recycled in 2005/06, up slightly from 25 per cent the previous year.

In 2005/06, LU set a 25 per cent target for recycling commercial and industrial waste. It has met and exceeded this target, achieving almost 27 per cent. Most of the increase results from the expansion of station paper recycling programmes being undertaken by PPP suppliers (see box 9).

Figure 17: Construction and demolition waste



The 2005/06 waste recycling rate for TfL head office buildings was 34 per cent. This is the first year these results have been reported. The target for 2006/07 is to recycle 40 per cent of waste, which is based on the GLA's targets. This matches the Government's target, contained in the 'Sustainable Development in Government' document. However, TfL plans to achieve this in 2006/07, three years ahead of the Government's recommendation.

Figure 16 shows TfL's performance on production and recycling of hazardous waste. Detailed figures for hazardous waste for each of the transport modes and main business units are presented in table A.5, appendix A.

The amount of hazardous solid waste increased considerably during 2005/06. This is largely due to LU track replacement under the Investment Programme, which removed 1,855 tonnes of contaminated ballast. There have also been changes to the definition of hazardous waste, with the result that more categories of waste are now included, such as waste electrical goods. A small increase in the reported amount of hazardous waste in 2005/06 was due to the inclusion of figures for Dial-a-Ride and East Thames Buses depots, and Victoria Coach Station, while DLR only reported waste and recycling performance during 2004/05.

The amount of construction and demolition waste produced and recycled during 2005/06 is shown in figure 17, alongside statistics for the previous year. Detailed figures for commercial and industrial waste for each of the transport modes and main business units are presented in table A.6 of appendix A.

The total amount of construction and demolition waste rose substantially during the past year, due to increased work undertaken as part of the Investment Programme. The proportion of construction and demolition waste recycled by LU fell in the last half of the year. Having reached a level of 87 per cent recycling in 2004/5, the proportion fell to 49 per cent of all construction and demolition waste in 2005/06. Again, this is due to changes in the method of classifying hazardous waste brought in by new legislation. Some waste was classified as 'difficult waste', which is contaminated but not to the extent

where it is considered hazardous, and was therefore not recycled. A methodology has been established for assessing the risk associated with used ballast, to ensure that waste that is suitable for recycling is identified. All of LU's metal track waste is recycled.

For the future, TfL will look to improve recycling of all kinds of waste across its operations. The paper and newspaper recycling scheme introduced by LU and its PPP suppliers will be extended across the network. In addition, a partnership of TfL and the boroughs is considering the introduction of a demonstration recycling facility for road-related construction waste, to enable it to be used as footway base material and trench backfill.

4.7 Transport of waste

TfL estimates that waste generated in London travels a distance of 44 million km on the Capital's roads each year. It is more sustainable to reduce the distance travelled by waste and to move to methods of transportation with lower environmental impacts.

TfL's goals for sustainable transport of waste will be in line with, and designed to meet, the requirements of the London Freight Plan, which is currently being developed (see box 4, section 2.1.5, 'Reducing the impacts of freight distribution'). TfL will develop an environmental KPI for transport of waste that is appropriate to the objectives of the London Freight Plan, once it is finalised.

TfL has already begun to implement initiatives to improve waste transport. For example, the

Box 10: Habitats surveyed for the West London Tram project

Habitats have been surveyed as part of preparations for the West London Tram. The purpose of the surveys is to enable the impacts of the project on local habitats to be minimised.

A phase one habitat survey was conducted for the proposed route, in liaison with English Nature (now Natural England). This was supplemented by a desktop biodiversity study.

The work identified a number of protected species that could be using the habitats along and adjacent to the proposed route, including bats, newts, birds and insects.

The results of the habitat survey will be reported in the environmental



statement that is being produced for the West London Tram. Plans will be developed to minimise the impact of the project on habitats along the route.

Freight Unit has progressed the development and trial of a multi-modal refuse collection vehicle, and is working with British Waterways on plans to use the technology to move waste, recyclables and construction material on the West London Canal Network. A new canal wharf has been developed at Old Oak Sidings, to enable thousands of tonnes of industrial, construction and demolition waste to be transferred to a new treatment site by water. The project was funded by TfL and British Waterways, and the new site is operated by Powerdays. The benefits of the £455,000 wharf include a reduction in congestion, fuel use and emissions by reducing the amount of waste transferred by road.

4.8 The natural environment

TfL owns many assets of ecological importance to London, including about 220km of trackside that is a potential wildlife habitat or corridor. Much of TfL's open land holding has ecological importance to the Capital – wildlife can flourish due the diversity of habitat and restricted public access.

LU, Streets and Croydon Tramlink all have open land holdings. These assets need to be protected and enhanced and will be

considered in ongoing operations and plans for new transport infrastructure. TfL also has a responsibility to identify and manage any impacts of its operations on the broader natural environment. The Mayor's Biodiversity Strategy sets out the ways in which key London organisations, such as TfL, can work together to protect and enhance wildlife.

TfL has an objective to maintain and, where possible, enhance the quality of London's natural environment. The corresponding KPI is the proportion of TfL open land holdings which have been habitat surveyed for biodiversity.

To date, most of the open land holdings managed by LU have been surveyed. LU supports the London Biodiversity Partnership and, in conjunction with its PPP suppliers, has started to develop a Biodiversity Action Plan and made arrangements for the analysis of biodiversity data.

A Highway Asset Management Plan is being developed, which includes TfL's objectives for maintaining and enhancing biodiversity. A programme of replacement and additional tree planting was completed across parts of the TLRN in 2005/06. An asset management system will be used to ensure that the tree stock on the network is maintained. Streets's new maintenance contracts, starting in April 2007, will include improved specifications for landscape, biodiversity and arboricultural management.

The Major Projects team undertakes biodiversity surveys as part of its environmental impact assessments for new projects. A comprehensive ecological survey was undertaken in 2005/06 for land on the proposed West London Tram route (see box

10). Similar surveys will be undertaken for each new project taken forward.

Work to improve biodiversity on TfL's open land holdings, and to reduce the impact of TfL's operations on biodiversity, will continue. Appropriate landscape and biodiversity mitigation will be provided for as part of project development and, where practical, opportunities for landscape and biodiversity enhancement will be included in projects.

4.9 Water consumption

During 2006, London faced serious water shortages and one water company applied for the first UK Drought Order in 11 years. TfL uses water in its office buildings, station workshops and bus and train washes in depots. As a result, the organisation is affected by restrictions on water and has a responsibility to use it efficiently. It aims to do this by implementing measures such as low water usage systems and facilities for using grey/recycled water for vehicle washing.

TfL measures the amount of water consumed in its operations as a KPI, in order to determine the effectiveness of efforts to improve efficiency. Performance against this KPI is shown in figure 18 for 2005/06, alongside the statistics for 2004/05. Detailed figures for water consumption are provided in table A.7, appendix A.

Reported water consumption increased by 1.6 per cent between 2004/05 and 2005/06, due to the inclusion of figures for Dial-a-Ride and East Thames Buses. If new data are not

Figure 18: Water consumption



taken into account, water consumption was unchanged from 2004/05 to 2005/06. It is worth noting that a number of transport modes and business units are not yet included in the figures for water consumption – details of omissions are provided in table A.7, appendix A.

Annual water consumption for TfL as a whole has been normalised for the total number of passenger km across all of the main modes of transport. In addition, water consumption per

employee in head office buildings has been calculated. Both figures for 2005/06 are quoted in table 9, together with the change in performance compared to 2004/05.

TfL’s total reported water consumption per passenger km has increased (table 9). Water consumption per employee in TfL’s head office buildings has improved over the past year. More specifically, water consumption in head office buildings increased by nine per

Table 9: Normalised water consumption for TfL and head office buildings

	Performance 2005/06	Change since 2004/05
TfL Group		
Water consumed per million passenger km (cubic metres)	53	+2.4%
Head office buildings only		
Water consumed per head office employee (cubic metres)	16	-8.8%

cent, against an increase of 20 per cent in the number of people occupying the buildings. An ambitious reduction programme with a target of nine cubic metres per person has been set for 2006/07 to match Government benchmarks.¹¹

LU has improved its procedures for the detection and repair of leaks and was able to increase train distances operated during 2005/06 without increasing water consumption. Train washes which recycle water are already in use at several LU depots and opportunities are being explored to install them at more. The DLR is investigating the feasibility of procuring a new train wash for its Beckton Depot that uses grey water and recycles water. TfL is also considering water efficient systems and grey water use at the Croydon Tramlink depot to further reduce consumption.



Section 5 – Looking to the future

5.1 Looking to the future

TfL has improved its mechanisms for environmental management over the past year, and has made a number of significant achievements. However, it recognises that there is still much to do to make transport in London environmentally sustainable.

In the future, TfL will continue to place environmental improvement, particularly climate change mitigation, high on its agenda. Adapting to the expected results of climate change will also be a key challenge.

Key to TfL's future environmental performance is:

- Mitigating its contribution to climate change, by reducing CO₂ emissions through greater energy efficiency and increasing the use of renewable energy
- Continued trials of zero and low-emission buses so that TfL's fleet continues to be one of the cleanest in the world
- Extension of Congestion Charging into further parts of Westminster and Kensington and Chelsea in February 2007
- The introduction of a London-wide LEZ in 2008 to improve air quality, subject to consultation (see box 11)

TfL will continue to monitor and seek improvements to its own operational impacts on the environment, and the impacts of transport in London more broadly. In 2006/07, it will develop plans to comprehensively embed sustainability into its planning, projects and operations, and work towards developing sustainability reporting.

The transport system will continue to improve, with the following major new developments being implemented as part of TfL's £10bn Investment Programme:

- Underground improvements that will enable an extra three million km to be run each year by 2009/10. Examples are longer trains on the Jubilee line, introduced in 2006, and other improvements to the line by 2009 to increase passenger carrying capacity by 45 per cent
- Rail extension and capacity increases including the East London Line extension; the DLR link to London City Airport, which was opened in December 2005, and its extension to Woolwich Arsenal by 2008; and three-car DLR trains on the Bank to Lewisham branch by 2009
- New transit schemes, for example the bus-based, rapid East London Transit (due for completion in 2008) and Greenwich Waterfront Transit (to be completed in 2009)
- Local improvements to town centres, interchanges and residential streets
- Walking and cycling improvements to TfL and borough roads, totalling £200m

TfL is proud to be supporting the Mayor's vision of a sustainable London and will continue to develop plans and activities to help deliver its responsibilities towards that vision.

Box 11: Proposals for a London LEZ

An LEZ is a designated area where measures have been put in place to improve air quality by preventing or deterring the most polluting vehicles from driving within the zone.

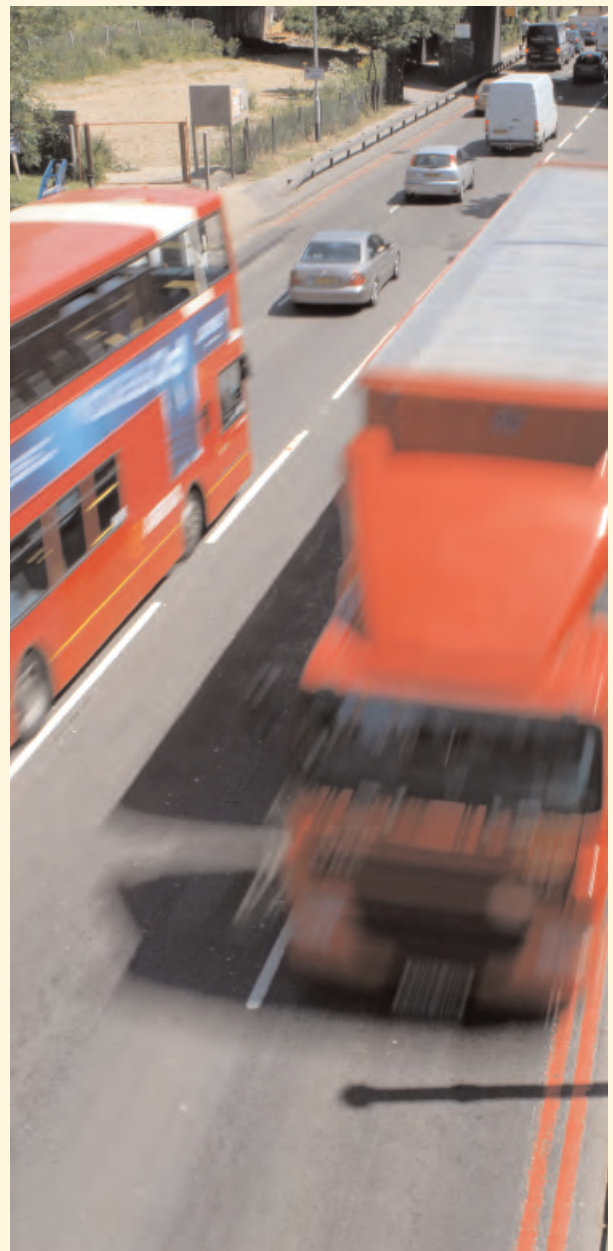
TfL, on behalf of the Mayor, is taking forward a proposal to establish a London-wide LEZ in order to move London towards achieving national and European air quality objectives and, as a result, improve the health of Londoners. The LEZ particularly aims to reduce levels of PM₁₀.

The LEZ would cover Greater London and would target the most heavily-polluting vehicles. It would initially apply to heavy goods vehicles (HGVs), buses and coaches. It would later be extended to include the larger light goods vehicles and minibuses.

The LEZ would seek to deter these vehicles from driving within the zone by levying a substantial daily charge for non-compliance with specified emission standards. The purpose of the charge would be to encourage operators to modify or replace their vehicles to meet the LEZ standard, so that they drive cleaner vehicles in London without paying the charge.

The proposed LEZ emission standards will initially be Euro III for PM₁₀ emissions. In 2012, it is proposed that the standard be tightened to Euro IV for HGVs, buses and coaches.

The Mayor consulted on revisions to his Transport and Air Quality Strategies earlier this year to allow for the LEZ. TfL has now



developed a detailed scheme for further consultation. Subject to the outcome of the consultation, the LEZ could come into force from early 2008.



Section 6

6.1 Feedback

TfL encourages feedback about its interaction with London's environment and would welcome comments on this report and the issues that it raises.

Comments should be sent to:

Helen Pearce
Sustainability Unit
Group HSE
Transport for London
Windsor House
42–50 Victoria Street
London
SW1H 0TL

Alternatively, email helenpearce@tfl.gov.uk

6.2 Glossary

CO ₂	Carbon dioxide
CSS	Customer satisfaction survey
dB(A)	'A' weighted decibal
Defra	Department for Environment, Food and Rural Affairs
DLR	Docklands Light Railway
GLA	Greater London Authority
KPI	Key performance indicator
LCCC	London Construction Consolidation Centre
LEQSE	Local Environmental Quality Survey of England
LEZ	Low Emission Zone
LU	London Underground
MSS	Mystery shopper survey
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
PM ₁₀	Fine particulate matter, less than 0.01mm in diameter
PPP	Public Private Partnership
SO ₂	Sulphur dioxide
TDM	Travel demand management
TfL	Transport for London
TLRN	Transport for London Road Network

Appendix A: Detailed data tables

The tables presented in this section contain data collected from the transport modes and business units within TfL for reporting purposes. They are intended to highlight any omissions in the data, or differences in the areas reported on from one year to another. Any further comments about the data, particularly what has been included or excluded, are also in the tables. The tables have been coloured according to the following key:

Key	
Not available	
Not applicable	

Table A.1: Passenger journeys and passenger kilometres travelled by transport mode

Passenger journeys					
Transport mode or business unit	Passenger journeys		Passenger km		Comments
	2004/05	2005/06	2004/05	2005/06	
LU					
LU	975,877,051	971,085,719	7,605,995,609	7,586,214,482	
Surface Transport					
Buses					
London Bus network	1,792,713,268	1,815,631,883	6,754,909,752	6,652,646,390	
East Thames Buses					
Bus permits and agreements					
Taxis					
Private hire vehicles					
Dial-a-Ride	1,261,000	1,232,000	3,455,140	3,375,680	Passenger km figures assume an average journey length of 2.7km
Croydon Tramlink	21,807,178	22,496,349	1,133,973,279	1,16,981,016	

Table A.1: Passenger journeys and passenger kilometres travelled by transport mode – continued

Passenger journeys					
Transport mode or business unit	Passenger journeys		Passenger km		Comments
	2004/05	2005/06	2004/05	2005/06	
London River Services					
Piers, Thames Clippers and Riverboat Services	1,865,000	2,126,000	4,132,000	4,252,000	
Woolwich Ferry					
London Rail					
DLR	50,102,490	53,000,000	242,800,000	257,400,000	

Table A.2: CO₂ emissions by energy source and transport mode or business unit

Greenhouse gas emissions									
Transport mode or business unit	CO ₂ emissions from electricity use (tonnes)		CO ₂ emissions from gas use (tonnes)		CO ₂ emissions from liquid fuel use (tonnes)		Total (tonnes)		Comments
	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	
LU									
LU	423,288	419,748	9,407	7,053		4,478	432,695	431,279	
Greenwich Power Station			5,944	7,402			5,944	7,402	
Surface Transport									
Buses									
London Bus network	0	0			649,974	682,508	649,974	682,508	London Bus network is on 100% renewable electricity tariff
East Thames Buses	Included in Dial-a-Ride						Included in Dial-a-Ride		East Thames Buses and Dial-a-Ride share a garage
Bus permits and agreements						20,789		20,789	
Taxis					237,705	237,442	237,705	237,442	

Table A.2: CO₂ emissions by energy source and transport mode or business unit – continued

Greenhouse gas emissions										
Transport mode or business unit	CO ₂ emissions from electricity use (tonnes)		CO ₂ emissions from gas use (tonnes)		CO ₂ emissions from liquid fuel use (tonnes)		Total (tonnes)		Comments	
	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06		
	Private hire vehicles						252,987			252,987
Dial-a-Ride	364	370	451	431	2,303	2,399	3,118	3,200	Includes East Thames Buses	
Croydon Tramlink	5,344	5,515	131	131			5,475	5,646		
Victoria Coach Station	318	320	112	111			430	431		
London River Services										
Piers, Thames Clippers and Riverboat Services	87	88			9,257	10,507	9,344	10,595		
Woolwich Ferry					2,186	2,426	2,186	2,426		
London Rail										
DLR	19,028	19,350	1,140	1,140			20,168	20,490	The DLR was extended during 2005/06 and new routes were tested	

Table A. 2: CO₂ emissions by energy source and transport mode or business unit – continued

Greenhouse gas emissions									
Transport mode or business unit	CO ₂ emissions from electricity use (tonnes)		CO ₂ emissions from gas use (tonnes)		CO ₂ emissions from liquid fuel use (tonnes)		Total (tonnes)		Comments
	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	
Streets	26,446	14,911				1,454		16,365	
Head office buildings	0	0	3,361	4,627			3,361	4,627	Head office buildings are on 100% renewable electricity tariffs

Table A.3: Air pollutant emissions by energy source and transport mode or business unit

Air pollution							
Transport mode or business unit	NO _x (tonnes)		PM ₁₀ (tonnes)		SO ₂ (tonnes)		Comments
	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	
LU							
LU		16		1.1			
Greenwich Power Station	11	13			1.1	1.3	
Surface Transport							
Buses							
London Bus network	5,832	5,830	32	11			Emissions from bus stations/ garages are not included
East Thames Buses							
Bus permits and agreements		128		3.2			
Taxis	884	854	108	99			
Private hire vehicles		711		49			
Dial-a-Ride	50	36	1.7	1.3			
Croydon Tramlink							

Table A.3: Air pollutant emissions by energy source and transport mode or business unit – continued

Air pollution							
Transport mode or business unit	NO _x (tonnes)		PM ₁₀ (tonnes)		SO ₂ (tonnes)		Comments
	2004/05	2005/06	2004/05	2005/06	2004/05	2005/06	
Victoria Coach Station		1.1		0.02			
London River Services							
Piers, Thames Clippers and Riverboat Services	169	192	3.1	3.5	166	189	
Woolwich Ferry	39	44	0.7	0.8	39	43	
London Rail							
DLR							
Streets		4.3		0.3			
Head office buildings							

Table A.4: Commercial and industrial waste produced and recycled, by transport mode or business unit

Commercial and industrial waste						
Transport mode or business unit	Amount produced (tonnes)		Amount recycled (%)		Comments	
	2004/05	2005/06	2004/05	2005/06		
LU						
LU	10,147	9,052	20%	27%		
Greenwich Power Station						
Surface Transport						
Buses						
London Bus network						
East Thames Buses		Included in Dial-a-Ride		Included in Dial-a-Ride	East Thames Buses and Dial-a-Ride share a garage	
Bus permits and agreements						
Taxis						
Private hire vehicles						
Dial-a-Ride		153		15%		
Croydon Tramlink						

Table A.4: Commercial and industrial waste produced and recycled, by transport mode or business unit – continued

Commercial and industrial waste						
Transport mode or business unit	Amount produced (tonnes)		Amount recycled (%)		Comments	
	2004/05	2005/06	2004/05	2005/06		
Victoria Coach Station		316		0%		
London River Services						
Piers, Thames Clippers and Riverboat Services	98	101	0%	0%		
Woolwich Ferry						
London Rail						
DLR	309		30%			
Streets						
Head office buildings		852		34%		

Table A.5: Hazardous waste produced and recycled, by transport mode or business unit

Hazardous waste						
Transport mode or business unit	Amount produced (tonnes)		Amount recycled (%)		Comments	
	2004/05	2005/06	2004/05	2005/06		
LU						
LU	456	2,381	0%	0%		
Greenwich Power Station						
Surface Transport						
Buses						
London Bus network						
East Thames Buses		Included in Dial-a-Ride		Included in Dial-a-Ride	East Thames Buses and Dial-a-Ride share a garage	
Bus permits and agreements						
Taxis						
Private hire vehicles						
Dial-a-Ride		79		48%		
Croydon Tramlink						

Table A.5: Hazardous waste produced and recycled, by transport mode or business unit – continued

Hazardous waste						
Transport mode or business unit	Amount produced (tonnes)		Amount recycled (%)		Comments	
	2004/05	2005/06	2004/05	2005/06		
Victoria Coach Station		41		0.2%		
London River Services						
Piers, Thames Clippers and Riverboat Services						
Woolwich Ferry						
London Rail						
DLR	2.4		0%			
Streets						
Head office buildings		0.8		100%		

Table A.6: Construction and demolition waste produced and recycled, by transport mode or business unit

Construction and demolition waste						
Transport mode or business unit	Amount produced (tonnes)		Amount recycled (%)		Comments	
	2004/05	2005/06	2004/05	2005/06		
LU						
LU	64,332	115,012	87%	49%		
Surface Transport						
Buses						
London Bus network						
East Thames Buses						
Bus permits and agreements						
Streets						

Table A.7: Water consumption, by transport mode or business unit

Water consumption			Comments
Transport mode or business unit	Water consumption (m ³)		
	2004/05	2005/06	
LU			
LU	634,851	633,877	
Greenwich Power Station			
Surface Transport			
Buses			
London Bus network			
East Thames Buses		Included in Dial-a-Ride	East Thames Buses and Dial-a-Ride share a garage
Bus permits and agreements			
Taxis			
Private hire vehicles			
Dial-a-Ride		11,000	
Croydon Tramlink			
Victoria Coach Station	29,356	24,637	

Table A.7: Water consumption, by transport mode or business unit

Water consumption			
Transport mode or business unit	Water consumption (m ³)		Comments
	2004/05	2005/06	
London River Services			
Piers, Thames Clippers and Riverboat Services	15,910	14,867	
Woolwich Ferry			
London Rail			
DLR			
Streets			
Head office buildings	86,982	94,967	

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End notes

¹Defined by the GLA as creating a better quality of life for people, both now and in the future.

²This calculation assumes that, on average, cars emit 170g of CO₂ per km, and an average car journey is 6.8km.

³A corridor in this sense is all the space between building frontages, including the carriageway, pedestrian footways and other public spaces.

⁴The CO₂ emissions reported by transport mode in table 4 only take into account energy used to power the vehicles and exclude energy used in support services, eg maintenance activities and administration. Energy used in support services has been taken into account in calculating the Group CO₂ emissions presented in figure 4.

⁵Passenger km is a standard measure used in the transport sector and represents the total distance in km travelled by users of the given mode over a specified time period, in this case per annum. Figures for passenger km are given in table A.1 of appendix A.

⁶CO₂ emissions per passenger km for cars has been estimated on the basis of figures from the 2004 National Travel Survey (www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_039344.pdf), which include average km driven per car in London. Average CO₂ emissions of 170g per km driven were assumed. An average of 1.37 passengers per car was assumed, based on figures in the London Travel Report 2005. Total emissions from cars have been projected from the latest data available from the London Energy and CO₂ Emissions Inventory.

⁷Energy consumption in head office buildings has been normalised for head office floor space (offices had a combined floor area of 116,497 square metres in 2004/05, rising to 129,676 in 2005/06) and number of head office occupants (4,934 in 2004/05, rising to 5,904 in 2005/06).

⁸LEDs are significantly more energy efficient than conventional light bulbs.

⁹The Energy Efficiency Accreditation Scheme is an independent external auditing scheme run by the National Energy Foundation on behalf of the Carbon Trust (www.thecarbontrust.co.uk/energy/takingaction/eeas.htm) and is monitored by the Energy Institute (www.energyinst.org.uk/).

¹⁰BREEAM is the industry standard for assessing a building's environmental impact (www.breeam.org).

¹¹The head office water consumption target of 9m³ per person is a Defra published benchmark for typical office buildings. The TfL head office portfolio covers a greater mix of building types and usage patterns than typical offices so, going forward, TfL will ensure its reporting reflects this and is consistent with Government reporting and industry best practice.



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