

Transport for London



**Transport and Air Quality Strategy Revisions:
London Low Emission Zone**

Supplementary Information

Public and Stakeholder Consultation

30 January 2006

1. INTRODUCTION

1.1 On behalf of the Mayor, Transport for London (TfL) is consulting on draft revisions to the Mayor's Transport and Air Quality Strategies. The draft revisions take forward the proposed London Low Emission Zone (LEZ). This Supplementary Information document provides further detail on the LEZ proposals, including:

- the relevant national Air Quality Objectives and European Union Limit Values;
- the range of daily charge and penalty charge being considered;
- the proposed emission standards and how they would operate; and
- the expected impacts of the LEZ on air quality, and the health benefits expected to derive from this for people who live, work and visit London, as well as other anticipated impacts of the LEZ.

1.2 This document provides a greater depth of information than is provided in the Draft Revisions, which are primarily strategic in nature. It aims to facilitate greater understanding of the proposed LEZ, and thereby support the consultation.

2. THE LEZ AND AIR QUALITY OBJECTIVES

2.1 Improving air quality for the protection of human health

2.1.1 The proposed LEZ has two objectives. The first is to move London closer to achieving target air quality objectives and limit values. These have been set nationally and at the European level with the aim of protecting human health. The second objective is to improve the health and quality of life of people who live, work in and visit London, through improving air quality. The LEZ would achieve these objectives by bringing forward reductions in air pollution arising from road transport emissions. By so doing, the LEZ would reduce the health impacts of these emissions on the population.

2.2 EU and UK legislative framework

2.2.1 To address the problem of poor air quality, the EU and the UK have developed legislation that requires action to be taken to reduce the concentrations of air pollutants to levels which will have minimal impacts on human health. At the EU level, the primary legislation is the *Directive 96/62/EC on Ambient Air Quality Assessment and Management*, known as the 'Air Quality Framework Directive'. Under this Framework, Air Quality Daughter Directives have been developed which set the actual limit values for individual pollutants.

- 2.2.2 The Air Quality Framework Directive and the Air Quality Daughter Directives are transposed into English law by the Air Quality (England) Regulations 2000, the Air Quality Limit Values Regulations 2001 and amendments. They are implemented in large part through Part IV of the Environment Act 1995. Regulations made under Part IV of that Act, the Air Quality (England) Regulations 2000, contain domestic air quality objectives for England. Many of these are set at the limit values contained in the Air Quality Daughter Directives. The Secretary of State, local authorities and the Mayor are required to take steps to achieve these domestic air quality objectives. The Secretary of State is required to prepare a national air quality strategy, which is the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (2000). The Strategy is currently under review, and a new draft is expected in spring 2006.
- 2.2.3 The EU Directive and Daughter Directives set a strategic framework for tackling poor air quality through the setting of legally binding 'limit values' that are to be achieved by target dates for a range of pollutants that impact on human health, vegetation and ecosystems. A limit value is defined as: 'a level fixed on the basis of scientific knowledge, with the aim of avoiding, preventing or reducing harmful effects on human health and/or the environment as a whole, to be attained within a given period and not to be exceeded once attained'.¹
- 2.2.4 The AQS sets air quality 'objectives' for a number of priority pollutants in order to restrict the concentration at which that pollutant is present in the air from a target date. Most of the priority pollutants are those present at levels that have a significant impact on human health. They are benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide (NO₂), ozone, sulphur dioxide and particulate matter less than 10 microns in diameter (PM₁₀). Polycyclic Aromatic Hydrocarbons (PAH) have also been recently included (2003) for regulation through the AQS. The AQS also sets separate objectives for oxides of nitrogen (NO_x) and sulphur dioxide, to address their impact on vegetation and ecosystems.
- 2.2.5 Under local air quality management (LAQM), local authorities, including the GLA, have a statutory obligation to work towards these national air quality objectives. Ozone and PAH are not set as a statutory requirement at the local level as they are considered trans-boundary pollutants beyond the effective control of local authorities.
- 2.2.6 The air quality objectives are derived from health-based standards which have been developed by the Expert Panel on Air Quality Standards (EPAQS). This was set up in 1991 to provide independent advice to UK ministers on air quality issues, particularly the levels of pollution at which none or minimal health effects would be likely to occur. These standards have been developed taking account of the

¹ EU Air Quality Framework Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management
Official Journal L 296 , 21/11/1996 P. 55 - 63

effect of human exposure to each pollutant. The United Kingdom has subsequently taken into account issues of economic efficiency, practicability, technical feasibility and timescale when setting the air quality objectives.

2.2.7 The European Commission has recently developed a proposed new directive on ambient air quality and cleaner air for Europe.² The proposed directive would seek to regulate fine particles (PM_{2.5}) from 2010. There is increasing evidence to suggest that many of the toxic health effects of particles could be due to PM_{2.5}. The proposed directive suggests a new concentration cap for regulating this pollutant, which might replace the 2010 limit value for PM₁₀.

2.2.8 The Commission has indicated that it expects to take two years for the proposed directive to be examined by the European Council and European Parliament. The proposed directive may be amended by the Council and/or the Parliament before it becomes law. In the meantime, the UK remains under an obligation to work towards achievement of the limit values specified under the existing Air Quality Framework Directive and its Daughter Directives. The Mayor's duties are also set out in the air quality objectives prescribed in the Air Quality (England) Regulations 2000, the Air Quality Limit Values Regulations 2001 and amendments, and the national air quality strategy; these are unchanged.

2.2.9 The proposed Directive does introduce scope for deferring the achievement of EU limit values for NO₂, PM₁₀ and potentially the new concentration cap for PM_{2.5}. However, a deferment would be subject to Commission approval and it would need to be demonstrated that the Member State concerned had made every effort to achieve the relevant limit value or concentration cap. The LEZ would have a beneficial impact in reducing emissions of PM_{2.5}, as road traffic is an even larger source of PM_{2.5} than PM₁₀. The proposed LEZ, therefore, would be a means to demonstrate that the UK and London in particular is making every effort to achieve the new limit values or concentration caps for PM₁₀ and NO₂.

2.3 Objectives and limit values for PM₁₀ and NO₂

2.3.1 London is expected to meet the majority of the objectives for pollutants prescribed under the Local Air Quality Management regulations, but it is unlikely to meet its objectives for nitrogen dioxide (NO₂) and particulate matter (PM₁₀). Currently, each year that the UK misses an EU air quality limit value there is the risk of infraction proceedings, and the UK paying daily fines based on a percentage of Gross Domestic Product.

2.3.2 PM₁₀ in the atmosphere consists of a wide variety of materials, including: primary particles arising from combustion sources (mainly

² The proposal for a directive of the European Parliament of the Council on ambient air quality and cleaner air cleaner air for Europe., http://europa.eu.int/comm/environment/air/cafe/pdf/cafe_dir_en.pdf

road traffic); secondary particles, mainly sulphate and nitrate formed by chemical reactions in the atmosphere; and coarse particles, e.g. suspended soils and dust and particles from construction work. Both short-term and long-term exposure to PM₁₀ is consistently associated with respiratory and cardiovascular illness as well as other ill health effects³. As noted above, emerging evidence suggests that many of the toxic health effects of particles could be due to fine particles (PM_{2.5})⁴.

2.3.3 NO_x is the symbol for a generic group of chemicals called oxides of nitrogen, including both NO (nitric oxide) and NO₂ (nitrogen dioxide). NO_x is produced by high temperature combustion processes. Tailpipe emissions include NO and NO₂, though the amount of emissions of NO₂ in this direct way is relatively small. NO₂ is also formed from the reaction of NO with ozone; this reaction is thought to be responsible for the majority of NO₂ originating in London. It is NO₂ that is associated with adverse effects on human health⁵. NO does not have significant impacts on human health, but it is of concern because its reaction in the atmosphere can lead to NO₂.

2.3.4 In London in 2005, it was estimated that road transport accounted for 47 percent of PM₁₀ emissions and 47 percent of NO_x emissions⁶. Road transport emissions dominate in London much more than nationally. This is due to a combination of the high traffic levels in London and the small number of large industrial processes and power stations. London is also unique in the UK in terms of road emissions characteristics; high traffic volumes and low overall vehicle speeds often make road transport a more significant contributor to levels of these pollutants than would be the case in many other UK cities. Moreover, emissions from road vehicles are emitted close to ground level and are often concentrated on streets lined with buildings, creating poor dispersion conditions which can further increase their impact, and the exposure of people to excessive levels of these pollutants⁷.

2.4 Measuring progress against air quality objectives

2.4.1 Actual compliance with the national air quality objectives and EU limit values is measured using data collected from the national network of monitoring sites. These sites measure the actual concentrations of air pollution at representative locations and are the official measure for establishing whether the objectives and limit values are met. Because

³ Air Quality Expert Group, Particulate Matter in the United Kingdom, Department of Environment, Food and Rural Affairs; 2005, p29 – 33.

⁴ Department of the Environment, Transport and the Regions, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Working Together for Clean Air, 2000, p52.

⁵ *ibid*, p45

⁶ London Atmospheric Emissions Inventory (LAEI) 2002. The LAEI is an annually updated database of identifiable emissions sources, as well as estimates of the quantity of specific pollutants emitted into the air within and around the Greater London area. The figures quoted here are those predicted for 2005 from the 2002 base year.

⁷ Greater London Authority, Cleaning London's Air: Mayor's Air Quality Strategy, Greater London Authority, September 2002, p. 34.

of the limited number of monitoring sites, a combination of monitoring sites and computer models are used to measure achievements against air quality objectives to make forecasts. The models use data from more than one hundred national and air quality monitoring sites across London. These models use topographical, chemical, meteorological and historical data to predict concentrations of pollutants across London, and are the basis on which London's progress in meeting air quality objectives is determined.

2.4.3 The computer models predict concentrations of pollutants for the whole of London, on a 20m² basis. Areas of predicted high pollution can be identified and in addition, the total area which is expected to exceed the levels set by the objectives either on an hourly, daily or annual basis can be calculated.

2.5 Progress against objectives and limit values for NO₂ and PM₁₀

2.5.1 Table 1 below sets out United Kingdom Air Quality objectives and European Union Limit Values. London has to achieve these objectives and limit values by the specified date, and once attained should not exceed them.

Table 1: UK AQS Objectives and EU Limit Values for NO₂ and PM₁₀

Pollutant	Averaging Period	UK Objective	Target Date	EU Limit Value	Target Date
NO ₂	1 hour mean	200µg/m ³ not to be exceeded more than 18 times a year	31 Dec 2005	200µg/m ³ not to be exceeded more than 18 times a year	1 Jan 2010
	Annual mean	40µg/m ³	31 Dec 2005	40µg/m ³	1 Jan 2010
PM ₁₀	24 hour mean	50µg/m ³ not to be exceeded more than 35 times per year	31 Dec 2004	50µg/m ³ not to be exceeded more than 35 times per year	1 Jan 2005
	24 hour mean	50µg/m ³ not to be exceeded more than 7 times per year (UK) or 10 times per year (London)	By 2010	50µg/m ³ not to be exceeded more than 7 times per year	By 2010 (indicative target)
	Annual mean	40µg/m ³	31 Dec 2004	40 µg/m ³	1 Jan 2005
	Annual mean	23 µg/m ³ (London) 20 µg/m ³ (UK)	By 2010	20 µg/m ³	By 2010 (indicative target)

2.5.2 London is expected to have achieved the AQS objectives for the 1 hour mean concentrations of NO₂ (the objectives and limit values are set out below in Table 1). However, it is expected that when fully ratified data is available it will have failed to achieve the annual mean objective for NO₂ (target date 2005) and the annual mean and daily objective for PM₁₀ (target date 2004). These objectives are expected to be exceeded particularly around the road network where pollution

concentrations are higher than a number of the AQS objectives and EU limit values.

2.5.3 The most challenging targets for the UK and for London and their current status are set out below:

- The annual mean NO₂ concentration, set at 40 µg/m³, to be achieved from the end of 2005 under the AQS and by 2010 under the EU Directive. **Provisional data indicates that London failed to achieve this objective in 2005.**
- The annual mean PM₁₀ concentration of 40 µg/m³ in 2005 for London under the AQS. **Provisional data indicates that London failed to achieve this objective at pollution hotspots in 2005.**
- The annual mean PM₁₀ concentration of 23 µg/m³ in 2010 for London under the AQS (it is tightened to 20 µg/m³ for the rest of the UK). There is also an indicative EU limit value of 20 µg/m³ for 2010. **Significant areas of London are forecast to exceed the annual mean PM₁₀ objective for 2010.**
- The daily PM₁₀ mean concentration of 50 µg/m³, not to be exceeded more than 35 times per year from January 2005 under the AQS and EU Directive. **Provisional data for 2005 indicates that London has failed to achieve this objective and limit values at some sites.**
- The daily PM₁₀ mean concentration of 50 µg/m³, not be exceeded more than 10 days each year in London from 2010 as set out in the AQS and as an indicative target of 7 days under the EU Directive. **Significant areas of London are forecast to exceed the daily PM₁₀ objective for 2010.**

2.5.3 The provisional data for 2005 indicates that levels of PM₁₀ and NO₂, when averaged over the entire year, exceeded the annual mean objectives at more than one monitoring site in London. The daily mean PM₁₀ objective allows the limit of 50 µg/m³ to be exceeded up to 35 times a year before the objective is breached. Provisional monitoring data indicates that at several sites pollution levels rose above 50 µg/m³ on more than 35 days. The PM₁₀ objectives had to be achieved from 31st December 2004. Exceedances of these standards in 2005, by ratified data, would be a legal breach of UK regulations. The data is expected to be ratified by May 2006.

2.6 Multiple factors affect air quality

2.6.1 The relationship between reductions in emissions and air quality is not linear as air quality depends on the quantity of pollutants emitted, chemical processes in the atmosphere, and the weather. The nature

of the prevailing weather conditions can impact significantly on air pollution levels. If levels of emissions have reduced from one year to the next, but the weather is unfavourable, then improvement in air quality will not necessarily occur.

2.6.2 The other key contributing factor affecting concentrations of pollutants in London is trans-boundary pollution. Air pollution, particularly acid rain, particles and ozone can be transported by air masses drifting from other parts of the UK, Europe or elsewhere; this can also adversely impact on pollution levels experienced in London. The LEZ would, however, reduce road transport emissions of two harmful pollutants that concentrate in London, being Particulates and NO₂.

3. THE OPERATION OF THE PROPOSED LEZ

3.1 Setting the level of the charge

- 3.1.1. The Mayor's preferred option at this stage is the implementation of a LEZ via a Scheme Order under the GLA Act 1999. This would not ban non-compliant vehicles; rather, it would apply a substantial daily charge so that operators would make an economic decision whether or not to take their vehicles into the LEZ. The charge would be set at such a level as to encourage operators to modify or replace their vehicles, and so maximise the air quality and health benefits of the LEZ. The level of penalty charge for non-compliance would need to be proportionate, having regard amongst other factors to the level of the daily charge.
- 3.1.2 TfL is considering a range of possible levels of charge and penalty charges. The proposed ranges are between £100 and £200 for the daily charge, and between £500 and £1000 for the penalty charge. These ranges were chosen because they provide a direct economic incentive to all but the most infrequent visitors to the LEZ to make their vehicles compliant.
- 3.1.3 TfL's modelling work suggests a gradual erosion of health and air quality benefits from the LEZ between the high and the mid charge range, and a steeper erosion from the mid to the low range. Below the £100/£500 level, the anticipated health benefits of the LEZ are severely eroded, as operators have more of an incentive to pay the daily charge rather than clean up their vehicles.

3.2 Vehicles covered by the LEZ

- 3.2.1 The vehicles that would be covered by the proposed LEZ in 2008 are diesel-engined Heavy Goods Vehicles (HGVs) over 3.5 tonnes, whether licensed for private use, commercial use or hire and reward. Buses and coaches with 17 or more seats (excluding the driver) licensed for the carriage of passengers for hire or reward, voluntary, community or other non-profit purposes are also included within the LEZ.
- 3.2.2 The LEZ aims to reduce the harmful emissions from these diesel-engined vehicles. The health and air quality benefits of the LEZ would also be eroded if there were an extensive range of exemptions. Consequently, it is proposed that there be a limited number of exemptions from the LEZ, and these would apply only to those specialist vehicles for which the fitting of abatement equipment is not an option, and where it would be unreasonable to require replacement.

3.2.3 TfL proposes that the following vehicles would have an outright exemption:

- Military operational vehicles (the Green Fleet), because of their military role; and
- Heritage vehicles, because they cannot be replaced and their total contribution to air pollution is minimal, as such vehicles are driven infrequently.

3.2.4 Mobile Machinery, which falls within the scope of the European Union Non-Road Mobile Machinery (NRMM) Directive 1997 (which became effective from 1998), is subject to different emissions limits set by that Directive and would be exempted from the scope of the LEZ.⁸ Such vehicles include construction plant equipment, for example cement mixers. TfL is considering further what (if any) other classes of specialist vehicles might be granted an exemption, and how such a process might work.

3.3 Euro Standards

3.3.1 Since 1990, EU legislation has meant that vehicle manufacturers have had to meet increasingly strict emission standards, commonly referred to as “Euro standards”. These standards reduce the amount of carbon monoxide, hydrocarbons, particulate matter and oxides of nitrogen that are emitted from vehicle engines.

3.3.2 It is proposed that emissions criteria would be set for entry into the LEZ based on Euro standards which cover those heavy goods vehicles (HGVs), coaches and buses using diesel fuels. Diesel vehicles, while they tend to be more fuel efficient and emit less carbon dioxide (the main greenhouse gas), emit more particulate matter and NO_x than petrol-fuelled vehicles. The tougher standards introduced through Euro standards together with the proposed LEZ would bring about reductions in PM₁₀ and NO_x through the faster introduction of cleaner, less polluting vehicles into the fleet.

3.4 The proposed LEZ emission standards

3.4.1 Proposed emission standards for vehicles operating in the LEZ are:

- for 2008, a standard of Euro III for particulates (PM₁₀) for HGVs, buses and coaches;

⁸ Directive 97/68/EC of the European Parliament and of the Council of 16 December 1997. The Directive covers “non-road mobile machinery”, which means any mobile machine, transportable industrial equipment or vehicle with or without bodywork that is not intended to be used to carry goods or passengers on the road, in which an internal combustion engine is installed, for example excavators and other construction equipment. <http://europa.eu.int/scadplus/leg/en/lvb/l21219.htm>

- for 2010 a standard of Euro IV for PM₁₀, or the relevant particulate standard in force at the time.⁹ In the event that retrofit NO_x certification capability is available, there would be a standard of Euro IV for PM₁₀ **and** NO_x (the issues around developing a certification process for NO_x is further discussed in 3.7.6 below). This would apply to HGVs, buses and coaches; and
- there is also an option of extending the LEZ to Light Goods Vehicles (LGVs) in 2010 based on a rolling ten year age limit, subject to further analysis of the costs and benefits of doing so.

3.4.2 The proposed emission standards for 2008 would allow all registered Euro III, Euro IV and Euro V HGVs, buses and coaches into the zone without charge. In addition, all pre-Euro III HGVs, buses and coaches would be permitted to operate in the zone without charge if they took verifiable additional action to improve emissions performance (for example by fitting a new engine, fitting a diesel particulate filter or through alternative fuel conversion).

3.4.3 The same principle and approach would apply to all Euro IV or equivalent HGVs, buses and coaches in 2010. That is, all pre-Euro IV HGVs, buses and coaches would be permitted to operate in the LEZ, provided they took verifiable additional action to improve emissions performance to the proposed LEZ standard.

3.4.4 If the LEZ were to be extended to LGVs in 2010, it is proposed the standard for these vehicles would be a rolling 10 year age limit. This is because a standard that promoted the fitting of pollution abatement equipment would not be practical for this sector of the market as retrofit solutions for smaller vehicles are currently not well developed. Potentially, a large number of vehicles could be affected.

3.5 Abatement equipment

3.5.1 Many heavy goods, buses and coaches can be fitted with particulate abatement systems to reduce PM₁₀ emissions. Over 100,000 HGVs have been fitted with Diesel Particulate Filters (DPFs) across Europe, including approximately 20,000 to 30,000 in the UK. These have been used on a wide range of heavy vehicles and achieve significant levels of emissions reductions (estimated at between 85% - 95% depending on the device fitted and the vehicle type).

3.5.2 The proposed LEZ includes an option for a 2010 standard of Euro IV for PM₁₀ and NO_x. From 2005, new heavy duty commercial vehicles from the major European manufacturers have been introduced with NO_x abatement equipment fitted as standard in the form of Selective

⁹ TfL will continue to monitor the progress of the European Commission's Thematic Strategy, and take account of the impact of the proposed new Directive on ambient air quality and cleaner air for Europe.

Catalytic Reduction (SCR)¹⁰ or Exhaust Gas Recirculation (EGR)¹¹ systems. These meet the Euro IV emission standards, which will be mandatory for all new vehicles from 2006. In addition, vehicles able to meet the tighter Euro V standards are already in production with some manufacturers. All Euro IV and Euro V vehicles will be compliant with the LEZ standard for 2010 and will be able to enter the LEZ without paying a charge.

- 3.5.3 NO_x abatement devices for retrofit are also available. Exhaust Gas Recirculation devices (which require engine modification) is the system that is most commonly fitted. Retro-fit SCR systems are less well developed than retrofit EGR, with substantially fewer vehicles currently operating with these systems.
- 3.5.4 Trials of retrofitting of NO_x abatement equipment to existing vehicles have successfully demonstrated that particulate traps and NO_x abatement equipment can be fitted to unmodified engines. NO_x retrofit abatement equipment is being trialled on TfL-contracted buses, and the results of these trials are expected in March 2006.
- 3.5.5 The issues around the promotion of NO_x technology on a large scale are more complex than for particulates. In order for the SCR equipment to work properly the engine needs to be continually dosed with urea or ammonia-liberating additives. Without adequate on-board diagnostic systems and controls within the vehicle the abatement equipment may not function properly and produce higher emissions than if no abatement equipment had been fitted.
- 3.5.6 In order to enable TfL to set a standard of Euro IV for NO_x as well as for PM₁₀ in 2010 it is essential that adequate technical standards, equipment certification, inspection and maintenance regimes are put in place for retrofitted NO_x abatement equipment. In the UK the Reduced Pollution Certificate (RPC) scheme operated by the Vehicle and Operator Services Agency (VOSA) provides certification for the retrofit of particulate abatement devices but no such standards currently exist in the UK or in Europe for retrofit NO_x devices. TfL is currently in discussion with DfT and the Environmental Industries Commission regarding options for providing NO_x retrofit standards.

3.6 Registration, Certification and inspection

- 3.6.1 In order to determine whether vehicles driving within the LEZ are subject to the charge, a certification database of compliant and non-compliant vehicles would be built up from data from licensing authorities such as the DVLA (for UK registered vehicles), and from operators. The DVLA does not directly hold the Euro Emissions

¹⁰ SCRs reduce oxides of nitrogen (NO_x) by mixing ammonia or urea into special catalysts in the exhaust gases of combustion engines, converting NO_x into harmless nitrogen and water vapour.

¹¹ EGR systems recirculate a small amount of exhaust gas which reduces the emissions of NO_x in the tailpipe by producing a cooling effect on combustion processes.

standard of the vehicle. However, for most vehicles this can be derived by comparing the date of first registration recorded by DVLA with the mandatory introduction dates of the Euro standards. Using this proxy, all vehicles registered after 1st October 2001 are assumed to be Euro III or better, and all vehicles registered after 1st October 2006 will be Euro IV or better.

- 3.6.2 A key support for the LEZ would be a mechanism for certifying that an appropriate abatement device has been fitted, has been regularly inspected, and is correctly maintained.
- 3.6.3 In the UK, the Reduced Pollution Certification scheme currently certifies the reduction of vehicle particulate emissions through the fitting of particulate emission abatement devices, re-engining or fuel conversion. The RPC scheme is operated by VOSA (Vehicle Operator Services Agency). The DfT has expressed its support for the use of the existing RPC as an eligibility criterion for the LEZ's proposed particulates standard. TfL is now working with VOSA and the VCA (Vehicle Certification Agency) on proposals to ensure the RPC scheme would have the capacity to support the increased demand the LEZ would create, both in terms of volumes and types of vehicles. An RPC would, for example, need to be issued to significantly greater numbers of smaller vehicles (under 7.5 tonnes) than are currently fitted through this process.
- 3.6.4 The RPC scheme provides a means by which vehicles meeting the proposed LEZ emission standards for particulates could be identified. There is an annual retest of the vehicles to ensure the emission reductions are maintained, and RPC status is recorded on Driver and Vehicle Licensing Agency (DVLA) records. Vehicles fitted with RPC certified devices would probably not therefore need to register to drive within the LEZ, as this information can be obtained directly from DVLA.
- 3.6.5 There are, however, alternative certification mechanisms available, such as the Clean up register maintained by the Energy Savings Trust, and other European schemes including the Swiss VERT, French ADEME and Swedish MTB.
- 3.6.6 TfL is investigating these alternative certification mechanisms, with the intention that they work alongside an RPC equivalent process. A list of equivalent standards would be maintained to enable vehicles fitted with appropriate retro-fit equipment certified under these different certification schemes to drive within the LEZ without being required to pay the charge. Such an approach has the advantage of widening the technology routes for vehicles to comply with the LEZ, and enables foreign vehicles fitted with retro-fitted devices to enter the zone. It would also assist in managing the demand for retrofit equipment that would be generated by the LEZ, by allowing operators to use multiple routes to comply with the proposed LEZ standards.

3.6.7 For NO_x the certification, inspection and maintenance issues are more complex. As indicated above, SCR and EGR technologies exist for NO_x abatement, and are being trialled on London buses. The operational interfaces developed to support the existing RPC process could also be adapted for NO_x. There are, however, no registers analogous to the Energy Savings Trust “cleanup register” for approved NO_x abatement equipment. No procedures currently exist for testing NO_x technology, which needs to take account of actual road conditions (for particulates, vehicles can be tested in idling conditions). A NO_x emission standard would, therefore, require standards for the testing of NO_x abatement technology to be developed. TfL is continuing discussions with the abatement manufacturing industry, VOSA and VCA on these issues.

3.7 Enforcement

3.7.1 Vehicles driving within the LEZ would be detected using fixed and mobile cameras. The LEZ would use Automatic Number Plate Recognition (ANPR) cameras. The LEZ enforcement infrastructure would be made up of a combination of the existing Congestion Charging cameras, additional fixed cameras located across the Greater London area and mobile patrol units also fitted with ANPR cameras.

3.7.2 The number plates would then be matched against the data base of operator details described above, and a Penalty Notice issued against a non-compliant vehicle that had not paid the daily charge. The enforcement process would cover the issue of the Penalty Charge Notices, payment collection, representation and an appeals processing system similar to that used for Congestion Charging.

4. IMPACTS OF THE PROPOSED LONDON LOW EMISSION ZONE

4.1.1 The potential impacts of the LEZ have been identified and assessed. In addition to modelling changes in emissions and air quality, the effects of the proposed LEZ on the environment, health, business and the economy, sustainable development and equalities and social inclusion have been assessed. They will continue to be assessed during the development of the proposals.

4.1.2 As part of this work, and pursuant to the Environmental Assessment of Plans and Programmes Regulations 2004, a Strategic Environmental Assessment (SEA) of the proposed revisions to the Strategies was undertaken. This is discussed at the end of the environmental impacts section.

4.2 Impacts on the environment of the proposed LEZ

4.2.1 Impact on emissions and air quality

4.2.1.1 Whilst the introduction of the LEZ would not bring London into full compliance with the AQS and the EU Directive, it would:

- reduce the tonnage of pollutants emitted by the vehicles targeted by the LEZ;
- reduce concentrations of air pollutants present in the atmosphere; and
- reduce the numbers of people exposed to excessive levels of these pollutants.

It would therefore deliver progress towards improving air quality in London and the health of people who live, work and visit London.

4.2.1.2 To assess the air quality benefits of the proposed LEZ, the expected reductions in emissions (measured in tonnes emitted from vehicle tailpipes), and air quality concentrations (pollutants present in ambient air measured in $\mu\text{g}/\text{m}^3$) have been modelled for 2008 and 2010. Expected reductions are all additional to the reductions that are likely to happen without the LEZ, i.e. through the natural cycle of vehicle replacement and other pollution control initiatives. Such initiatives include reducing the emissions of London buses and taxis through their contract and licensing arrangements.

4.2.1.3 It should be noted that air quality objectives are set in respect of concentrations rather than emissions. This is an important point as while emission reductions might be significant, they do not necessarily translate directly into measured improvements in air quality concentrations. This is because of the multiple factors that impact on London's air quality, including meteorology. The following forecasts of impacts of the LEZ on London's levels of

PM₁₀ and NO₂ have been modelled using the meteorological conditions of the 2002 year.

Forecast Reductions in PM₁₀

- 4.2.1.4 The proposed LEZ would have the effect of reducing the areas that exceed the limit values and objectives set for concentrations of PM₁₀.
- 4.2.1.5 For PM₁₀, the UK objective and EU limit value of particular relevance is the 24 hour mean. If the proposed LEZ was implemented in 2008 it is expected that the area exceeding daily PM₁₀ limit (i.e. more than 35 days per year) would reduce by around 12% in 2008. This would equate to around 2,700 fewer people being exposed to excessive levels of this pollutant (i.e. exceedences of 50µg/m³ more than 35 days per year).
- 4.2.1.6 The 2010 objective for the 24 hour mean for PM₁₀ is tightened under the AQS such that London is not to exceed 50µg/m³ more than 10 times per year after 31 December 2010. The LEZ standards proposed to be implemented in 2010 would reduce by around 17% the area of London exceeding this tighter limit, equating to some 38,000 fewer people exposed to excessive levels of PM₁₀ (i.e. exceedences of 50µg/m³ more than 10 days per year).
- 4.2.1.7 The second PM₁₀ objective is for the annual mean concentration. The objective and limit value is 40µg/m³ which London and the rest of the UK are likely to have exceeded at pollution hotspots by the 2005 target date when provisional results are confirmed. However, new targets for the annual mean concentration of PM₁₀ have been set for London under the AQS to be met by 2010. This requires London not to exceed a concentration of 23µg/m³, and the rest of the UK, 20µg/m³.
- 4.2.1.8 The LEZ in 2010 (with a standard of Euro IV for PM₁₀) is predicted to reduce emissions of PM₁₀ by around 8%, and reduce the area of London exceeding this annual mean PM₁₀ objective by around 18%. This would equate to around 48,000 fewer people being exposed to excessive levels of this pollutant. Adding LGVs to the LEZ in 2010 would mean emissions are reduced in total by around 9.2%, the area exceeding the PM₁₀ objective shrinking by around 22 percent, and around 55,000 fewer people exposed to excessive levels of this pollutant.
- 4.2.1.9 Despite this progress, it should be noted that while a LEZ would reduce the area of London exceeding the PM₁₀ annual mean objective, it is expected that the objective for 2010 would still not be met in some areas of London.

Forecast Reductions in NO_x

- 4.2.1.10 For the annual mean objective for NO₂, a LEZ would deliver improved progress against meeting the UK objective and EU limit value of 40µg/m³. (The UK's domestic requirement is for this objective to be achieved by 31 December 2005 and the EU Directive's requirements by 1 January 2010).
- 4.2.1.12 The LEZ, in 2008, would not have a NO₂ standard. However, it would still lead to reduced emissions of NO_x through encouraging the uptake of modern vehicles that emit less of this pollutant. Modelling of the impacts indicates that in 2008 the proposed LEZ would reduce emissions of NO_x by 1,100 tonnes, or around 4% of the total tonnage emitted. The area exceeding the annual mean NO₂ objective for 2010 would shrink by around 7%, and around 51,000 fewer people would be exposed to excessive levels of NO₂.
- 4.2.1.13 The LEZ, with a standard of Euro IV for PM₁₀ only in 2010, would reduce emissions of NO_x by around 1,140 tonnes in that year. This would reduce the area exceeding the annual mean NO₂ objective by around 10.5%, and mean 21,000 fewer people were exposed to excessive levels of this pollutant.
- 4.2.1.14 Adding a Euro IV standard for NO_x in 2010 would considerably improve the effectiveness of the LEZ in relation to reducing emissions of NO₂. It would mean an additional 2140 tonnes reduction in NO_x. The area of London exceeding the 2010 annual mean objective would reduce by around 28%. Around 59,800 fewer people in total would be exposed to excessive levels of NO₂.
- 4.2.1.15 Despite this expected progress, the UK objective and the EU limit value would remain challenging. A summary of the air quality impacts for the core LEZ scheme and its 2010 options are set out in Annex A. Annex B also provides maps which give a visual representation of how improvements in air quality and reductions in numbers of people exposed to excessive levels of these pollutants are expected to play out across Greater London.

Primary NO₂

- 4.2.1.16 For emissions of NO_x, the overall trend in London is one of gradual reduction. Though levels of NO_x and NO₂ are declining overall, it has recently been observed at some roadside monitoring stations that the proportion of NO_x emitted as NO₂ has been rising. There are thought to be several reasons for this, including congested driving conditions, higher numbers of diesel engined vehicles and also the fitting of some types of particulate filters which generate NO₂ as part of their cleaning process.

4.2.1.17 TfL has undertaken a series of vehicle emissions tests to investigate this issue further. TfL will continue to seek expert input to interpret the available data to ensure the most up-to-date estimates of the NO_x/NO₂ ratio are incorporated into forecasts of LEZ impacts. This will be taken account of in developing the LEZ proposals and ongoing monitoring.

4.2.2 Impact on Greenhouse gases (carbon dioxide)

4.2.2.1 It is not anticipated that the proposed LEZ would have a significant impact on carbon dioxide (CO₂) emissions. There may be some small benefits from reduced CO₂ emissions through newer vehicles being introduced into the fleet, though these may be counterbalanced by greater fuel use of (or “fuel penalty” impacts) relating to the fitting of particulate abatement equipment.

4.2.3 Impact on ozone

4.2.3.1 The proposed LEZ is not expected to have a significant impact on the levels of ozone although it is a pollutant known to have impacts on the environment and on health. Given the complexities and uncertainties associated with the modeling of ozone impacts, no detailed modeling of the effects of a LEZ on ozone levels has been undertaken. Ozone is important in its role in the conversion process of NO_x to NO₂, and the proposed monitoring will be approaching ozone from this perspective.

4.2.4 Impact on noise

4.2.4.1 Small reductions in noise are possible, as post Euro III vehicles are slightly less noisy than pre-Euro III vehicles. [HIA findings]

4.2.5 Visual impacts

4.2.5.1 In addition to damaging health, air pollution damages buildings through soiling and erosion. This in turn impacts on London’s cultural and architectural heritage and reduces the visual amenity of the city. Building soiling also has economic effects arising from the costs of cleaning and reduced amenity. Quality of life impacts include the visible impacts of particulate soiling such as dirty windows and soiling of laundry. Reductions in PM₁₀ under the proposed LEZ would therefore bring about some small benefits in this area through a reduction in building soiling caused by particulate matter. At the same time, visual intrusion from new LEZ signage would be kept to a minimum.

4.2.6 Strategic Environmental Assessment

4.2.6.1 An Environmental Report has been prepared to look at the likely significant effects on the environment of the proposed LEZ. This was in accordance with the aim of the SEA directive to “provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes”. The LEZ is an environmental measure, designed to achieve health and air quality benefits. The SEA Report, and the consultation, will inform the further development of the LEZ proposals. The Environmental Report identified topics where significant impacts are likely:

- Air quality
- Biodiversity (including flora and fauna)
- Human health (discussed further under health assessment)
- Climate

4.2.6.2 The Report also considered where there might be some small impact, such as on:

- Material assets
- Cultural heritage
- Landscape/ townscape

4.2.6.3 The conclusions of the report produced through the SEA process are as follows. The LEZ is expected to deliver significant reductions in PM₁₀, especially in outer London in 2008 and further reductions in 2010 when the LEZ emission standard is tightened to Euro IV. Smaller reductions in NO₂ are expected. The effect of the LEZ on climate change and greenhouse gases is expected to be negligible.

4.2.6.4 Although air pollution is likely to be a contributing factor to habitat degradation, it is difficult to separate out air pollution from the range of factors influencing habitat quality. However, existing levels of understanding on the ecological effects of reducing levels of PM₁₀ and NO_x do not allow meaningful conclusions on the effect of the LEZ to be drawn.

4.2.6.5 The LEZ is not expected to have any significant impact on material assets or cultural heritage, apart from reduced soiling benefiting some buildings. There could be intrusions on the landscape resulting from the LEZ infrastructure (including cameras and signs). However, TfL would seek to minimise these intrusions as part of the development of any order.

4.3 Impacts of the proposed LEZ on health

4.3.1.1 Assessing the health impacts of the LEZ has two aspects. The first aspect is the assessment of the direct health benefits of the LEZ on people who suffer from respiratory or cardiovascular complaints. These benefits are able to be given a monetary value, in terms of reduced hospital admissions, less use of medication and the like. These direct impacts are discussed first in this section.

4.3.1.2 The second aspect is the broader health impact of the LEZ on communities, lifestyle and behaviour generally. This covers factors such as any increase in social capital through greater physical activity and the value placed on local amenities. Both the direct health impacts and broader health impacts of the LEZ are covered in the Health Impact Assessment, a summary of which follows the section on the quantifiable health impacts of the proposed LEZ.

4.3.2. Measuring the health impacts

4.3.2.1 A key objective of the proposed London LEZ is to improve the health of Londoners by reducing air pollution related impacts. Air quality in the UK is generally unlikely to cause any short-term health effects for the majority of the population. However, certain groups are more susceptible to poor air quality. For example, people with lung diseases or heart conditions, the elderly and those already suffering from asthma are more likely to be adversely affected.

4.3.2.2 It is a complex exercise to measure the benefits of improvements in air quality on the health of a population or on particular groups or individuals. The approach that has been taken is to estimate the health impacts using two methodologies. The first is approved by the UK Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP) and used by the Department of Environment, Food and Rural Affairs (Defra). The second is a recognised EU methodology.

DEFRA Methodology

4.3.2.3 The Defra methodology for estimating health benefits is 'conservative' and is consistent with the guidance given by the UK Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP). This method captures only the serious health impacts of air pollution e.g. premature deaths and respiratory hospital admissions. It is generally accepted that other, more minor health effects are also caused by air pollution, such as restricted activity days, and these would be reduced by measures such as the proposed LEZ.

- 4.3.2.4 Using the DEFRA methodology the estimated health benefits are between £130m - £180m for a 2010 standard of Euro IV for PM₁₀ only, and between £150m - £210m for a 2010 standard of Euro IV for PM₁₀ and NO_x and including LGVs (see Table 2).

EU Clean Air for Europe (Café) Methodology

- 4.3.2.5 The EU approach attempts to take into account a wider range of health effects e.g. restricted activity days and respiratory symptoms, and increased use of medicines, whilst recognising the increased uncertainty of some of these estimates.
- 4.3.2.6 Using this methodology, the estimated health benefits are between £190m - £260m for a 2010 standard of Euro IV for PM₁₀ only, and between £230m - £310m for a 2010 standard of Euro IV for PM₁₀ and NO_x including LGVs (see Table 3).
- 4.3.2.7 Tables 2 and 3 below show the potential benefits that would be derived nationally (that is, inside London and outside London) from the 2008 LEZ proposal. They then show the incremental benefits derived from tightening the proposed standards in 2010 to either a standard of Euro IV for PM₁₀ only or to a standard of Euro IV for both PM₁₀ and NO_x. They also show the additional benefits of adding LGVs in 2010. The ranges given show the likely outcomes for low or high operator compliance rates with the proposed LEZ.
- 4.3.2.8 The benefits outside London estimate the health impacts arising as a result of vehicle operators based outside London having less polluting vehicles in order to operate in London. These estimates carry a greater degree of uncertainty than the London benefits due to a number of factors, including the response of non-London operators to the proposed LEZ and the journey patterns of their vehicles. These estimates also allow for some older vehicles being taken outside of London in response to the LEZ.
- 4.3.2.9 The non-health benefits shown are those achieved through reduction in materials damage, primarily building soiling associated with particulate matter.

Table 2: Monetised Health Benefits - DEFRA Methodology

	Benefits (£m) Present Value¹²			
	2007/08 – 2015/16			
	2008 Scheme Euro III for PM₁₀ (HGV, bus and Coach)	2010 Scheme Euro IV for PM₁₀ only (incremental over 2008 Scheme)	2010 Scheme with additional NO_x abatement (alternative to PM₁₀ only)	2010 Scheme with LGVs (incremental over HGV, bus and Coach)
London Benefits				
Primary Health	38.0 - 50.9	47.0 – 62.0	44.5 – 59.5	12.8
Secondary Health	2.6 - 3.4	2.7 – 3.4	4.5 – 5.9	0.7
Non-Health	0.1 – 0.1	0.1 – 0.2	0.1 – 0.2	0.04
Total London Benefits	40.8 – 54.5	49.8 – 65.5	49.2 – 65.6	13.6
Outside London Benefits¹³	26.3 – 35.2	16.6 – 21.5	18.1 – 23.7	11.3
Total Benefits	67.1 – 89.7	66.3 – 87.1	67.3 – 89.3	24.9
Total monetised health benefits	Core LEZ scheme: £130 – £180		NOx option: £135 - £185	Plus LGVs: £150 - £210

¹² Health benefits have been discounted at 3.5%

Table 3: Monetised health benefits – EU Methodology

Benefits (£m) Present Value				
2007/08 – 2015/16				
	2008 Scheme Euro III for PM₁₀ (HGV, bus and Coach)	2010 Scheme Euro IV for PM₁₀ only (incremental over 2008 Scheme)	2010 Scheme with additional NO_x abatement (alternative to PM₁₀ only)	2010 Scheme with LGVs (incremental over HGV, bus and Coach)
London Benefits				
Primary Health	58.0 – 78.0	68.5 – 90.4	64.9 – 86.7	20.4 – 20.5
Secondary Health	11.1 – 14.7	11.7 – 15.4	19.6 – 26.2	2.3 – 2.6
Non-Health	0.1 – 0.1	0.1 – 0.2	0.1 – 0.2	0.03
Total London Benefits	69.2 – 92.9	80.3 – 106.0	84.6 – 113.1	22.9 – 23.0
Outside London Benefits	25.9 – 34.6	22.3 – 29.0	27.3 – 35.6	8.6
Total Benefits	95.1 – 127.5	102.6 – 134.9	111.9 – 148.7	31.4 – 31.6
Total monetised health benefits	Core LEZ scheme: £190 - £260		NO_x option: £210 - £280	Plus LGVs: £230 - £310

4.3.3 Impact of PM₁₀ and NO₂ on health

4.3.3.1 Particulate air pollution is associated with a range of effects on health including effects on the respiratory and cardiovascular systems, asthma and premature death. The higher the concentrations of PM₁₀, the greater the effect on health, and there is no minimum threshold for safe levels of exposure¹³.

4.3.3.2 NO₂ is associated with both acute and chronic effects on health, particularly in people with asthma. At relatively high concentrations NO₂ causes inflammation of the airways. Evidence shows that long-term exposure to NO₂ may affect lung function and that NO₂ enhances the response to allergens in sensitised individuals.

4.3.4. Summary of Health Impact Assessment

4.3.4.1 A Health Impact Assessment on the proposed LEZ was also prepared on TfL's behalf. The study aimed to identify and examine the key health outcomes of the proposed LEZ on communities,

¹³ Department of the Environment, Transport and the Regions, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Working Together for Clean Air, 2000, p.52

according to certain key determinants of health, such as living and working conditions.

4.3.4.2 Four positive outcomes relating to the LEZ were identified. These were:

- Environment
- Transport
- Economy
- Lifestyle and Behaviour

4.3.4.3 *Environment.* The most significant health benefits to be achieved are associated with potential improvements in air quality throughout and beyond London. Such improvements would contribute in reducing respiratory and cardiovascular disease and contribute to reducing inequalities within relatively deprived communities. Improvements in air quality are also associated with improvements in the living environment, and increased equality in the living environment; however, the impact on health inequalities across London is minimal.

4.3.4.4 *Transport.* Noise reductions and consequent direct health benefits to London communities would be marginal. However, indirect health benefits associated with improved perceptions of the environment may be sufficient to stimulate behavioural changes for vulnerable road users and pedestrians. The proposed LEZ would accelerate the transfer to newer safer vehicles throughout and beyond London.

4.3.4.5 *Employment and income.* The proposed LEZ would result in increased employment and income opportunities in the build up to implementing the scheme. However, such opportunities would be temporary and not likely to afford significant long term socioeconomic health benefits. The LEZ would have some negative employment and income impacts, because it would bring forward or impose a cost on some operators, by requiring them to replace or modify their vehicles.

4.3.4.6 *Lifestyle and Behaviour.* Improvements in the perception of the environment may also lead to increased physical activity and the value placed on facilities and amenities in the area, thereby increasing social capital. All of these factors may help to reduce community severance as people value and feel safer in their communities.

4.4 Further impacts of the proposed LEZ

4.4.1 Equalities implications

- 4.4.1.1 The Mayor has expressed his commitment to bringing equality and social inclusion issues into the mainstream of the policy making process. Equalities issues are integral to considering revisions to the Mayor's Air Quality and Transport Strategies. They are being considered at all stages of the development of these revisions. Should the revision to the strategy be published, a final equality and social inclusion impact assessment would be carried out at Scheme Order stage.
- 4.4.1.2 The six equalities target groups identified by the GLA's Equalities Framework are:
- women;
 - black & minority ethnic people;
 - lesbians, gay men, bisexuals and transgendered people;
 - disabled people;
 - different faith groups; and
 - young and old people
- 4.4.1.3 The assessment is based on the GLA model framework for assessing equalities issues. The framework has been used to determine whether any target individuals or groups are likely to be affected by adverse impacts set out above in a systematic and disproportionate manner. Accordingly, this allows formation of a view as to whether the strategy as proposed supports the Mayor's vision of a fair city.
- 4.4.1.4 This initial high level assessment suggests that overall the impacts of the proposed LEZ on target groups, and for the population in general, are likely to be positive due to the health benefits arising from the scheme. The young and the old are likely to experience more substantial health benefits, as they are generally more susceptible to the negative impacts of poor air quality.
- 4.4.1.5 The Boroughs of Hillingdon and the central boroughs of Kensington and Chelsea, Westminster, Islington, Camden and the City are the most susceptible to negative health impacts of poor air quality. The central parts of Lambeth, Southwark, Hackney, Tower Hamlets and Hammersmith are also susceptible, and stand to benefit most from the LEZ. The initial analysis suggests that these areas are demographically representative of Greater London, so equalities issues are unlikely to arise.
- 4.4.1.6 A reduction in hospital admissions would benefit the whole economy, and there is no evidence to suggest that particular target groups would be impacted differently from the general population.

Nor is there any evidence from this initial assessment to suggest that these target groups are disproportionately employed in businesses likely to be directly impacted by the LEZ.

4.4.1.7 The consultation will inform further analysis of these equalities issues, building on the community profiling exercise undertaken as part of the health assessment¹⁴.

4.4.2 Sustainable Development

4.4.2.1 Sustainable development refers to the pursuit of environmental, social and economic development objectives simultaneously. It means that the achievement of one objective should not be at the expense of others. Where tradeoffs are required between objectives, this should be done in a transparent manner, and the approach taken should be clearly justified.

4.4.2.2 The Mayor of London recommends that plans, policies and proposals in London should be designed to maximise their positive impacts on sustainable development. The London Sustainable Development Commission's Sustainable Development Framework supports this recommendation, with the overall aim that:

*We will achieve environmental, social and economic development simultaneously; the improvement of one will not be to the detriment of another. Where trade-offs between competing objectives are unavoidable, these will be transparent and minimised.*¹⁵

4.4.2.3 This aim is expanded into 13 objectives, under the following headings:

- *taking responsibility*
- *developing respect*
- *managing resources*
- *getting results*

4.4.2.4 TfL has undertaken an initial high level sustainable development assessment of the LEZ and determined that it is consistent with the Sustainable Development Framework. The UK Government's Sustainable Development Strategy (SDS) includes a commitment to help businesses make different choices to achieve sustainable development. The SDS also includes the aim to "reduce...harmful emissions across business sectors", and the proposed LEZ would encourage operators to purchase the cleanest vehicles on the market, or modify their vehicles to an acceptable standard.

¹⁴ This community profiling examines the susceptibilities to the negative impacts of poor air quality according to ethnicity, social and demographic structure and relative deprivation, as well as the existing air quality where they live and work.

¹⁵ http://www.london.gov.uk/mayor/sustainable-development/docs/lfdc_framework.pdf

- 4.4.2.5 The objectives of the proposed LEZ are to improve air quality in order to realise health benefits and to meet national EU air quality standards. The monetised level of health benefits are substantial and if steps are not taken to meet standards there is a risk that the EU could take infraction proceedings against the UK which could result in the application of daily fines based on percentage of GDP.
- 4.4.2.6 Analysis of various options to achieve these objectives show that a LEZ is the most cost effective option once all sustainable development impacts are considered, including any negative economic development impacts¹⁶. TfL will continue to assess the economic development impacts of the proposed LEZ and consult with stakeholders. As much as possible, TfL will continue to ensure that negative impacts on economic development are minimised. Phased implementation of the LEZ is one means by which TfL is seeking to take steps to minimise potential negative impacts.
- 4.4.3 Economic impacts – focusing on employment and tourism
- 4.4.3.1 There would be direct and indirect impacts on the London and UK economy from the LEZ, as it would bring forward or impose a cost on operators. Many operators, particularly larger ones would not be affected because they already have compliant vehicles or intend to upgrade their fleets prior to the proposed LEZ being introduced. Other operators may replace their vehicles, retro-fit their vehicles with particulate traps or redistribute their non-compliant fleets out of London. The compliance costs would generally be more severe for smaller operators, which tend to have the largest numbers of non-compliant vehicles.
- 4.4.3.2 On current fleet projections, it is estimated that approximately 60,000 HGVs, buses or coaches which currently operate in London would have to be upgraded or replaced for the proposed 2008 standard, and a further 100,000 could be affected by the proposed 2010 standard. If the scheme were extended to include diesel-engined LGVs in 2010, some additional 50,000 to 80,000 LGVs could be affected.
- 4.4.3.3 TfL is undertaking an assessment of the economic impact of the LEZ on the London and UK economy, focusing on potential employment and tourism impacts. A number of coach operators indicated that they would pass the compliance costs of the LEZ onto customers. At the same time, the proposed LEZ could promote the retrofit industry, as demand for services and certification processes associated increases.

¹⁶ The alternatives considered, such as road user charging and incentives to scrap older vehicles, are either outside the remit of the Mayor and the Greater London Authority, reliant on the national government to take action or are not cost-effective in terms of producing the results needed in the timescales required.

4.4.3.4 This work will endeavour to quantify the direct economic impact of the proposed LEZ on the transport and tourism sectors, and the indirect and induced impacts, both negative and positive, on other sectors of the economy. This work will necessarily engage businesses in order to gain a better understanding of the costs to businesses of the core scheme, and its potential extension to LGVs in 2010.

4.4.4 Traffic and transport impacts

4.4.4.1 *Road transport users and the general population inside and outside London* - There are expected to be air quality and health benefits for road users and the general population living both within the Greater London area and outside it. The LEZ is expected to encourage the clean up of the vehicle fleet across the UK generally. Users of road transport generally would benefit from reduced emissions. Any wider impacts of the LEZ on road transport operators would be monitored.

4.4.4.2 *Traffic and public transport* – there are no anticipated impacts on traffic levels or congestion, as the LEZ is expected to impact on fleet profiles rather than traffic volumes in and out of Greater London. Non-TfL contracted buses are expected to become cleaner through complying with the scheme.

4.4.4.3 *Drivers, Pedestrians, cyclists, motorcyclists* – all the groups who are exposed to vehicle emissions when they travel would benefit from improved air quality.

4.4.4.4 *Road safety* – the proposed LEZ may have a small, positive impact on vehicle safety, as newer vehicles often have additional safety features.

4.4.4.5 *Parking* – the proposed LEZ is not likely to have any impact on parking.

ANNEX A: Summary of projected LEZ impacts on emissions, exceedances and population exposure*

Scenario	NO _x						PM ₁₀ - annual						PM ₁₀ - daily						
	Emissions of NO _x		Area exceeding annual mean NO ₂ objective for 2010 (40ug/m ³)		Population in area exceeding objective		Emissions of PM ₁₀		Area exceeding annual mean PM ₁₀ objective for 2010 (23ug/m ³)		Population in area exceeding annual mean PM ₁₀ objective		Area with >35 (pre-2010) and >10 (2010) exceedances p/a of daily PM ₁₀ objective (50ug/m ³)		Population in area exceeding objective				
	Tonnes emitted	% reduction	Area (km ²)	% reduction	Population exposed	Reduction in population exposure	% reduction	Tonnes emitted	% reduction	Area (km ²)	% reduction	Population exposed	Reduction in population exposure	% reduction	Area (km ²)	% reduction	Population exposed	Reduction in population exposure	% reduction
Base Case 2008	34700		80		626800			2400		100		717400			5		24300		
With LEZ in 2008 (emission standard of Euro III)	33600	3.2%	75	7.2%	575600	51200	8.2%	2300	4.3%	90	7.8%	658500	58900	8.2%	4	11.7%	21700	2700	10.9%
Base Case 2010 (No LEZ in 2008)	27600		30		193700			2150		37		253500			33		216400		
With LEZ in 2010 (emission standard Euro IV for PM10)	26400	4.1%	26	10.5%	172100	21600	11.1%	1950	7.9%	30	18.4%	205800	47700	18.8%	27	17.0%	178600	37800	17.5%
Options																			
Euro IV for PM ₁₀ and NO _x	24300	11.9%	21	28.0%	134800	58900	30.4%	1950	8.2%	30	19.4%	203000	50500	19.9%	27	17.9%	176000	40400	18.7%
Euro IV for PM ₁₀ + LGVs	26200	5.0%	25	13.0%	165800	27900	14.4%	1950	9.2%	29	21.4%	198400	55100	21.7%	26	20.0%	171800	44600	20.6%

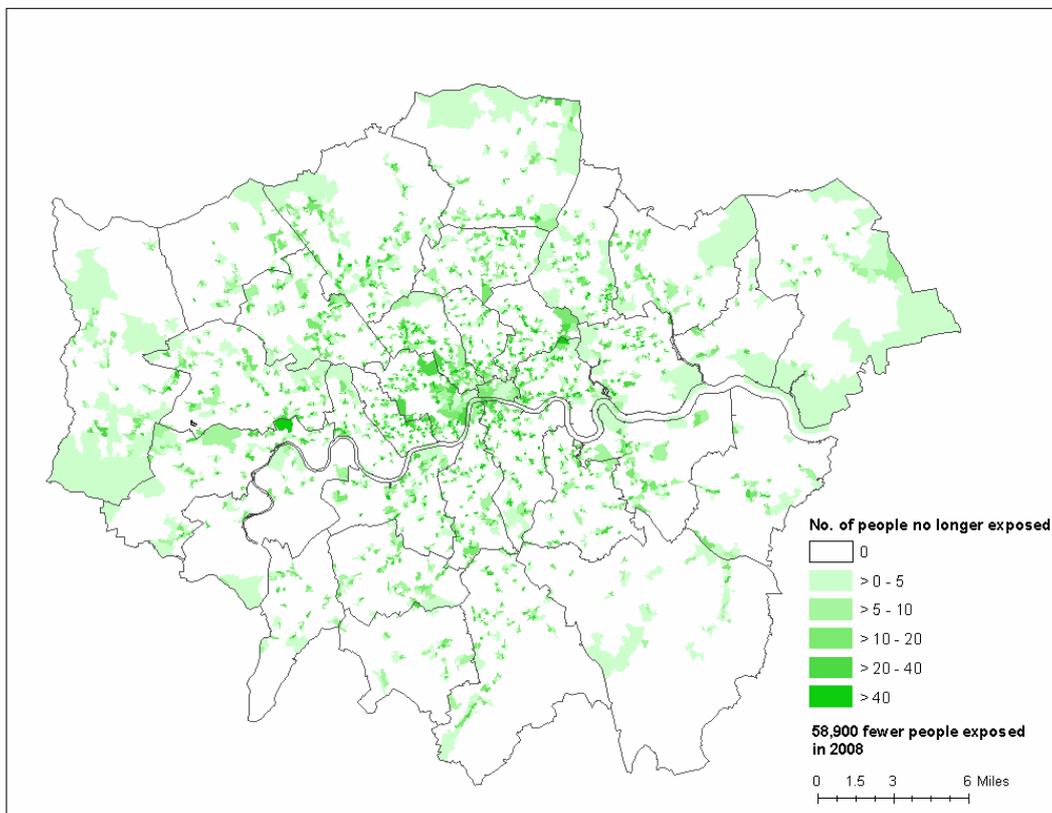
* Absolute figures have been rounded. Percentages are based on non-rounded figures.

**ANNEX B: Maps representing air quality benefits from the LEZ for the
Greater London Area**

**Maps 1 to 5 show reduction in populations exposed to levels of PM₁₀
and NO_x above National Air Quality Objectives and EU Limit Values**

Map 1: 2008 LEZ with emission standard of Euro III for PM₁₀

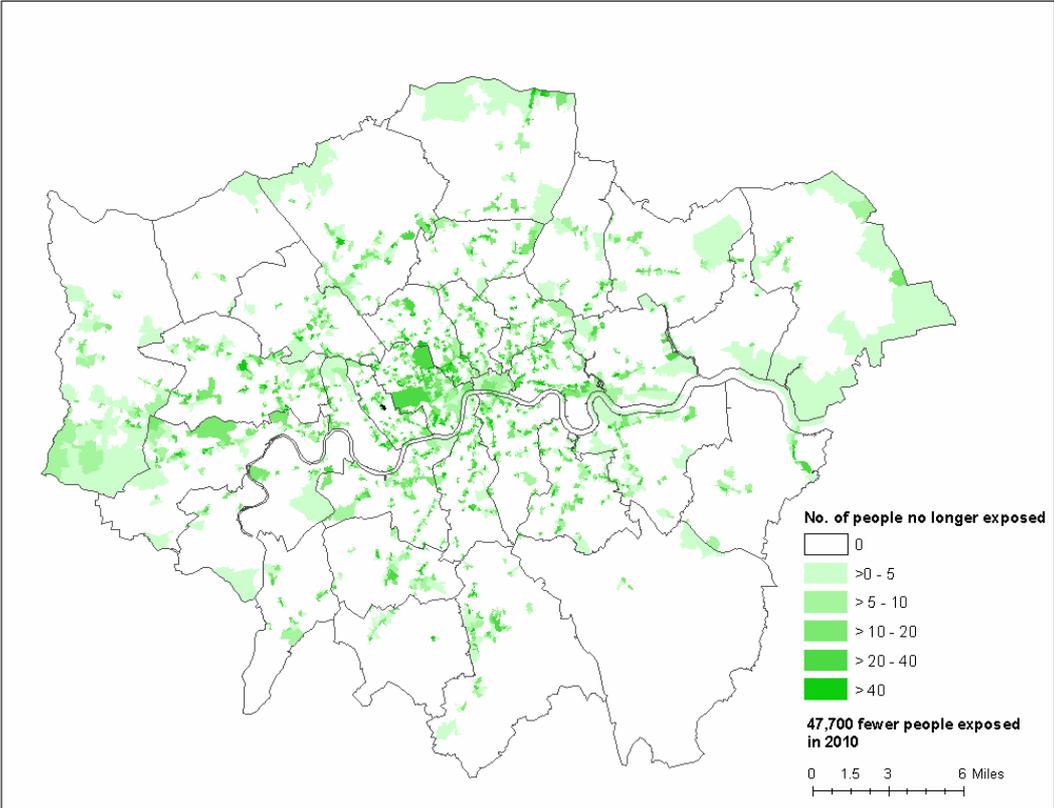
**Reductions in the number of people exposed to PM₁₀ levels exceeding
2010 annual mean objective (23 µg/m³) by output area***



*See technical note at end of this annex for the definition of “output area”.

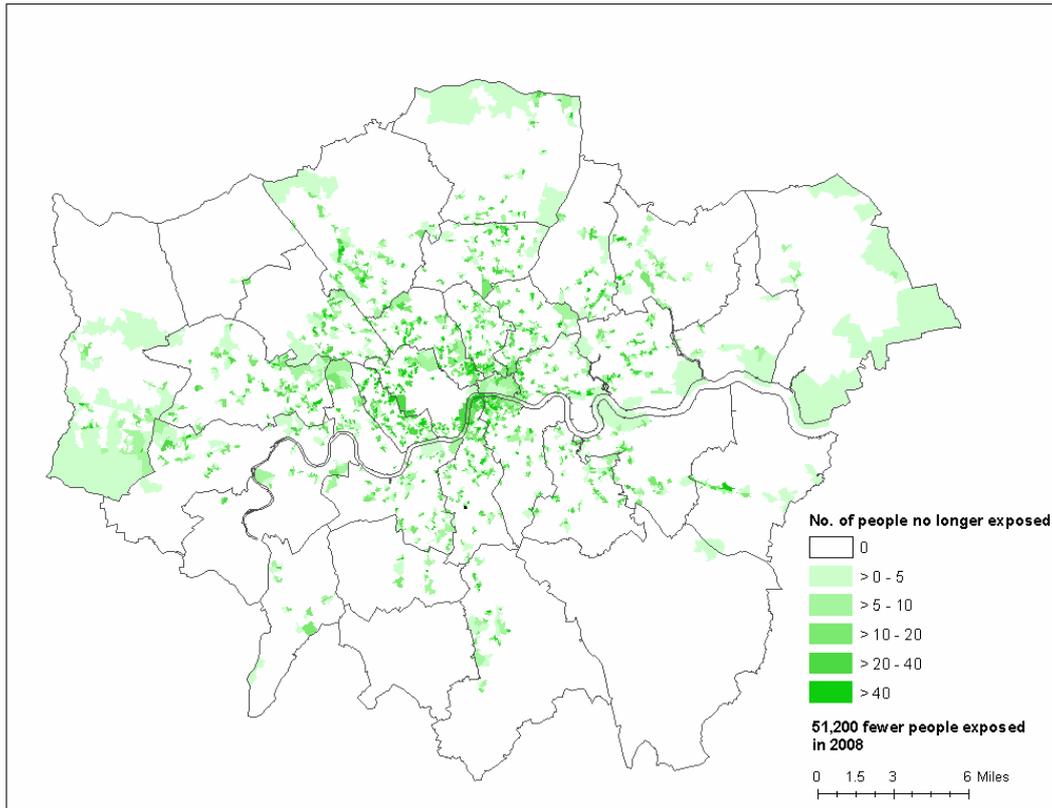
Map 2: 2010 LEZ with emission standard of Euro IV for PM₁₀

Reductions in the number of people exposed to PM₁₀ levels exceeding 2010 annual mean objective (23 µg/m³) by output area



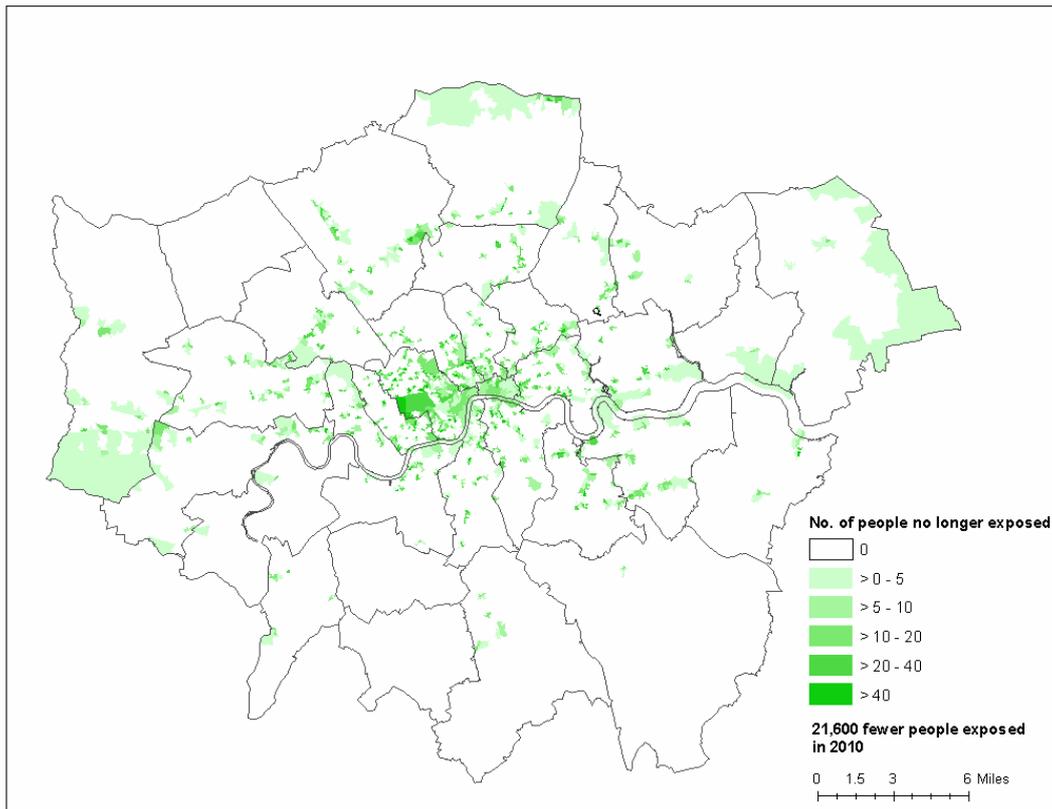
Map 3: 2008 LEZ with emission standard of Euro III for PM₁₀

**Reductions in the number of people exposed to NO₂ levels exceeding
2010 annual mean objective (40 µg/m³) by output area**



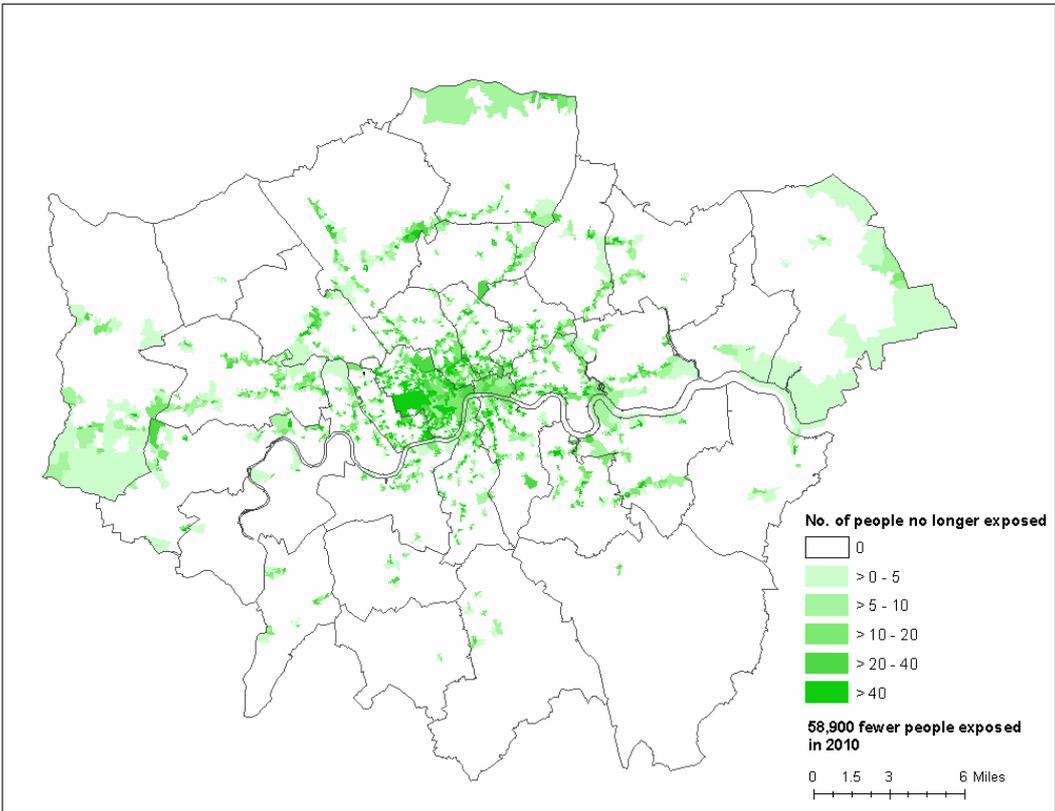
Map 4: 2010 LEZ with emission standard of Euro IV for PM₁₀

Reductions in the number of people exposed to NO₂ levels exceeding 2010 annual mean objective (40 µg/m³) by output area



Map 5: 2010 LEZ with emission standard of Euro IV for PM₁₀ and NO_x

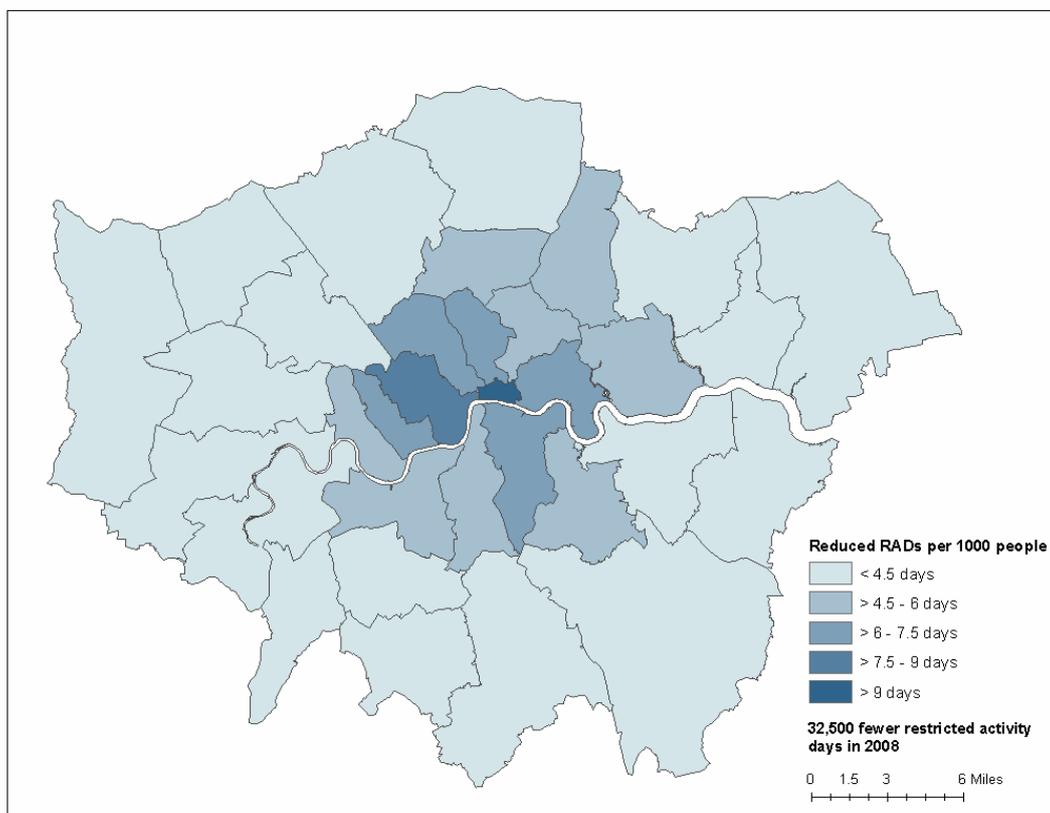
Reductions in the number of people exposed to NO₂ levels exceeding 2010 annual mean objective (40 µg/m³) by output area



Maps 6 to 9 show reductions in Restricted Activity Days (RADs) as a result of the LEZ

Map 6: 2008 LEZ with emission standard of Euro III for PM₁₀

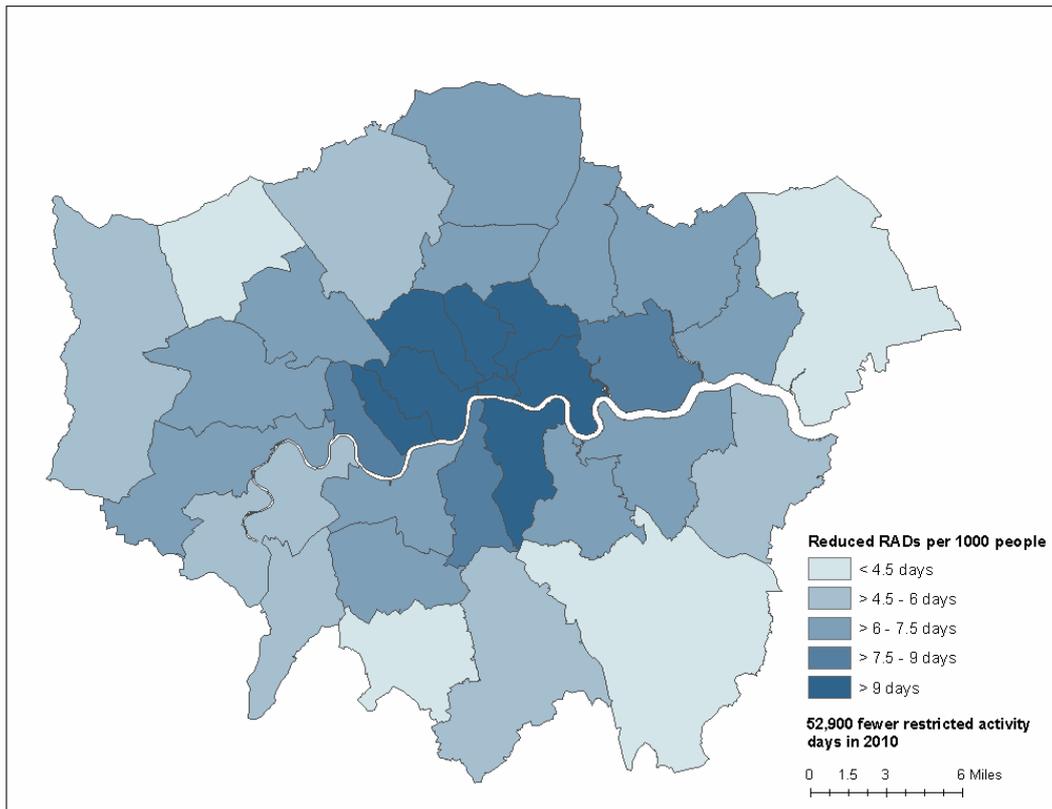
Reduction in 2008 in number of Restricted Activity Days (RADs) by Borough per 1000 persons*



*See technical note at end of this annex for the definition of “Restricted Activity Days”.

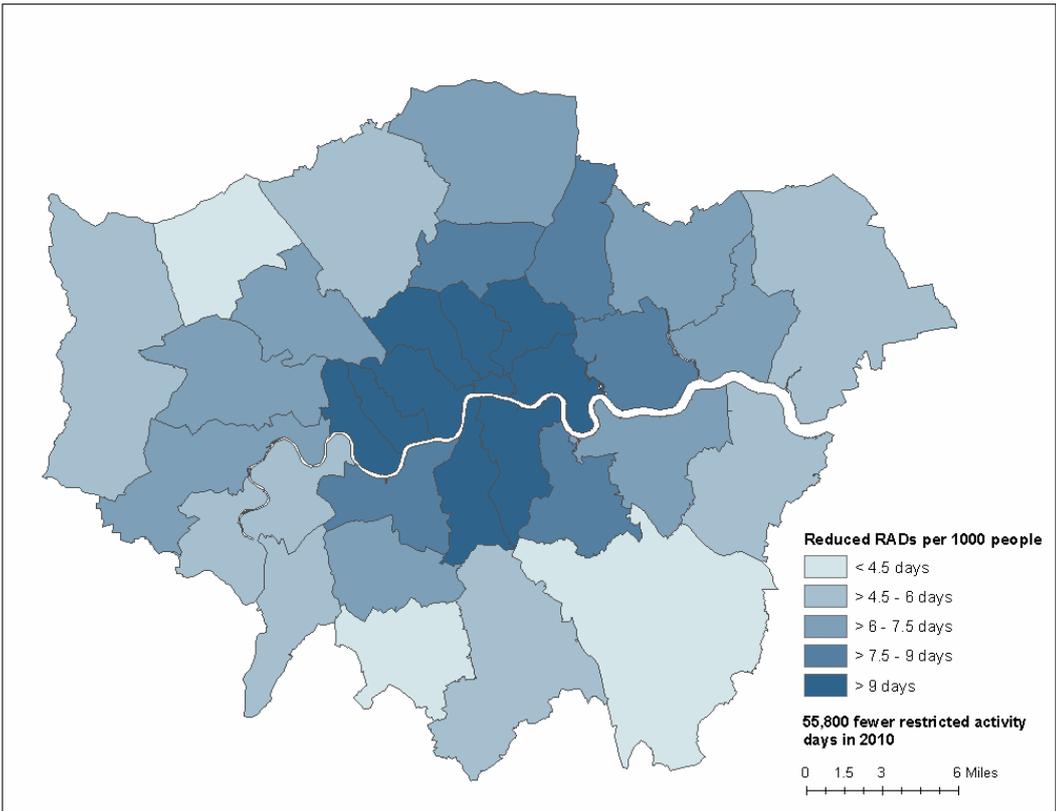
Map 7: 2010 LEZ with emission standard of Euro IV for PM₁₀

Reduction in 2010 in number of Restricted Activity Days (RADs) by Borough per 1000 persons



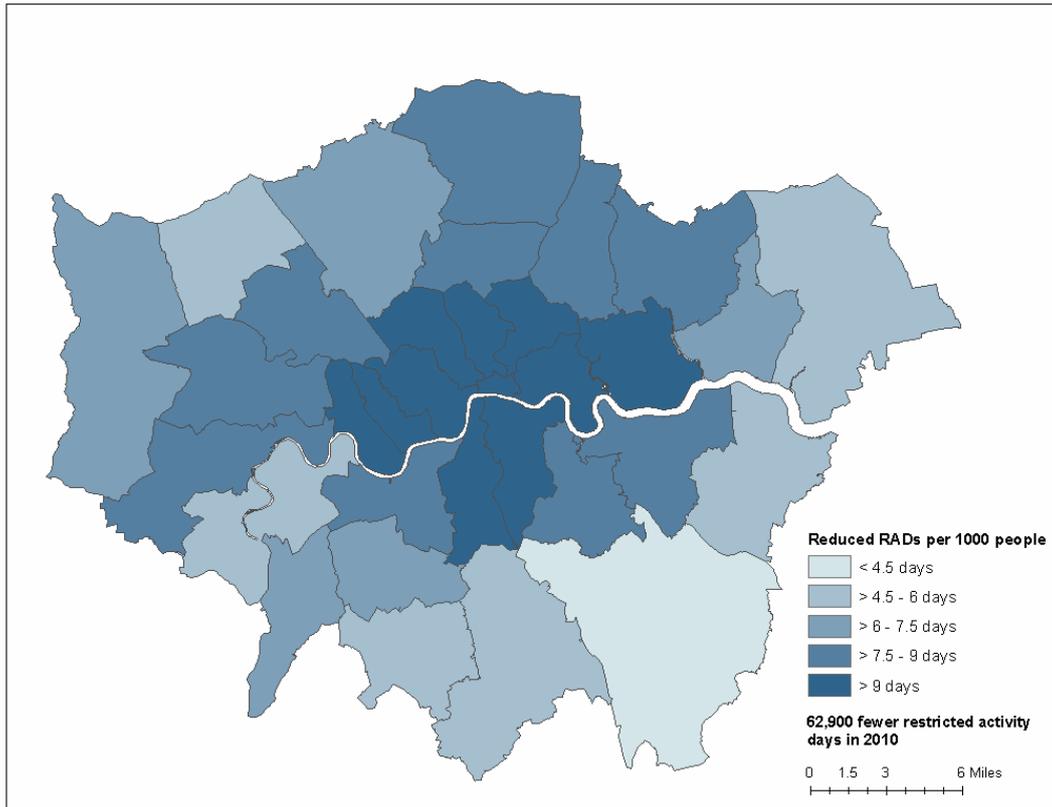
Map 8: 2010 LEZ with emission standard of Euro IV for PM₁₀ and NO_x

Reduction in 2010 in number of Restricted Activity Days (RADs) by Borough per 1000 persons



Map 9: 2010 LEZ with emission standard of Euro IV for PM₁₀ plus LGVs

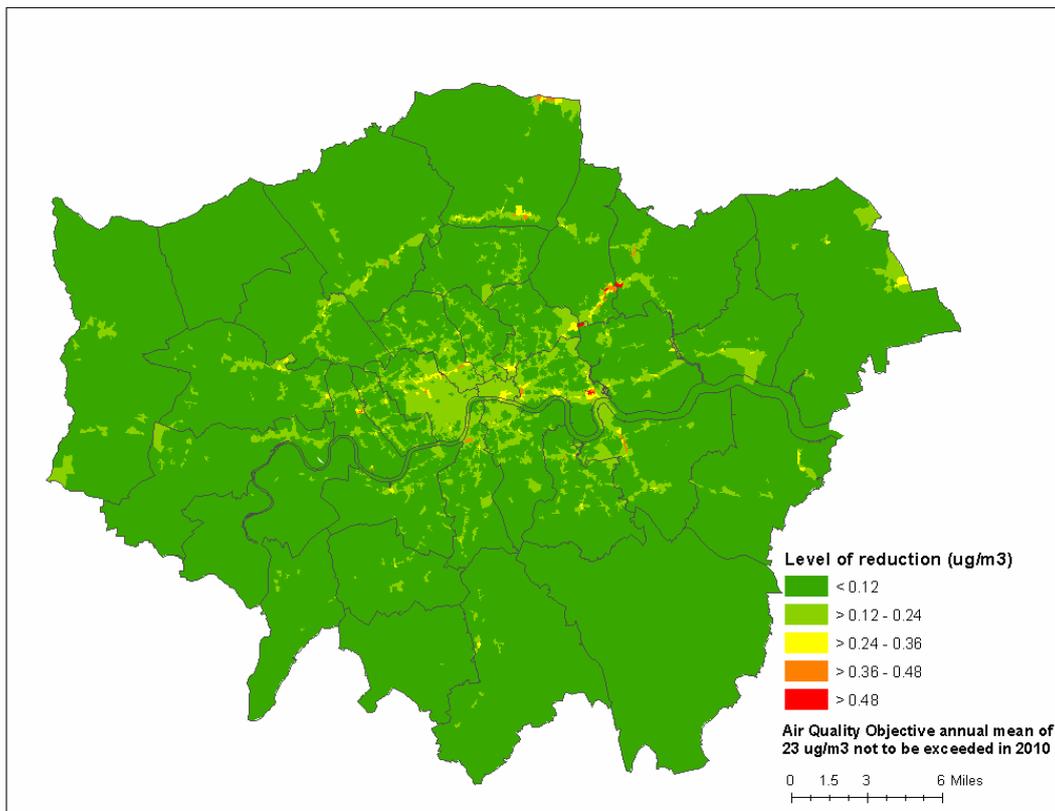
Reduction in 2010 in number of Restricted Activity Days (RADs) by Borough per 1000 persons



Maps 10 to 13 show reductions in pollutant concentrations as a result of the proposed LEZ

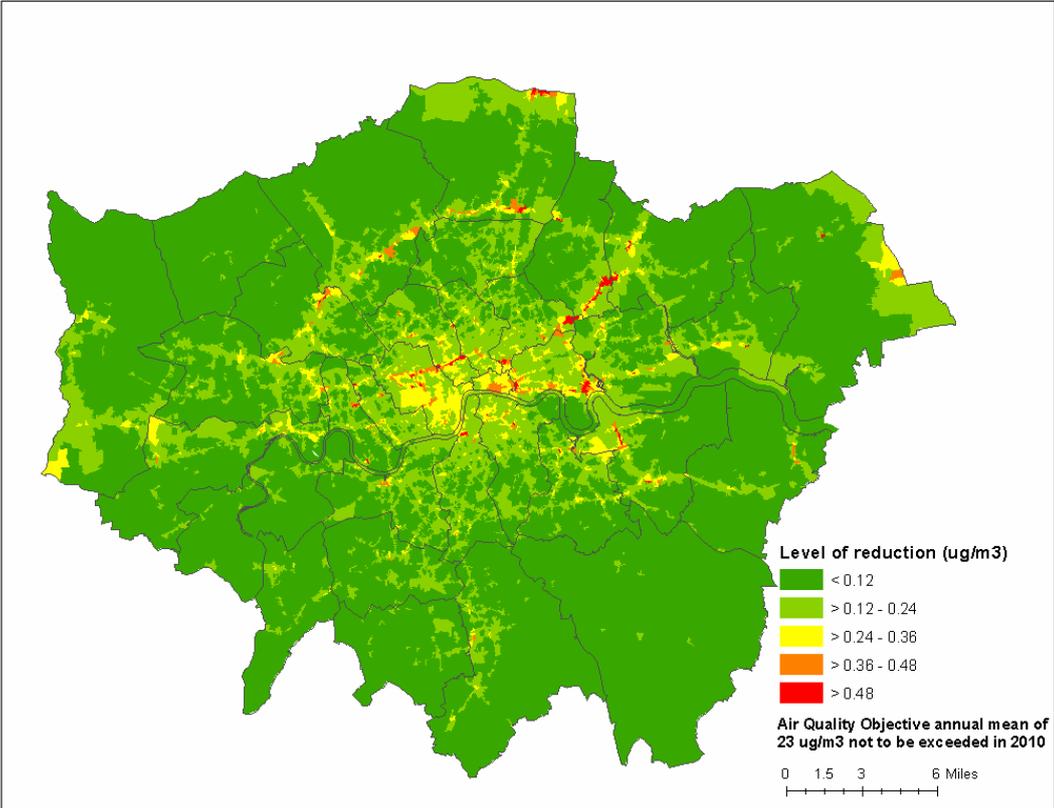
Map 10: 2008 LEZ with emission standard of Euro III for PM₁₀

Forecast reductions in $\mu\text{g}/\text{m}^3$ of concentrations of PM₁₀ in 2008 resulting from LEZ



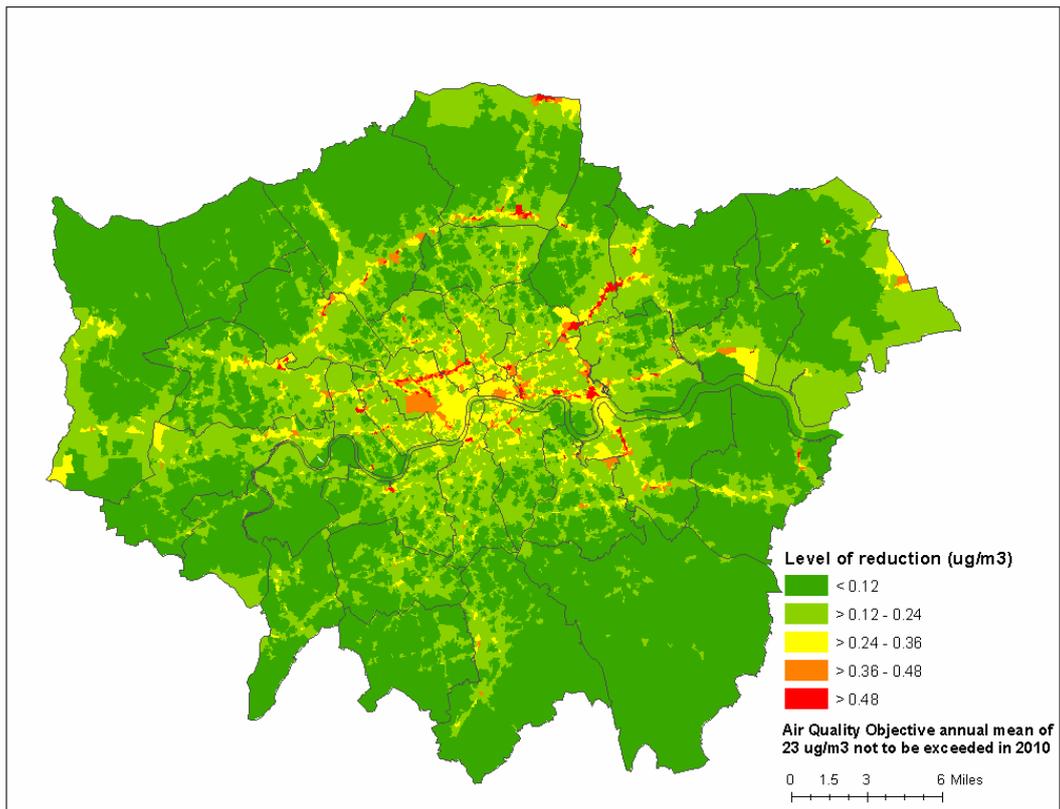
Map 11: 2010 LEZ with emission standard of Euro IV for PM₁₀

Forecast reductions in $\mu\text{g}/\text{m}^3$ of concentrations of PM₁₀ in 2010 resulting from LEZ



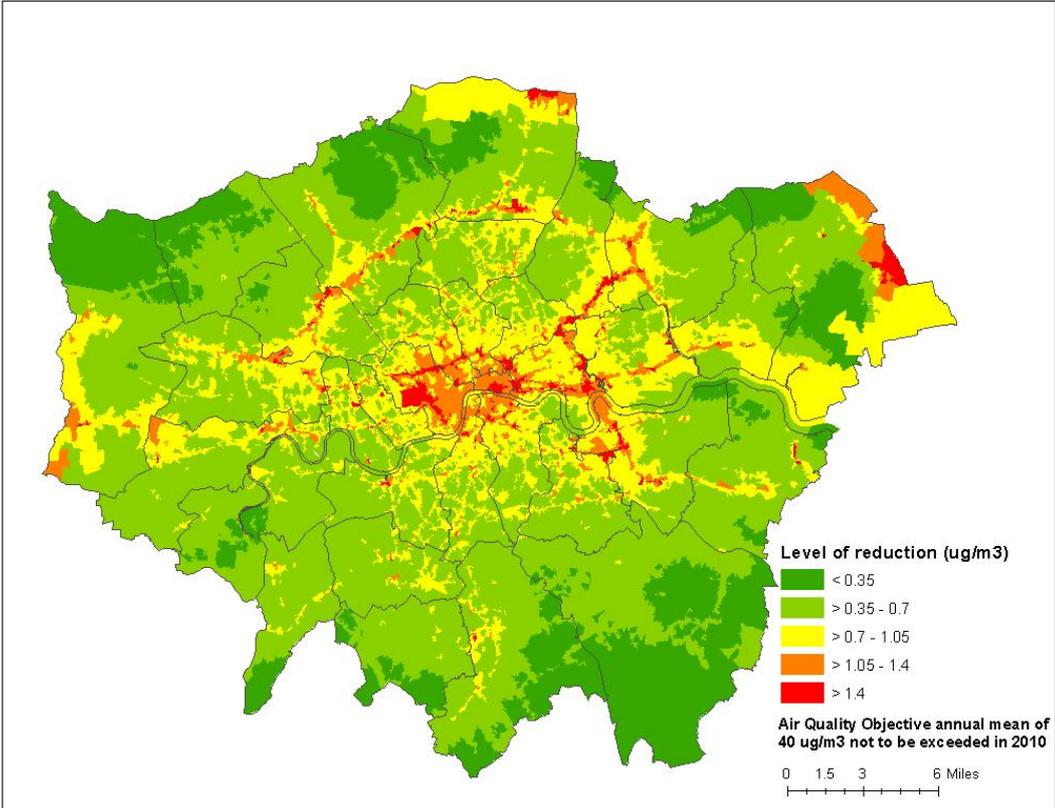
**Map 12: 2010 LEZ with emission standard of Euro IV for PM₁₀ plus
LGVs**

**Forecast reductions in $\mu\text{g}/\text{m}^3$ of concentrations of PM₁₀ in 2010 resulting
from LEZ**



Map 13: 2010 LEZ with emission standard of Euro IV for PM₁₀ and NO_x

Forecast reductions in $\mu\text{g}/\text{m}^3$ of concentrations of NO₂ in 2010 resulting from LEZ



Technical note

“Output areas”

This term is used in relation to maps graphically representing the expected reduction in exposure of people to excessive levels of Particulates and NO_x due to the LEZ (Maps 1 to 5). Output Areas were developed for the 2001 census, and are designed to have similar population sizes and to be socially homogenous in terms of dwelling type and tenure of household. While an output area (in Greater London) has an average of about 300 people resident, these vary in size due to the factors listed above and numbers of people resident per household. The maps, therefore, do not allow a calculation of average reduction in numbers of people exposed per output area, but rather set out total reductions across London in terms of numbers of people exposed to excessive levels of the target pollutants.

Restricted Activity Days (RADs)

The term Restricted Activity Days is used in relation to maps 6 to 9. The term refers to restrictions on individuals' ability to complete every day activities through ill-health caused by poor air quality. In the maps, the cumulative instances of these curtailed activities are added up to a total number of days lost per thousand people in London.

$\mu\text{g}/\text{m}^3$

The term used throughout the maps and in reference to air quality generally. It refers to micrograms of pollutants per cubic metre, and equates to a 1 millionth of a gram of PM₁₀ or NO₂ per cubic metre of air.