



SCOTT WILSON Planning & Environment
**Strategic Environmental Assessment of the
Proposed Revisions to the Mayor's Transport Strategy and
the Mayor's Air Quality Strategy to Introduce a
Low Emission Zone**

ENVIRONMENTAL REPORT
Non-technical Summary

January 2006



**Strategic Environmental Assessment of the Proposed
Revisions to the Mayor's Transport Strategy and the Mayor's
Air Quality Strategy to Introduce a Low Emission Zone**
Environmental Report – Non-technical Summary
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1 INTRODUCTION

1.1 Strategic Environmental Assessment

1.1.1 Transport for London (TfL) has commissioned Scott Wilson to undertake the Strategic Environmental Assessment (SEA) of the proposed revisions to the Mayor's Transport Strategy and Air Quality Strategy to introduce a Low Emission Zone in London. A Low Emission Zone (LEZ) is a geographically defined area that restricts or deters access by those vehicles that do not meet defined emissions standards.

1.1.2 SEA involves the identification and evaluation of the environmental effects of a plan or programme. The European Council and Parliament have legislated for SEA with the adoption of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. The aim of the Directive is *"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, with a view to promoting sustainable development"*.

1.1.3 These environmental effects must be documented in an Environmental Report and an accompanying Non-technical Summary. The SEA must cover the likely significant effects on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, landscape and the interrelationship between them.

1.2 Proposed London Low Emission Zone

1.2.1 The Mayor of London has a statutory duty to take steps towards achieving Government air quality objectives and the LEZ is designed to help achieve this. The objectives of the proposed LEZ are two-fold:

- To move London closer to achieving the national statutory air quality objectives (and EU limit values) for 2010, in support of the Government's Air Quality Strategy (AQS) and the EU's Air Quality Framework and Daughter Directives
- To improve the health and quality of life of people who live and work in London, through improving air quality

- 1.2.2 Several LEZ options are under consideration. The core option for the LEZ would cover the whole of Greater London, excluding motorways. It would target the reduction of small particles (PM₁₀), as these are thought to have the greatest impact on human health. The core option would apply to heavy goods vehicles over 3.5 tonnes, coaches and buses from 2008. In order to drive within the LEZ without charge, vehicles would have to comply with certain emissions standards (so-called Euro standards). The standard for this option would be Euro III for small particles in 2008 and Euro IV for small particles in 2010 (or the relevant particulate standard in force at that time, for example, should the European Commission move towards a standard for ultra-fine particles). Non-compliant vehicles could still enter the LEZ but their owners would have to pay a charge in order to do so.
- 1.2.3 TfL is currently assessing the feasibility of extending the LEZ core option in 2010 to control emissions of nitrogen oxides ('the core plus NO_x option'). Another option is to extend the LEZ core option to cover light goods vehicles with diesel engines, from 2010 ('the core plus LGV option').

2 SEA SCOPE AND METHODOLOGY

2.1 Topics considered

2.1.1 The Environmental Report discusses the likely significant impacts of the LEZ core option and the two variants, focussing principally on the following topics, where significant impacts are thought to be likely:

- Air; and
- Human health.

2.1.2 The assessment also gives brief consideration to potential impacts on the following topics, where significant impacts are not thought likely but may occur:

- Biodiversity (including flora and fauna);
- Climate;
- Material assets;
- Cultural heritage; and
- Landscape / townscape.

2.2 Methodology

2.2.1 The following scenarios were assessed:

- Future conditions without a LEZ;
- The LEZ core option – this would commence in 2008, and include HGVs, buses and coaches. The emission standard would be Euro III for small particles from 2008 and Euro IV for small particles from 2010 (or the relevant particulate standard in force at that time, for example, should the European Commission move towards a standard for ultra-fine particles);
- The core plus NO_x option – this would commence in 2010. It would be as for the core option, but with emission standards of Euro IV for both small particles and oxides of nitrogen; and
- The core plus LGV option - this would also commence in 2010. It would be as for the core option, but would also include LGVs. The standard for light goods vehicles would be a rolling vehicle age-based limit of 10 years.

2.2.2 The assessment methodology was based around a model of London's traffic and the associated emissions of pollutants. Using this model, predictions were made concerning the likely future volumes of traffic in different parts of the capital and the effect of these volumes of traffic on air quality.

- 2.2.3 This modelling, conducted by King's College Environmental Research Group (ERG), predicted the likely concentrations of small particles and nitrogen dioxide across London. Predictions were made for 2008, the assumed start date for the LEZ core option, and 2010.
- 2.2.4 The assessment of air quality impacts was carried out by Air Quality Consultants. Progress towards the achievement of national statutory air quality objectives is determined from the calculations of predicted levels of and changes in concentration of small particles and nitrogen dioxide.
- 2.2.5 The resulting benefits for human health are based on work conducted by AEA Technology, utilising the Department of Environment, Food and Rural Affairs (DEFRA) and Clean Air For Europe (CAFE) methodologies for estimating the health effects of changes in air quality.
- 2.2.6 The health effects methodology is further informed by consideration of the Health Impact Assessment (HIA) of the LEZ produced by Environmental Resources Management (ERM).
- 2.2.7 This Environmental Report addresses biodiversity effects with reference to whether the change in emissions as a result of the LEZ would substantially change the total level of pollutants at a site of biodiversity interest and whether the resulting levels would exceed thresholds at which adverse effects are considered to occur.

2.3 Consideration of whether effects would be significant

- 2.3.1 The consideration of whether an environmental impact would result in a significant effect depends both on the magnitude of the impact and the importance of the affected environmental resource or population group (termed a receptor), so that even a small impact on a valuable receptor would be considered to be significant.

2.4 Alternatives

- 2.4.1 TfL has reviewed alternative ways at both the national and local levels for addressing road transport related emissions. The conclusion of this work is that alternatives are unlikely to deliver the same level of benefits as the proposed LEZ in the same timeframe.
- 2.4.2 Alternatives to the LEZ for achieving road transport related emission reductions that have been considered in the past include:
- Relying on the natural vehicle replacement cycle and tighter

Euro standards to produce the same air quality improvements as the proposed LEZ;

- Higher levels of Vehicle Excise Duty (VED) for more polluting vehicles;
- Grants for retro-fitting emissions reducing equipment to vehicles;
- Scrapping of older vehicles; and
- Roadside emissions testing.

2.4.3 Variant LEZ scenarios considered but not taken forward include:

- A variant with a boundary at the M25;
- A variant applying to the Transport for London Road Network (TLRN) only;
- A variant covering the existing Central London Congestion Charging Scheme area and the area of the western extension; and
- A variant that extends controls to private cars.

3 ENVIRONMENTAL ASSESSMENT

3.1 Effect on Air Quality

3.1.1 Currently the national statutory air quality objectives for small particles and nitrogen dioxide are exceeded in many locations across London. Many London Boroughs have declared Air Quality Management Areas in order to tackle the causes of poor air quality, which in most cases is attributable to road transport.

Future conditions without the LEZ

3.1.2 Concentrations of small particles would decrease significantly by 2010. However, they would remain high alongside busy roads and at background locations in central London.

3.1.3 Concentrations of nitrogen dioxide in London would decrease between 2008 and 2010 even if the LEZ were not implemented. This is because modern vehicles emit fewer pollutants than older vehicles.

Effect of the LEZ core option

3.1.4 The effect of the LEZ core option would be to accelerate the expected general decreases in emissions from vehicles in London. Reductions in concentrations of small particles from traffic sources across the whole of London are expected to be 4.3% in 2008 and 8.0% in 2010 due to the LEZ.

3.1.5 Significant improvements in concentrations of nitrogen dioxide would principally occur close to major roads. Across the whole of London a reduction of 3.2% in concentrations of oxides of nitrogen from traffic sources is expected in 2008. A further reduction of 4.1% is expected in 2010. Afterwards the effects would not be as great because expected improvements in vehicle technology catch up with the changes imposed by the LEZ.

Effects of additional options

3.1.6 The core plus NO_x option would have little additional impact on small particles. However, it would provide an additional benefit in reducing emissions of nitrogen oxides. Compared with the core option, a larger area would see concentrations reduced, especially close to busy roads in central London and along the M25 corridor. Conversely the core plus LGV option has the more dramatic impact on emissions of particles than on emissions of nitrogen oxides.

3.2 Human health

- 3.2.1 Air quality plays an important role in human health and air quality improvements would have benefits both in reducing the incidence of respiratory and cardiovascular disease and in extending life spans. However air quality is but one of many determinants of health; income and employment also have a major influence on public health.
- 3.2.2 Currently public health in parts of London compares unfavourably with neighbouring regions of southern and eastern England, which enjoy many of the same income advantages as Londoners and have better air quality. Health varies across the capital with many deprived areas suffering worse than average health statistics. Many of these deprived areas are also places with poor air quality.

Future conditions without the proposed LEZ

- 3.2.3 Health statistics are likely to improve in the absence of the LEZ, as demonstrated by the historic and ongoing trend of increasing life expectancy across London. Admissions to hospital for respiratory conditions have declined in recent years, by around 4% between 1997/8 and 2000/1 (roughly 1% per year). This trend also seems likely to continue.
- 3.2.4 Some especially vulnerable people with serious pre-existing cardio-respiratory disease are at risk from occasional incidents of unusually poor air quality. This may hasten the terminal effects of their disease by some days or weeks. Research carried out on behalf of TfL suggests that in 2008 some 230 Londoners will die early as a result of such short-term pollution impacts from traffic related sources. This figure is expected to fall to some 220 people in 2010.
- 3.2.5 Exposure to small particles over the long-term, perhaps much of a lifetime, can also have adverse health effects and cause people to die early. Premature deaths from long-term exposure to small particles from traffic sources are expected to account for some 2,000 premature deaths in London during 2008 and a further 1,900 deaths in 2010.

Effect of the LEZ core option

- 3.2.6 The LEZ core option would directly benefit human health through improvements in air quality. Some 40 premature deaths from short-term exposure and some 230 deaths from long-term exposure to small particles would be avoided if the core option is adopted. The 230 or so fewer deaths from long-term exposure are particularly

significant since the estimates suggest that in some cases the people concerned may benefit from several additional years of life.

- 3.2.7 The LEZ core option is also likely to reduce the number of admissions to hospital for severe respiratory symptoms and for cardiac conditions by around 1.3% in 2008 and 2.2% in 2010, which would be an improvement on the current trend. Cases of less severe respiratory problems are expected to reduce correspondingly.

Effects of other options

- 3.2.8 The core plus NO_x option and core plus LGV option are likely to provide additional benefits over and above those conferred by the LEZ core option. Most of the health benefits in London are likely to arise from reductions in the concentrations of small particles, so the additional benefits of the core plus NO_x option are less marked than that of the core plus LGV option.
- 3.2.9 It is expected that some 45 premature deaths from short-term exposure and around 240 deaths from long-term exposure to small particles are likely to be avoided if the core plus NO_x option is adopted. If the core plus LGV option is adopted some 50 premature deaths from short-term exposure and some 285 deaths from long-term exposure to small particles are likely to be avoided. These figures include the impacts of the LEZ core option.
- 3.2.10 Admissions to hospital for severe respiratory symptoms and for cardiac conditions are expected to decline by around 1.3% in 2008 and 2.4% in 2010 under the core plus NO_x option, or by 1.3% in 2008 and 2.7% in 2010 under the core plus LGV option (again, compared with business as usual). Similarly, cases of less severe respiratory problems are expected to reduce proportionally under both scenarios.

Indirect health effects

- 3.2.11 Employment and income are regarded as key determinants of health and influence a range of factors including access to housing, education, diet, lifestyle, coping skills, services and social networks. These are in turn key determinants for a range of physical and mental health impacts and ultimately health and well-being.
- 3.2.12 The cost of compliance with the LEZ may result in unemployment or loss of income for HGV operators affected by the core option, and for LGV operators under the core plus LGV option. There may, however, be economic benefits in certain sectors: among vehicle

manufacturers, resulting from a short-term increase in demand for new, compliant vehicles, for instance; or among mechanics, needed to fit particle filters to non-compliant vehicles.

- 3.2.13 This suggests that there may be indirect impacts on health, some beneficial, some adverse, for certain groups of people resulting from changing economic circumstances brought about by the LEZ. It is not possible here to quantify these effects at this time.

3.3 Biodiversity

- 3.3.1 There are many sites of international, national and metropolitan importance for nature conservation within London. Many of these sites support habitats that are known to be sensitive to air pollution, particularly that which may result from nitrogen pollutants. Epping Forest is one such site. English Nature has specifically identified the decline of the lichens on this site as being a result of air pollution.

- 3.3.2 At high concentrations oxides of nitrogen can be directly toxic to higher plants and can adversely affect sensitive habitats that are naturally low in nitrogen. Nitrogen is also implicated in acidification of habitats and contributes to the formation of ozone, another gas toxic to plants.

- 3.3.3 The assessment of biodiversity compares estimates of atmospheric deposition with 'critical loads' below which environmental effects are thought not to occur. No critical load is defined for small particles, however the critical load for oxides of nitrogen is defined and is therefore the key factor in terms of biodiversity impacts.

Future conditions without the LEZ

- 3.3.4 In the absence of the LEZ concentrations of small particles and oxides of nitrogen will continue to decline. This is likely to be of benefit to habitats currently adversely affected by poor air quality, in particular for those habitats affected by excess nitrogen.

Effect of the LEZ core option

- 3.3.5 The introduction of the LEZ core option is predicted to result in a higher overall reduction in concentrations of small particles than would be expected under the business as usual scenario. Some reduction in concentrations of oxides of nitrogen is also expected and this would be of additional benefit to habitats affected by excess nitrogen.

- 3.3.6 However this benefit cannot be quantified and, given the current

state of knowledge, the impact of the reduction in concentrations of oxides of nitrogen on sensitive habitats cannot be divorced from other impacts, such as pressure from visitors or climate change. Nevertheless as lichens have been shown to respond to relatively small changes in concentrations of pollutants, expert opinion has suggested that the effect could still be considered significant.

Effects of other options

- 3.3.7 Given that small particles play a comparatively minor role in adversely affecting habitats, the core plus LGV option is not likely to have a significant impact on biodiversity. However the core plus NO_x option, which introduces tighter controls on oxides of nitrogen, would hasten reductions in concentrations of oxides of nitrogen and thereby would be expected to reduce the amount of nitrogen deposited from the atmosphere by a larger amount than the LEZ core option.

3.4 Climate

- 3.4.1 Estimates given in the Mayor's State of the Environment Report indicate that emissions of greenhouse gases in London between 1999 and 2000 amounted to some 40,324,000 tonnes of carbon dioxide equivalent, from all sources. The contribution from transport sources was some 8,548,000 tonnes of carbon dioxide equivalent.
- 3.4.2 Estimates for the UK as a whole show a steadily rising trend until 2003 for emissions from transport, to 127,824,000 tonnes of carbon dioxide equivalent. Emissions from all sources appeared to peak in the period 1999-2002, although the most recent estimates show a further increase in 2003. The latest annual UK total from all sources is 722,328,000 tonnes carbon dioxide equivalent.

Future conditions without the proposed LEZ

- 3.4.3 Carbon emissions from traffic sources have continued to rise year-on-year in the UK as a whole. This trend seems set to continue in the foreseeable future unless offset by increases in fuel efficiency or other government intervention.
- 3.4.4 Emissions modelling undertaken by King's College Environmental Research Group suggests that there would be a similar increase in emissions in London until 2013 – 2015, followed by a slight decline, probably as a result of the increasing fuel efficiency of vehicles. If vehicles consume less fuel there would be a corresponding decline in greenhouse gas emissions. The predicted annual figure for 2015 is some 12,068,000 tonnes carbon dioxide equivalent.

Effect of the LEZ core option

- 3.4.5 Modelling for the LEZ core option predicts that the effect on greenhouse gas emissions would be negligible. It is predicted that the LEZ core option will result in a slightly higher total of greenhouse gas emissions than would otherwise be the case. The estimate follows from the assumption that the technology used to make older vehicles compliant would make them slightly less fuel-efficient. The increase would vary from 0.001% to 0.005% per annum, which is not of any significance. However, there are a number of uncertainties in the modelled outputs which make it difficult to predict the impact of the proposed LEZ on greenhouse gas emissions.

Effects of additional options

- 3.4.6 Modelling of the core plus NO_x option and core plus LGV option exhibit a similar behaviour. Again the effects would be only marginal.

3.5 Material assets

- 3.5.1 For the purposes of the assessment, material assets are considered to be structures such as buildings, roads, bridges and so forth. Nitrogen, among other gases, has the potential to cause damage to buildings through acid corrosion, an effect thought magnified by interaction with ozone. Consequent damage to materials is a known air pollution issue, although one difficult to measure. Soiling of buildings and other structures leading to the need for cleaning is another well-known effect of poor air quality.

Future conditions without the proposed LEZ

- 3.5.2 It is unclear how the interaction of various pollutants would impact material assets in the absence of the LEZ. However the expected decline in traffic-sourced emissions of small particles and nitrogen oxides in London suggests that impacts from soiling and corrosion would decline.

Effect of the LEZ core option

- 3.5.3 The LEZ core option is likely to bring forward any decline in soiling or corrosion impacts. For individual structures this effect is not likely to be significant.

Effects of other options

- 3.5.4 The core plus LGV option would have a bigger impact on small particle emissions and is likely to lead to a greater reduction in the soiling of buildings than the LEZ core option. Similarly the core plus NO_x option would reduce emissions of nitrogen oxides and thereby lead to lower corrosion impacts than the LEZ core option alone. While these options are likely to reduce the adverse effects of soiling and corrosion of materials, neither is likely to have a significant effect.

3.6 Cultural heritage

- 3.6.1 Just as there are impacts from air pollution on material assets generally, so there are impacts on structures that are especially important for their architectural or historic value. The significance of any effects is likely to be greater on buildings and other structures of cultural heritage importance since they are, in the main, older and therefore more sensitive to corrosion or soiling. Owing to their sensitivity, damage to cultural heritage assets can provide early evidence of air pollution.

Future conditions without the proposed LEZ

- 3.6.2 The main impact is the soiling of sensitive receptors such as important Listed Buildings, which then require cleaning with the risk of damage to irreplaceable architectural detail. Both this effect and direct impacts from acid corrosion are likely to decline as London's air quality improves.

Effect of the LEZ core option

- 3.6.3 The LEZ core option is likely to bring forward any decline in soiling or corrosion impacts on cultural heritage assets. For individual structures this effect would probably not be significant, since the impact of the core option would be to bring forward the reduction in expected reduction in concentrations of small particles and oxides of nitrogen.

Effects of additional options

- 3.6.4 As discussed in the section on material assets, the effect of the core plus NO_x option is likely to be minimal, although individual structures that are particularly sensitive may benefit disproportionately. Both variants of the LEZ would have a beneficial effect on the soiling of cultural heritage assets because concentrations of small particles would be reduced. However the

effect would be limited.

3.7 Landscape / townscape

- 3.7.1 Implementation of the LEZ would require installation of new signs and cameras. These features would have the potential to adversely affect landscape and townscape if they intrude on, for example, parks, open countryside, or Conservation Areas with buildings of architectural character. Equally, everyday views could be spoiled by insensitive placement of such infrastructure.
- 3.7.2 Detailed implementation plans for the LEZ would follow if the Strategy Revisions are adopted and it is at this stage that potential adverse impacts can best be addressed.

Future conditions without the LEZ

- 3.7.3 Without the LEZ, there would be no impacts on townscape or landscape.

LEZ core option and other options

- 3.7.4 There is no reason to suggest that there would be any significant landscape / townscape effects. If the LEZ is implemented any impacts are likely to be adverse but it would be possible to 'design them out'.
- 3.7.5 TfL would take account of the potential for visual intrusion in scheme design and seek to ensure that an appropriate level of consultation with stakeholders takes place over the positioning of infrastructure.
- 3.7.6 In every case where new signs and/ or cameras are to be erected, TfL would review adjacent signs and equipment to see whether they can be rationalised and integrated with the new signs in order to reduce clutter.

4 MITIGATION OF EFFECTS

4.1 Introduction

4.1.1 The final form of the LEZ will influence the extent of some of the environmental effects identified in this report. For instance, the infrastructure associated with the scheme (cameras and signs) could be sited sensitively to prevent avoidable impacts on townscape or landscape.

4.1.2 Some of the effects that will result from the implementation of the LEZ would require mitigation to offset negative or enhance positive effects. Others may require further investigation. Some of this mitigation might be beyond the authority of TfL but quite straightforward for other bodies to achieve.

4.2 Links to other tiers of plans and programmes

4.2.1 The Environmental Report would encourage the following best practice measures within all Borough Local Implementation Plans or Air Quality Action Plans, to complement the LEZ and enhance the beneficial air quality effects:

- Continue encouragement for non-car means of travel (public transport, walking and cycling);
- Promote closer integration between transport and land use planning to reduce the need to travel;
- Consider engineering measures at junctions to free traffic bottlenecks and avoid tailbacks;
- Encourage the use of Clear Zones to tackle local pollution hotspots;
- Facilitate provision of clean fuel infrastructure (such as LPG in filling stations and electric vehicle charging points);
- Promote Freight Quality Partnerships where these do not already exist; and
- Investigate the outcome of the Camden trial use of NOXER paving stones, which are designed to absorb oxides of nitrogen.

4.2.2 The Report would also encourage Local Planning Authorities to adopt policies in Local Development Frameworks that support the LEZ and enhance the beneficial effects:

- Promote closer integration between land use and transport planning to reduce the need to travel;
- Consider refusal of planning permission for proposed developments that adversely affect air pollution hotspots; and

- Encourage the Home Zone concept (streets designed primarily to meet the interests of pedestrians and cyclists rather than motorists).

4.2.3 Implementation of the LEZ would also need to take into account the following specific issues and proposed mitigation measures:

- There is potential for a possible increase in emissions of primary nitrogen dioxide resulting from particle traps fitted to control emissions of small particles: this effect may require a so-far undefined technical solution; and
- A very small increase in greenhouse gas emissions is possible as a result of the proposed LEZ. The impact on greenhouse gas emissions should be considered in the future development of the scheme.

4.3 Proposals for monitoring

4.3.1 The following monitoring proposals would measure the actual effects of the LEZ if it is introduced, or deal with potential adverse impacts, which, while not thought likely, could undermine the benefits of the scheme:

Air

- Ambient annual mean nitrogen dioxide and small particle roadside concentrations, as a 3-year rolling average, for 5 sites across the GLA area, including inner and outer London locations;
- Number of local authorities with Air Quality Management Areas for nitrogen dioxide due to transport; and
- Number of local authorities with Air Quality Management Areas for small particles due to transport.

Human health

- Mortality from Bronchitis and Emphysema;
- Mortality from Asthma;
- Mortality from all Circulatory Diseases; and
- Number of hospital admissions for respiratory diseases;

Climate

- Estimate of the total emissions of greenhouse gases from transport sources in the GLA area.

Biodiversity

- Changes in tree-borne lichens at certain key sites.

5 CONCLUSION

5.1 Summary of the SEA

- 5.1.1 The SEA has investigated the likely significant environmental effects of the proposed LEZ. The assessment has considered the effects of the LEZ core option, the core plus NO_x option and the core plus LGV option. Alongside these it has assessed the effects of not implementing any of the LEZ options
- 5.1.2 The investigations have determined that the LEZ core option and alternatives are likely to have significantly beneficial effects on air quality and human health. There may be indirect impacts on health, some beneficial, some adverse, for certain groups of people resulting from changing economic circumstances brought about by the LEZ. It is not possible to quantify these effects at this time. Other environmental effects are likely to be benign, though they may not be significant.