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Clearing the air

The Mayor's draft air quality strategy for public consultation

MAYOR OF LONDON

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Mayor's Foreword

It is my vision for London to be a city that prospers whilst zealously protecting the health and well being of its citizens. Having fresh, clean air to breathe is a fundamental part of this goal. Thankfully London is no longer a city whose air is clogged with the industrial effluent that caused its infamous pea-soupers, but there is still a need for robust action to tackle airborne pollution.

We can all recognise the deeply unpleasant sensation of taking a gulp of dusty air but it is the most vulnerable in our society that are most at risk. Exposure to particles and fumes cause serious health problems for children, older people and those with underlying health problems. Clearing up the air in a city as large and complex as London is no easy challenge. Many of the essential mechanics required to keep the capital functioning have a direct impact on our air quality by creating emissions that belch out into the atmosphere. We also experience harmful pollutants being blown into London from sources beyond our direct control and influence.

I firmly believe we can create a cleaner, greener city to the benefit of all. Many of the proposals contained in this Strategy are already making a difference: a London wide Low Emission Zone, buses running on hybrid engines; and an unprecedented cycle revolution. We have recently secured £17million to progress work to encourage 100,000 zero emitting, electric vehicles on our streets. This will help deliver 1,600 charge points over the next 12 months rising to 7,600 by 2013, with an aim to reach 25,000 by 2015. The new bus we are delivering for London, due to enter service in 2012, will incorporate the latest hybrid technology and will be both 40 per cent more fuel efficient than conventional diesel buses and 15 per cent more fuel efficient than current London hybrid buses.

This Strategy also outlines steps to position London at the forefront of new and innovative technologies to combat dirty air, so that one day, London can be a zero emissions city. For example, we are proposing to work with manufacturers to develop, by

2020, a wonderful new black cab that emits no fumes. We are targeting the most polluted areas with a package of clean-up measures including cleaning persistent pollution from the road, focusing the cleanest buses in these areas, better enforcement of no idling rules and new green infrastructure to absorb pollution and protect pedestrians from fumes.

At the core of these proposals is the message that everyone needs to play their part to take the steps to improve air quality, and that those who contribute more to the problem should be expected to do more to provide the solution.

We have outlined a set of tough new standards to make the most polluting users of our road networks, including buses, taxis and vans, play their full part in cleaning up our city. These are recommended actions that require the full cooperation of other key organisations to deliver. I am working with London Councils to explore how we can improve the London Lorry Control Scheme so that it continues to reduce night time noise but also incentivises cleaner and greener freight vehicles by allowing them to deliver at night.

Air quality is an issue that affects all cities and towns across the country. The recent House of Commons Environment Audit Committee report suggests that as many as 50,000 people in the UK could be dying prematurely as a result of air quality impacting on pre-existing conditions such as asthma, heart disease and respiratory illness. We are calling on central Government to implement new policies and provide funding for initiatives to tackle this issue in London and across the UK.

Being the number one city in the world to invest in, to do business in and visit, goes hand in hand with our ability to create an environment in which we can thrive. It is vital we identify the best ideas to do so. We want Londoners to let us know their thoughts about these plans to clean up the capital's air. We look forward these contributions ahead of the publication of a final version of this Strategy.

Boris Johnson
Mayor of London

Contents

1 Setting the scene

1.1 Introduction

Air quality matters to Londoners. Air pollution not only harms the environment but also health and well-being. The 2009 Londoner Survey[1] found that pollution from traffic was one of the top environmental concerns for Londoners, second only to litter. Poor air quality can cause serious health problems and reduces the quality of life for all of us. Its impacts are most severely felt by vulnerable people such as children, older people and those with existing heart and lung conditions. In addition, people living in areas near major roads – which are often some of the most deprived parts of London - are exposed to particularly high levels of pollution.

As recently as the 1950s London was infamous for its pollution. In December 1952 a dense fog covered Greater London for several days, leading to a sudden rise in mortality rates. Whilst Londoners had experienced similar periods of smog, this episode led to an estimated 3,500-4,000 more deaths than would have been expected under normal conditions[2]. The great smogs of that decade forced Governments to introduce legislation to reduce emissions of air pollutants. While significant improvements have been made, air pollution remains a real challenge for all cities, especially large conurbations, where the sources of pollutants are more geographically concentrated, coupled with far greater populations exposed to them.

Two pollutants cause most concern within London: particulate matter (PM_{10}) and nitrogen dioxide (NO_2). Levels of PM_{10} declined in the 1990s though the rate of improvement has been slower in the last decade, a trend that has also been experienced throughout Europe[3]. Similarly, levels of nitrogen dioxide (NO_2) in London fell until 2002 but have been relatively stable ever since.

The challenge of cleaning London's air is made more difficult because a significant amount of the pollution sources are not within London. Much is blown in from the surrounding regions, but can also come from much further away, from as far afield as the Saharan desert. Pollutants do not respect administrative boundaries. Around 20 per cent of NO_2 pollution comes from emission sources outside London. Equally, data from central London indicates that about 40 per cent of PM_{10} originates from outside London. Sources within the UK that contribute to London's poor air quality tend to be located in the south east of England. It is likely that these areas are also affected by pollution from London and the Mayor will work with authorities there to ensure that air quality improvement plans have wider benefits and that best practice on reducing emissions is shared. In addition, the Mayor will encourage planning authorities and the Environment Agency in

the south east of England to ensure that major new developments outside London do not worsen air quality in the capital. The challenge we face is not just one for London but requires considerable effort on the part of all layers of government, businesses and individuals.

Great strides have already been taken in London to improve air quality. Measures already announced or underway that will reduce emissions in London[4] include:

- Development of electric vehicle infrastructure
- Congestion charging and the London Low Emission Zone
- Smarter travel initiatives to encourage a shift to cleaner modes of transport
- Funding and supporting car clubs (especially hybrid and electric cars)
- Improving road maintenance (to reduce particles from road disintegration)
- Smoothing traffic
- Bus emissions programme, so that from 2012 every new bus entering the fleet will be diesel-electric hybrid, including the New Bus for London
- Publication and implementation of the London Best Practice Guidance for controlling dust and emissions from construction.

Together with natural fleet replacement, these measures are expected to do a great deal to reduce emissions of both PM_{10} and NO_x and those that are being continued are included in this Strategy. However, further measures are needed to make more substantial inroads to reducing pollution.

1.2 What is air pollution?

Most air quality legislation in Europe and the UK is derived from health-based guidelines, and the scientific evidence on which they are based is provided by the World Health Organisation (WHO). The WHO has published various guidelines for both global air quality and European air quality based on the latest research from around the world. These guidelines are neither standards nor legally binding criteria; they are designed to offer guidance in reducing the health impacts of air pollution based on expert evaluation of

current scientific evidence. Nevertheless, many countries use these guidelines as the basis for their own air quality standards.

The European Union has issued an air quality Directive (2008/50/EC) that sets standards for a variety of pollutants that are considered harmful to human health and the environment. These standards include limit values, which are legally binding and must not be exceeded. These limit values comprise a concentration value for the pollutant, an averaging period over which it is measured, the date by which the limit values are to be achieved and in some cases an allowable number of exceedences of the value per year. The Directive also includes target values, which are set out in the same manner as limit values, but which are to be attained where possible by taking all measures that do not entail disproportionate costs.

The Government's Air Quality Strategy provides the Government's policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants which are designed to protect health and the environment. It also sets out how the different sectors (industry, transport and local government) can contribute to achieving the air quality objectives. The Mayor has a legal responsibility to prepare and keep up to date an Air Quality Strategy.

Air pollution refers to substances in the air which directly affect human health, welfare, plant or animal life. Air quality is measured in terms of concentrations – the amount of a pollutant that is present in the air that you breathe. Most pollution emitted in London is from road transport and from domestic and commercial heating systems. By reducing these emissions in London, the contribution of these sources to concentrations will also fall.

Pollution, though, can also be carried great distances by the wind. Chapter 2 explains in detail the significant extent to which emissions blown in from outside London contribute to pollution in London. Effective control of emissions from outside London is therefore vital to improving air quality in the capital.

The Greater London Authority Act 1999 (the GLA Act) requires the Mayor to include in his Air Quality Strategy policies and proposals:

(a) for the implementation in Greater London of the policies contained in the strategy prepared and published by the Secretary of State in accordance with section 80 of the Environment Act 1995 (national air quality strategy), and

(b) for the achievement in Greater London of the air quality standards and objectives prescribed in regulations made under section 87(2)(a) and (b) of that Act.

These objectives, which are based on the EU limit values are for seven pollutants:

- Benzene
- 1,3 Butadiene
- Carbon monoxide
- Lead
- Nitrogen Dioxide (NO_2)
- Particulate Matter (PM_{10} and $PM_{2.5}$)
- Sulphur Dioxide

Five of these pollutants, most notably sulphur dioxide and lead, which have historically been a problem in London, are now at concentrations that do not affect human health. However, levels of PM_{10} and NO_2 continue to exceed the national air quality objectives in some areas. Ozone is another pollutant for which concentrations are still too high and which causes summer smogs during hot, sunny periods. However, formation of ozone can take place over several hours or days and may have arisen from emissions many hundreds, or even thousands of kilometres away[5]. For this reason ozone is not considered to be a 'local' pollutant. Therefore this Strategy focuses on interventions that will reduce concentrations of PM (PM_{10} and the smaller fraction $PM_{2.5}$) and NO_2 in particular, although in most cases these interventions will result in reduced concentrations of the other five 'local' pollutants. This Strategy will also result in lower emissions of nitrogen oxides (NO_x). As NO_x is one of the pollutants that contributes to the formation of ozone, this will also help to reduce the number of summer smog days in London.

Defra has recently consulted on draft Regulations to introduce a new control framework for $PM_{2.5}$, as required by European law (Directive 2008/50/EC). The central Government's proposed approach is to set a national exposure reduction target defined as a percentage reduction in annual average concentrations of $PM_{2.5}$ in urban background locations across the country, to be achieved by 2020. In addition, to ensure health protection more widely, a maximum level of $PM_{2.5}$ concentrations will be set which must not be exceeded anywhere in the country. It is expected that these Regulations will come into force during 2010 and as such this Strategy is also intended to reduce concentrations of $PM_{2.5}$.

The sources of $PM_{2.5}$ tend to be very similar to the sources of PM_{10}, particularly road transport. Therefore, many of the measures in this Strategy will address concentrations of both PM_{10} and $PM_{2.5}$. As further monitoring of $PM_{2.5}$ is undertaken in London more information will become available. This will make it possible to target action directly in the locations where $PM_{2.5}$ is a particular problem, if necessary.

Box 1: Pollutants of concern in London

Particulate matter (PM_{10} and $PM_{2.5}$): Particulate matter (PM) is a complex assemblage of non-gaseous material of varied chemical composition. It is categorised by the size of the particle (for example PM_{10} is particles with a diameter of less than 10 microgrammes (μm)). Most PM emissions in London are caused by road traffic, with engine emission and tyre and brake wear being the main sources. Construction sites, with high volumes of dust and emissions from machinery are also major sources of local PM pollution, along with accidental fires and burning of waste. However, a large proportion of PM comes from natural sources, such as sea salt, forest fires and Saharan dust, as well as from anthropogenic sources outside London. Small particles tend to be long-lived in the atmosphere and can be transported great distances. This imported PM forms a significant proportion of total PM in London.

Nitrogen dioxide (NO_2): All combustion processes produce oxides of nitrogen (NO_x). In London, road transport and heating systems are the main sources of these emissions. NO_x is primarily made up of two pollutants - nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is of most concern due to its impact on health. However NO easily converts to NO_2 in the air - so to reduce concentrations of NO_2 it is essential to control emissions of NO_x.

1.3 The policy context

The Mayor has powers to ensure London boroughs meet their statutory Local Air Quality Management requirements. Under the Local Air Quality Management (LAQM) framework set by central Government, the boroughs must regularly review and assess air quality within their boroughs and designate Air Quality Management Areas (AQMAs) where UK objectives are currently not being met. Information provided in reports produced by boroughs through the LAQM process has contributed to the policy development process for this Strategy. Where a Borough has declared an AQMA, an Air Quality Action Plan (AQAP) is required to be produced that works towards achievement of the air quality objectives. Currently all 33 London boroughs have designated AQMAs and the associated AQAPs must have regard to the Mayor's Air Quality Strategy. Equally, this Strategy includes measures which build on initiatives being taken by boroughs through their AQAPs.

This Strategy has been developed in conjunction with the Mayor's draft replacement London Plan, draft Transport Strategy, Climate Change Mitigation and Energy Strategy, Climate Change Adaptation Strategy and Municipal Waste Management Strategy. The policies in this Strategy are consistent with policies in those draft Plans and Strategies, as well as the Mayor's other statutory strategies.

1.4 Objectives of this Strategy

The first priority of this Strategy is to achieve European Union limit values, which will be the most effective means to reduce the impact of air pollution on Londoners. The relevant European Union (EU) limit values for PM_{10}, $PM_{2.5}$ and NO_2 are shown overleaf. The obligation refers to the actual levels of concentrations set in the Directive. The time period is the period over which the concentrations are averaged and the permitted exceedences is the number of days that the set level of concentrations can be exceeded in a calendar year.

Table 1.1: EU limit values for $PM_{2.5}$, PM_{10} and NO_2

Pollutant	Obligation	Time period	Compliance date	Permitted exceedences each year
PM_{10}	Limit value of 50 $\mu g/m^3$	24 hours	1 January 2005	No more than 35
	Limit value of 40 $\mu g/m^3$	1 year	1 January 2005	n/a
Nitrogen dioxide (NO_2)	Limit value of 200 $\mu g/m^3$	1 hour	1 January 2010	No more than18
	Limit value of 40 $\mu g/m^3$	1 year	1 January 2010	n/a
Fine particles ($PM_{2.5}$)	Limit value of 25 $\mu g/m^3$	Annual mean	1 January 2015	n/a
	Stage 2 indicative limit value of 20 $\mu g/m^3$	Annual mean	1 January 2020*	n/a
	Exposure concentration obligation of 20$\mu g/m^3$*	3 year average exposure indicator (AEI)	1 January 2015	n/a
	Exposure reduction target relative to the 2010 AEI (0% to 20% reduction) **	3 year average exposure indicator (AEI)	2020	n/a

* Will be reviewed by European Commission by 2013.

** The three-year running annual mean or AEI is calculated from the $PM_{2.5}$ concentration averaged across all urban background locations in the UK (ie. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010).

The national objectives for PM_{10} and NO_2 are almost the same as the limit values above, the sole differences being:

- The compliance date for the PM_{10} national objectives was 31 December 2004.

- The compliance date for the NO_2 national objectives was 31 December 2005.

Defra has recently consulted on draft Regulations that would introduce national objectives for $PM_{2.5}$. It is likely that these will be the same as the EU $PM_{2.5}$ limit values and obligations in the table above. On the basis of current modelling projections, the UK national exposure reduction target for 2020 is likely to be ten per cent relative to an average based on 2009, 2010 and 2011 levels, though this will not be confirmed until the measurement data for those years has been collated in early 2012.

While the date for compliance with some of these limit values has already passed, the Air Quality Directive provides for EU Member States to apply to extend the date for compliance with the limit values for PM_{10} until June 2011 and for NO_2 until January 2015, provided certain conditions are met, most importantly that a viable action plan to meet the limit values by the extended dates is in place.

In April 2009, central Government submitted an application to the European Commission to obtain an extension for the PM_{10} limit values for eight areas across the UK, including Greater London. The Government's modelling shows that by the maximum time limit of the extension, 2011, Greater London is the only region in the country that is at risk of not meeting the limit value. This is because the major cause of high concentrations of PM_{10} is road transport, and London has more traffic than other cities in the country. A number of other EU countries are experiencing similar problems. Twenty five of the 27 Member States have exceeded the PM_{10} limit values in at least one part of the country – normally the major cities. The GLA contributed data and policy information to central Government's application for a time extension to the PM_{10} limit values.

In December 2009, the European Commission announced that it had rejected the UK Government's application for a time extension for the Greater London area. The Government intends submitting a further request to the Commission for an extension in the first half of 2010, including new information about measures that will allow the limit values to be met in London. The Mayor will assist central Government in the preparation of this further request and considers that this Strategy will strengthen the Government's case.

Central Government intends to apply to the European Commission in 2010/2011 for a time extension to the NO_2 limit values until 2015. NO_2 is a national problem and the application will cover many regions and cities in the UK, not just Greater London.

Therefore, in recognition of the fact that the UK has failed to meet the limit values by the prescribed compliance date, and in line with central Government's approach, through this Strategy, the Mayor is working towards meeting the PM_{10} limit values by 2011 and the NO_2 limit values by 2015. Clearly, however, the programmes and policies aim to deliver benefits earlier wherever possible

1.5 Vision

The Mayor's vision for air quality:

To protect and improve the health of Londoners and increase their quality of life by significantly improving the quality of the air we breathe in London. This will:

- Make London a more pleasant place to live and work in
- Reduce the burden on health services in the capital
- Enhance London's position as a green city – making it more attractive to tourists and businesses
- Make London cleaner whilst safeguarding its biodiversity.

This Air Quality Strategy sets out how the Mayor will achieve this vision. It explains the actions that the Mayor will take to reduce air pollution in the capital using the powers available to him and sets a framework for boroughs to take action. It also sets out how the Mayor will encourage other organisations and authorities, including the European Union, central and local government and the business community, to take action to improve air quality in London.

In the short to medium term the priority is to achieve EU limit values for local pollutants, particulate matter and nitrogen dioxide; and achieve the objectives set by central Government in its Air Quality Strategy for England, Scotland, Wales and Northern Ireland. This will be achieved by the continuation of many of the measures listed above that are already announced or underway, as well as further measures, including:

- Reducing emissions from transport:
    - Encouraging smarter choices and sustainable travel behaviour
    - Promoting technological change and cleaner vehicles
    - Reducing emissions from the public transport and public transport fleets
    - Using emissions control schemes to reduce emissions from private vehicles.
- Targeting air quality priority locations:
    - Adopting local measures, including trialling new processes (such as the use of dust suppressants)
    - Using action days and special measures to reduce the number and length of periods of high pollution.
- Reducing emissions from homes, business and industry:
    - Promoting and delivering energy efficiency schemes
    - Using the planning system to reduce emissions from new developments
    - Updating and implementing best practice on construction and demolition.
- Increased awareness of air quality issues:
    - Improving access to information about the health impacts of poor air quality
    - Targeting information about poor air quality to those most at risk.

Once prescribed limit values have been achieved, it is vital that actions are maintained so that air quality continues to improve in London, as poor air quality below limit value levels still has the capacity to damage human health and biodiversity.

1.6 Policy development and analytical process

A number of measures were considered for inclusion in this Strategy. The potential impact of these on emissions was considered using an emissions model. The most effective potential measures were then analysed in more detail, taking into account their feasibility and the extent to which they would contribute to meeting other Mayoral objectives such as reducing carbon dioxide emissions, improving transport choices or promoting economic growth.

The Mayor has a legal responsibility in preparing and revising his Air Quality Strategy to have regard to the effect the Strategy would have on: the health of people in Greater London, health inequalities in Greater London, climate change and the consequences of climate change and sustainable development in Greater London. These were considered when appraising potential measures. An Integrated Impact Assessment process is being undertaken for this Strategy, and the impact of the proposals on a range of indicators covering health, the environment, the economy and equalities and social inclusion has also been taken into account. Box 2 sets out the policy development principles for this Strategy.

Box 2: Policy development principles

Targeted – policies and proposals should be targeted at the key sources of emissions to maximise effectiveness and ensure value for money.

Smart – policies and proposals should be smart, securing improvements using incentives and 'easier wins' first, but recognising that, in some cases, more challenging measures may be needed.

Cross-cutting – the Strategy should capture the potential air quality benefits **from** measures in other Mayoral strategies and, in turn, the policies and proposals included here should be structured to maximise co-benefits for other Mayoral objectives.

Flexible – policies and proposals should retain some flexibility to enable the Mayor and those involved in delivery to respond effectively to the challenges and issues that emerge and to take account of changing best practice.

Collaborative – many policies and proposals require the co-operation of others in order for them to be successfully delivered. In London, the Mayor, boroughs and other stakeholders each have their role to play in improving air quality. Consideration was also given to measures that could be implemented by other authorities, including the Government and the European Union.

Fair – policies and proposals should reflect the need for everyone to play their part. However, those producers of high levels of emissions should be expected to contribute more towards improving London's air quality. Where possible, compliance costs for individuals and businesses should be minimised with disincentives balanced with incentives.

Timely – urgent action is required to meet EU limit values. It is therefore important that short-term, targeted measures are introduced early, alongside longer-term measures that will bring about sustained and widespread improvements in air quality.

Pragmatic – policies and proposals need to balance effectiveness with the practicality of their implementation.

1.7 The health impacts of poor air quality

In recent years, a number of studies have established the link between poor air quality and health in urban areas. In particular, it is clear that long term exposure (that is, exposure to particles across the entire life span of an individual) can contribute to the development of chronic diseases and can increase the risk of respiratory illness.

The Mayor has a legal responsibility to have regard to the effect of his Strategies on the health of Londoners and on health inequalities in Greater London. The projections in this Strategy show significant reductions in pollution concentrations across Greater London, which will have important health benefits. The Mayor will also work with boroughs to implement measures to reduce levels of emissions at locations where exposure to pollution is high. Research has shown that people living in deprived areas are disproportionately affected by air pollution, in part because these areas tend to be near busy roads which tend to have higher levels of pollution caused by road traffic. Measures included in this Strategy will reduce emissions along main roads, and will thereby contribute to reducing the health inequalities in London of those who live near these roads. The Mayor will also work with London boroughs to identify those areas where people may be most at risk from air pollution and, wherever possible, particularly focus action in these areas.

Box 3: The health impacts of poor air quality

Particulate Matter (PM): PM aggravates respiratory and cardio vascular conditions. Research shows that particles with a diameter of ten microns and smaller (PM_{10}) are likely to be inhaled deep into the respiratory tract. Research in 2004 suggested that about five per cent of emergency hospital attendances for asthma would be avoided by meeting the PM_{10} annual mean limit value. As smaller particles can penetrate deeper in the respiratory tract, the health impacts of $PM_{2.5}$ are also significant.

Nitrogen Dioxide (NO_2): At high levels NO_2 causes inflammation of the airways and long term exposure can affect lung function and respiratory symptoms. It can also increase asthma symptoms. The health impacts of NO_2 are however less well understood than those of PM_{10}.

While the EU has set limit values aimed at significantly reducing the health impacts of poor air quality, even pollution levels below these limit values can affect human health. Therefore, improvements beyond these levels should still be sought.

Over recent years, a number of approaches have been taken to estimating the health impacts of poor air quality. In particular, there were uncertainties about the impacts of different types of pollution, the impacts of previous exposure to high concentrations, and the duration of exposure required to have an effect on health. In 2009, central Government's advisory group, the Committee on the Medical Effects of Air Pollutants (COMEAP), published a report into long term exposure to $PM_{2.5}$ and its impact on mortality[6].The report examines evidence from cohort studies in the US and other emerging research, and concludes that air pollution has a greater effect on mortality in the UK than previously thought. However, there is still considerable uncertainty around the precise link between concentrations and mortality.

The House of Commons Environmental Audit Committee[7] recently published its report on air quality in the UK, which included evidence that estimated that air pollution could be contributing to as many as 50,000 deaths in the UK per year. This is broadly in line with results of a study commissioned by the Mayor, which suggested that around 4,300 deaths per year in London are partly caused by long term exposure to $PM_{2.5}$ (which is widely acknowledged as being the pollutant which has the greatest effect on human health). Both studies used the COMEAP approach to reach these conclusions. Some of these deaths may be due in part to gradual damage from exposure to high levels of pollution in the past – so that even if there was no pollution present in the atmosphere, there would still be some deaths as a result of past damage. It should also be noted that this study is based on total $PM_{2.5}$ levels within London, some of which is due to non-human sources and some of which, as in any major city, is likely to be background pollution, including pollution blown in from outside the capital. Clearly eradicating the problem will be a huge challenge, though tackling it must be a priority.

The contribution of air pollution to the severity of illness and to the costs on health services and wider society are not yet well understood by the medical and scientific community. There is no agreed methodology for assessing the costs that air quality imposes on the NHS.

A number of surveys have been carried out to estimate the willingness of people to pay to avoid the adverse health impacts of poor air quality. These have been used as the basis for estimates of the health costs of air pollution. No London specific studies have been carried out, but central Government estimates that the economic cost of the health impacts of poor air quality in the UK is around £15billion, within a range of £8-17billion[8]. This would suggest that in London the economic cost of the health impacts of poor air

quality could as high as £2billion. Clearly, therefore, reductions in emissions and exposure will generate significant savings in health budgets and therefore are worth investing in purely on the basis of preventative health care. The Mayor believes that it is vital that research into the costs to society of mortality caused by poor air quality is accelerated, so that methodologies can be incorporated into cost benefit assessments for policies.

The House of Commons Environmental Audit Committee has recommended that central Government should urgently quantify the impact of morbidity and the cost to the NHS of poor air quality. The Committee also calls on central Government to improve understanding of the health effects of exposure to NO_2. The Mayor strongly supports these recommendations, and encourages central Government to include this information, along with information on mortality in methodologies for formally assessing the costs and benefits of policy options so that investment in air quality improvement policies can be better justified.

The GLA will shortly be publishing its study into the impacts of poor air quality in London. This will provide estimates for the number of deaths in London in a year which are partly attributable to poor air quality, as well as providing figures for associated years of life lost. The study will present some of the results at a borough level or smaller geographic area.

1.8 The impacts of poor air quality on the natural and built environment

Poor air quality can also affect biodiversity. Research has shown that local traffic emissions contribute substantially to exceedence of levels of pollution which damage vegetation at roadside conservation sites[9]. Long term exposure to pollution can restrict the growth and development of plants and trees. Increased nitrogen deposition is known to reduce plant diversity in natural and semi natural ecosystems[10]. Effects of pollution are seen through visible symptoms of tree decline, discolouring and susceptibility to diseases. This is a particular risk at designated Special Areas of Conservation (SACs) within London, such as Epping Forest and Wimbledon Common, though other sites could also be at risk. Reductions in concentrations of NO_x in particular would therefore contribute to the protection of these habitats and help to achieve the objectives of the Mayor's Biodiversity Strategy.

Some of the clearest visible evidence of air pollution is provided by building soiling. Particles are deposited on building surfaces, leading to them being discoloured. NO_x deposited on buildings can also make them vulnerable to accelerated weathering.

No studies have placed a financial cost on the impact of air pollution on biodiversity or the built environment in London. These might, however, be significant as a result of the increased need for building maintenance and cleaning.

1.9 Air pollution and climate change

Improving poor air quality can also help combat climate change. Ozone, which is caused by pollutants such as NO_x and volatile organic compounds (VOCs) reacting in sunlight, is a powerful greenhouse gas which contributes to global warming directly and by reducing carbon uptake by vegetation. Black carbon, which is part of the overall mass of particulate matter emitted by diesel engines through incomplete combustion, contributes to climate change by absorbing heat. By making vehicles, homes and workplaces more energy efficient, this Strategy will also contribute to achieving the objectives of the Mayor's draft Climate Change Mitigation and Energy Strategy.

Climate change will also have an impact on air quality. Longer, hotter summers could increase the frequency and severity of summer smogs, though wetter winters may reduce concentrations.

1.10 Delivering the Strategy – the role of central Government and other organisations

The Mayor is committed to taking affirmative action to improve air quality in London and considers the measures included in this Strategy to be feasible. The GLA's modelling shows that by 2011, measures included in this Strategy will allow EU limit values for PM_{10} to be achieved in all locations in Greater London. However, limit values for NO_2 will still not be achieved in parts of inner London and around Heathrow Airport by 2015 without significant further action at national level. This is because:

- A significant amount of the pollution that contributes to poor air quality in the capital - especially in central London – is blown in from outside Greater London.

- The Mayor has limited powers over the policies and incentives that affect the vehicles using London's roads. Therefore action to encourage the use of cleaner vehicles is needed by central Government and the EU.

- In addition, this Strategy includes measures that the Mayor encourages other organisations, including central Government. Significant investment in air quality improvement measures is required by central Government to reduce concentrations in London and other urban areas across the country.

The Mayor and central Government are working together on a shared approach to tackle air pollution in London and the Mayor is keen to strengthen this cooperation.

Some of the measures included in this Strategy are required to be implemented by boroughs, and the GLA will continue to work closely with them to ensure that they have the necessary technical support and data to manage local air quality effectively.

The Mayor will also continue to work with authorities in the health sector, so that emissions reduction measures are coordinated to ensure that improvements in air quality have the maximum possible benefits for health.

2 Setting the Scene

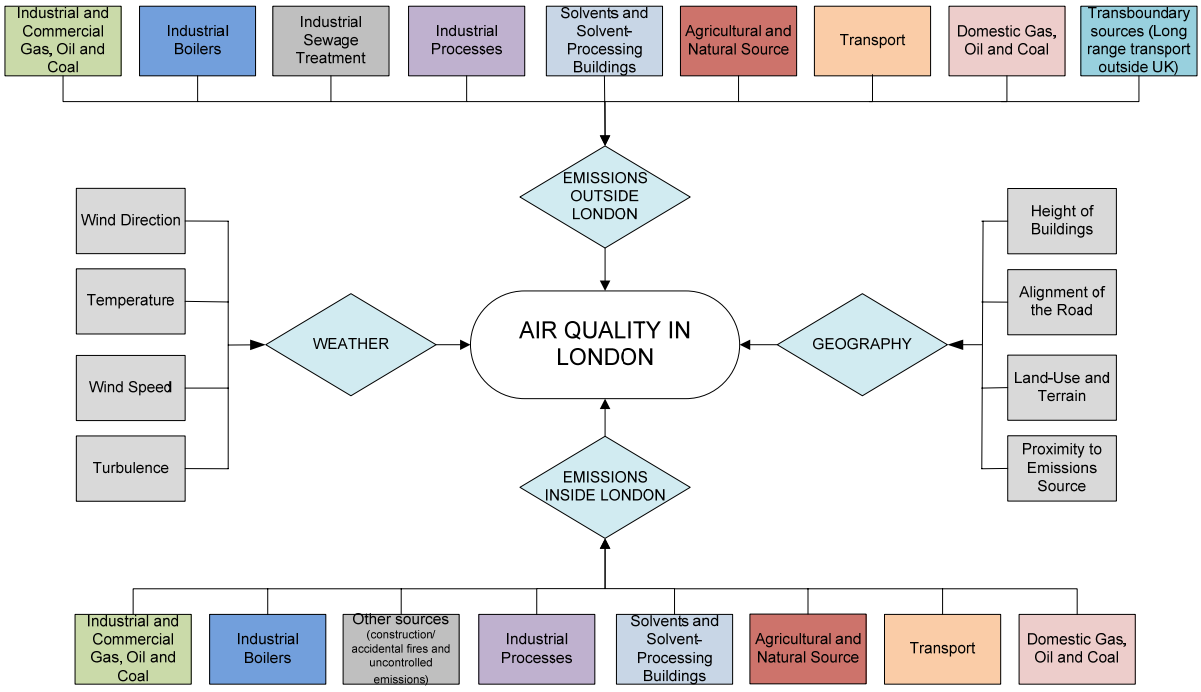
This chapter gives an overview of the emissions that affect London's air quality (notably particulate matter and nitrogen dioxide), recent trends in London's air quality, the sources of pollution emissions and concentrations and future air quality in London. Understanding these elements helps to ensure that this Strategy will direct remedial action to the right areas and be effective in reducing emissions to improve London's air quality. Further detail is set out in Appendix B.

2.1 What influences London's air quality?

London's air quality is affected by a number of factors, including the weather, geography and emissions sources from both inside and outside of London (as shown in Figure 2.1).

Variations in all of these factors affect air quality. Air quality is measured in terms of concentrations – the amount of a pollutant that is present in the air that you breathe, whilst emissions refer to the release of pollutants into the atmosphere as a result of an activity, such as transport or an industrial process.

Figure 2. 1: Influences on London's air quality



Weather and climate

The weather can have a significant impact on London's air quality. The air temperature and amount of sunlight can affect chemical reactions that result in new pollutants (known as secondary pollutants) being formed in the atmosphere. Rain can remove pollution from the air and also wash away or dampen dust that may otherwise be re-suspended into the air. Wind can disperse emissions, but can also carry pollution into Greater London from Europe and further afield, depending on wind direction.

Winter pollution episodes tend to occur during periods of low wind and cold ground level temperatures, which trap pollution in London. In the winter of 2007, London experienced its worst wintertime NO_2 episode in ten years[11]. Summer pollution episodes may also occur during hot sunny periods, which favour the production of new secondary pollutants and when the prevailing wind is carrying already polluted air from the continent. The influence of weather and climate change can also be seen through modelling. In the summer heatwave of 2003, London experienced four separate pollution episodes, each lasting one week. These conditions were replicated across much of Europe. The Air Quality Expert Group (AQEG)[12] estimates that there were 700 additional deaths[13] in the UK during this period due to prolonged and elevated levels of ozone and PM_{10}.

Due to a certain level of inevitable climate change, London is expected to experience more variable weather conditions such as longer, hotter summers and colder, wetter winters, however the occurrence of these is difficult to predict. Increased rainfall in the winter months means that winter pollution episodes should become less common, although longer and hotter summers are likely to increase the frequency and severity of summer pollution episodes. Whilst prediction of seasonal weather patterns is uncertain this Strategy provides the medium term policies which will results in reductions of emissions that can contribute to climate change.

Geography

The geography of a location can also influence air quality. In general, pollution levels decrease further away from sources as the emissions are dispersed. At roadside locations pollution levels usually decrease rapidly away from the kerb. In the urban environment, buildings can have a significant impact on the dispersion of pollution, trapping emissions within the 'street canyon', causing elevated pollution levels. This effect is dependent on the strength and direction of the wind compared to the alignment of the road and the height of buildings around. Other aspects of the streetscape, including street planting and other barriers, may affect dispersion of pollutants and influence local air quality. Pollution

tends to be highest close to major roads across London, in central London, and near Heathrow airport.

2.2 Sources of pollution in London

Both human activity and natural sources can affect pollution in London. Road, air and rail transport, shipping, domestic and commercial heating, industry, power generation and agriculture can cause polluting emissions; while natural sources include PM from wind-blown sea salt, sand or soil also contribute to pollution levels.

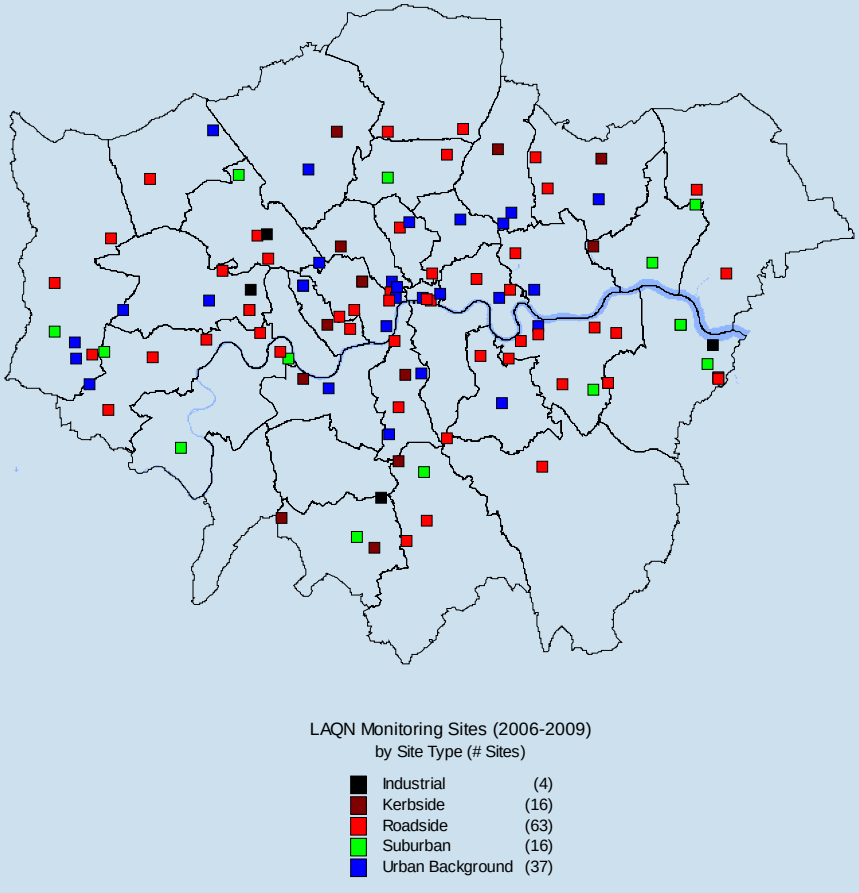
Pollution can travel great distances; for example, $PM_{2.5}$ can reach London from sources such as the Sahara up to 8,000 km away[14]. Therefore emissions of pollution outside London are also important in understanding pollution concentrations within London. Indications are that emissions from outside London may account for around 25 per cent of NO_2 concentrations in London[15]. Meanwhile, data from the air quality monitoring site in Marylebone Road in central London indicates that about 40 per cent of PM_{10} concentrations there originates from outside London, rising to 55 per cent during pollution episodes when daily mean concentrations[16] are above 50 $\mu g/m^3$. Tackling these 'non-London' emissions is therefore important to cleaning up London's air. Sources such as aviation, rail, shipping and industrial sites do not constitute a significant portion of London wide emissions, but can make a critical contribution to local pollution hotspots.

Box 4: How we monitor air quality and emissions in London

London's air quality is continuously monitored at over 100 different locations including kerbside, roadside, urban background, suburban and rural sites (see definitions overleaf). The London Air Quality Network (LAQN) is operated by King's College Environmental Research Group and the data is disseminated through a number of media including their website (www.londonair.org.uk), email alerts, news feeds and mobile phone applications.

The location of monitoring sites reported by the LAQN are shown in the figure below. The GLA also compiles the London Atmospheric Emission Inventory (LAEI) on an annual basis and this database provides information on emissions from all identifiable pollution sources in Greater London. The current LAEI includes emissions data for the 'base year' 2008 and projections for years 2011 and 2015. The monitoring data and the LAEI form the basis of the policy analysis for this Strategy.

Air Quality Monitoring Sites in London (LAQN)



Monitoring Sites Classification

Kerbside	Sites with sample inlets within 1m of the kerb of a busy road. Sampling heights are within 2-3m of the ground.
Roadside	Sites with sample inlets between 1m and 5m of the kerbside. Sampling heights are within 2-3m of the ground.
Urban Background	Urban locations away from major sources and broadly representative of town/city-wide background concentrations, e.g. urban residential areas.
Suburban	Sites typical of residential areas on the outskirts of a town or city.
Rural	Rural locations distanced from major population centres, roads, industrial areas or other pollution sources.
Industrial	Sites where industrial emissions make an significant contribution to pollution levels

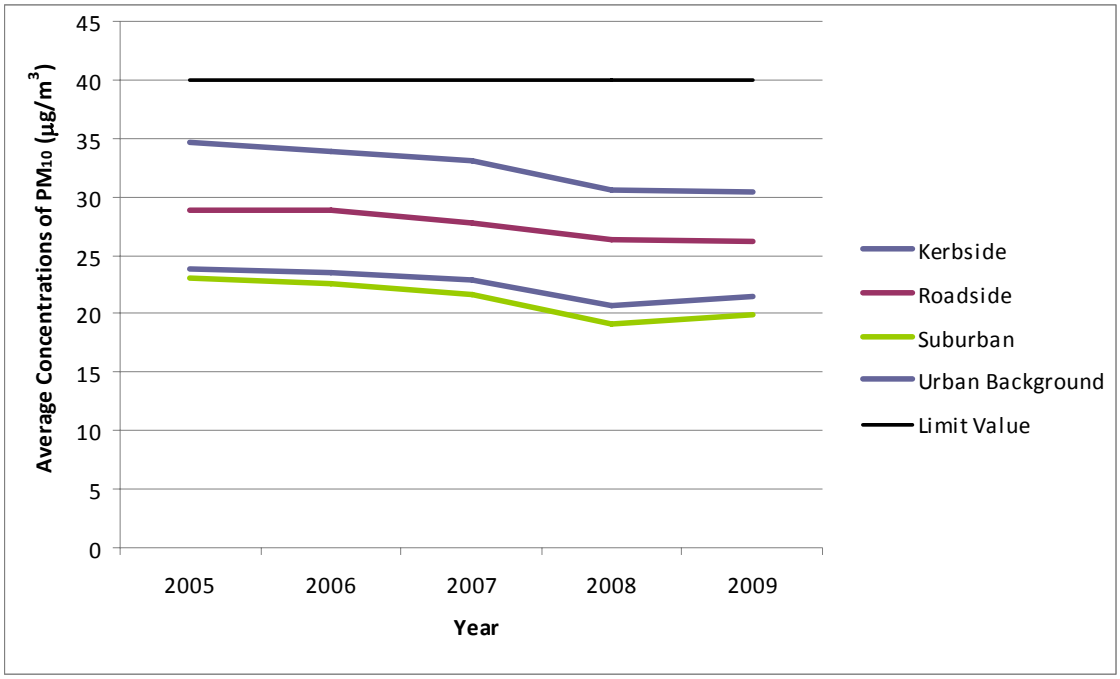
2.3 Recent trends in air quality – monitoring and modelling

PM_{10}

Concentrations monitored across London indicate that while PM_{10} levels in London declined in the 1990s, the decline has been slower in the last decade. This trend has been seen throughout Europe. However, these trends in PM_{10} concentrations do not reflect the predicted reductions in emissions. Despite research, there is no clear explanation for this disparity and it is something that needs to be better understood.

The EU limit value for annual mean PM_{10} (40µg/m^3) has been consistently met since 1997/8 at the majority of monitoring sites in the London network. Figure 2.2 shows that the trend in average PM_{10} concentrations in London since 2005 across all site types has reduced by an average of around 12 per cent at kerbside sites and 8 per cent at background locations.

Figure 2.2 Trend in annual averaged PM_{10} concentration in London since 2005

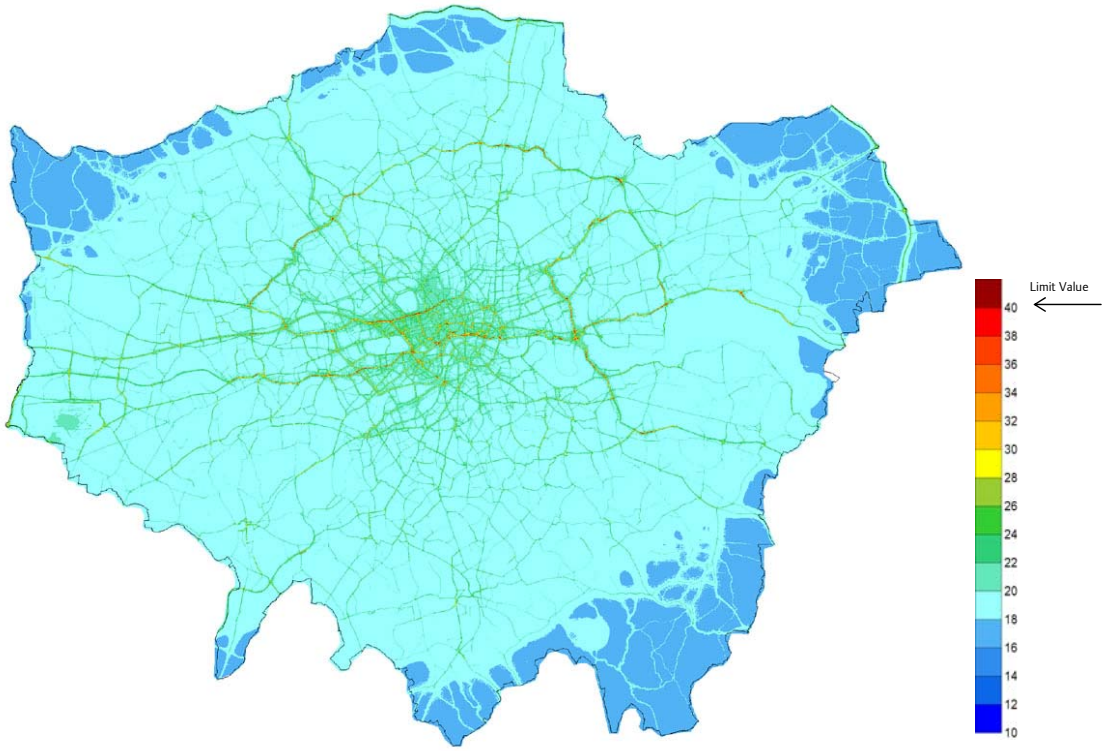


In 2009 the annual PM_{10} limit value was met at all but one monitoring site across London (Vauxhall Bondway Interchange which is partly affected by local ventilation sources). The more stringent EU limit value for daily mean PM_{10} concentrations is met at the majority of monitoring locations in London, but in the past few years has been exceeded intermittently at a small number of sites. These monitoring sites have exceeded the limit values for a number of reasons including proximity to waste management (due to re suspension of particles from vehicles or processes on site) or other local circumstances such as road works or construction. Other exceedences have been at kerbside monitoring sites next to some of London's busiest roads (including the Marylebone Road monitoring site).

Whilst London's air quality monitoring network is extensive it is only feasible to monitor at selected locations across London. Modelling of pollutant concentrations can be undertaken on a much wider basis and is used to determine the air quality in London and help identify other areas where pollution is high, such as close to major roads.

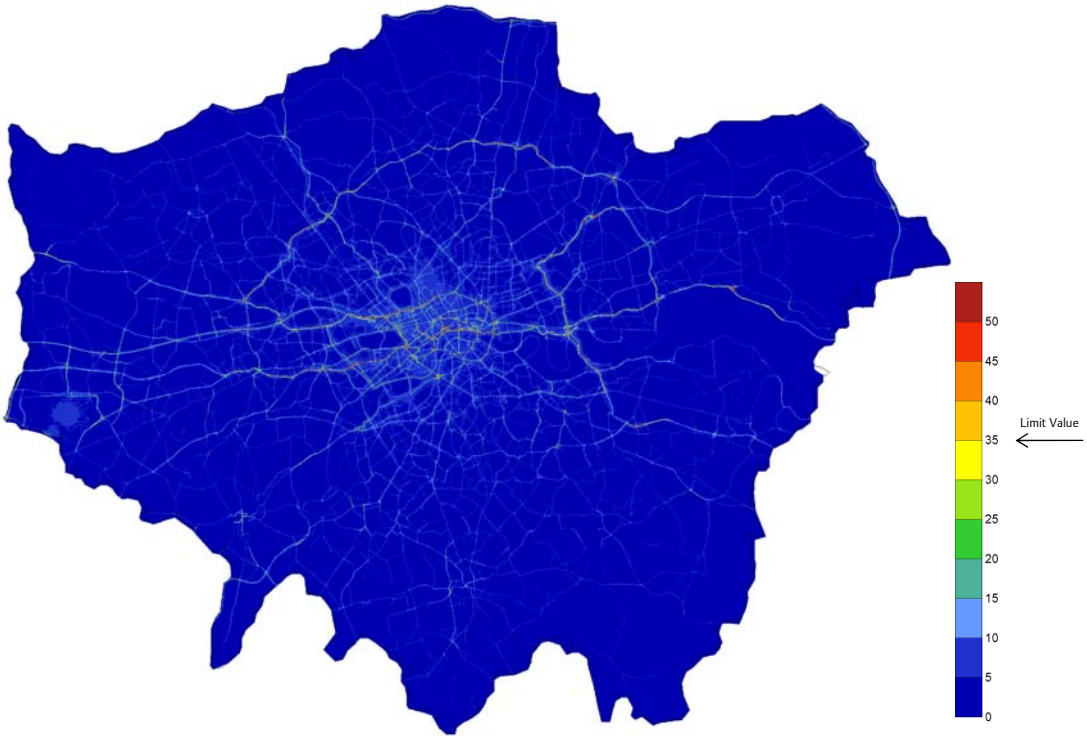
To inform development of this Strategy, updated modelling has been undertaken based on 2008 emissions and monitoring from across London. The results for PM_{10} in 2008 are shown in Figure 2.3. The modelling shows that the vast majority of London already meets the EU Limit Value for annual mean PM_{10} (shaded blue, green, yellow and orange). It can be seen that the highest concentrations are close to and restricted to major roads. Whilst pollutant concentrations of greater than 40 $\mu g/m^3$ occur at locations in inner London, it is important to note that elevated pollution concentrations tend to remain within the road carriageway and do not spread to the pavement where pedestrians are likely to be exposed, which can be examined through more detailed area-specific modelling. Circumstances such as these do not constitute a breach of the EU Air Quality Directive as there is no relevant public exposure.

Figure 2.3 PM_{10} annual average[17] concentrations ($\mu g/m^3$) for the year 2008



Most of London also meets the EU limit value for daily mean PM_{10} concentrations except at the kerbside of some of London's busiest roads (highlighted red in figure 2.4). The modelling results are in line with monitoring throughout London. As with PM_{10} annual mean concentration forecasts, there are limited locations within London that are projected to exceed the daily mean limit value but these do not constitute a breach of the EU Air Quality Directive as there is no relevant public exposure.

Figure 2.4 Number of days when average PM_{10} concentrations are above 50 $\mu g/m^3$ in 2008



$PM_{2.5}$

The EU limit values for $PM_{2.5}$ have not yet been included within UK law (they are due to be transposed later in 2010); however, as focus on $PM_{2.5}$ has increased in recent years, the number of $PM_{2.5}$ monitoring sites across London has also increased. There are twelve

sites which are able to provide a long term trend with concentrations being monitored for three or more years since 2003. Of these monitoring sites, eleven have recorded decreasing concentrations. Concentrations at the kerbside site in Marylebone Road have remained relatively stable since 2003.

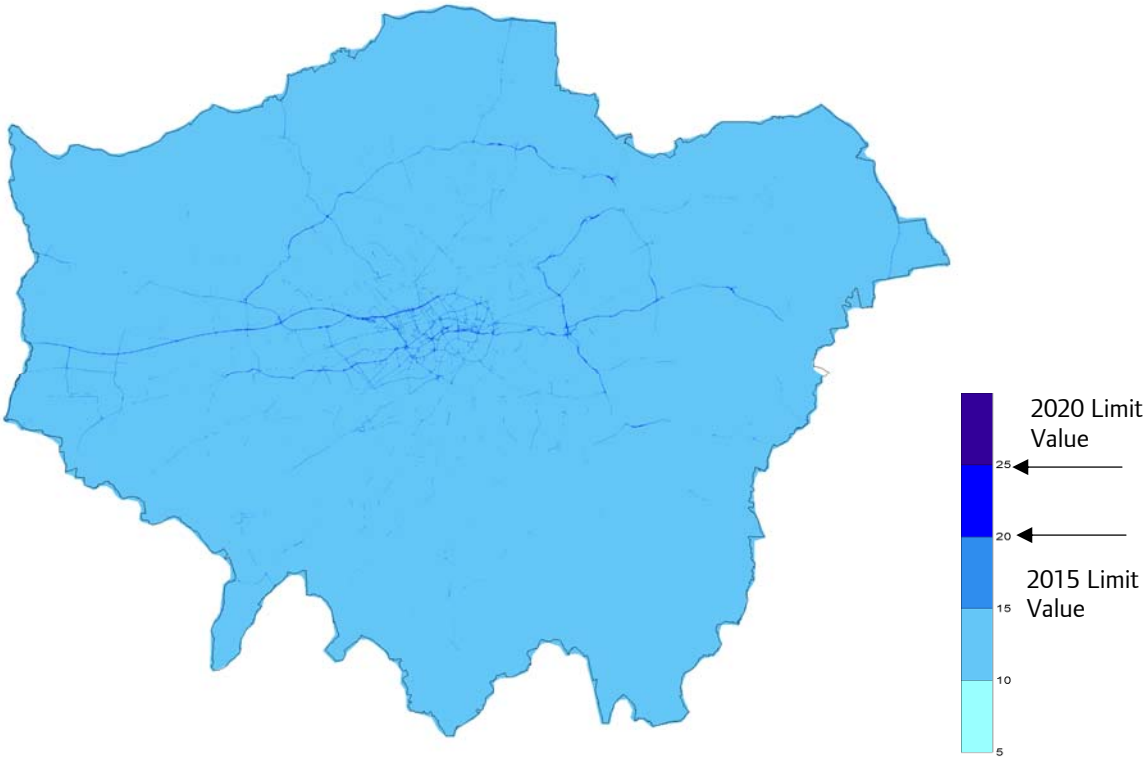
Concentrations monitored at all sites since 2003 met the $PM_{2.5}$ limit value of 25μg/m^3, which has a compliance date of 2015. Aside from the kerbside site in Marylebone Road and a roadside site in Greenwich, all monitored concentrations since 2003 have also met the stage 2 limit value of 20μg/m^3, which has a target date of 2020.

The EU exposure concentration obligation of 20μg/m^3, to be met by 2015, only applies at background locations and not roadside or kerbside locations. Between 2003 and 2008, concentrations were monitored at a few such locations for three or more consecutive years; all had concentrations below the exposure concentration obligation.

Modelling of $PM_{2.5}$ concentrations is not yet routinely undertaken in the UK, the main obstacle being the limited monitoring data set with which to verify modelling results. However, due to the importance of $PM_{2.5}$ in emerging air quality policy, modelling has been undertaken to support the development of this strategy.

Air quality modelling for 2008 confirms that the $PM_{2.5}$ stage 1 and 2 EU limit values (20μg/m^3 in 2015 and 25μg/m^3 in 2020, respectively) were met across almost all of London (see Figure 2.5) including all urban background locations. It is encouraging that London is predicted to meet the $PM_{2.5}$ EU limit value at locations where there is relevant public exposure as this is the fraction of particulate matter that is widely acknowledged by the scientific and medical community as being the main pollutant of concern for human health.

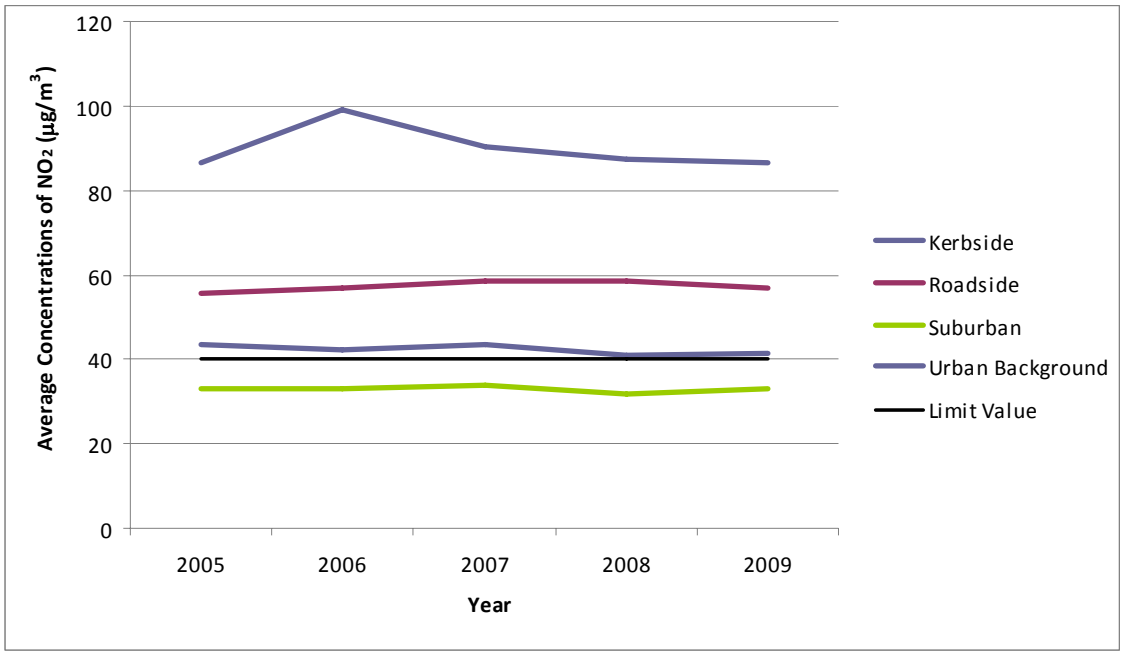
Figure 2. 5 $PM_{2.5}$ annual mean concentrations ($\mu g/m^3$) for the year 2008



NO_2

Monitored NO_2 concentrations across London indicate that in general, levels declined until 2002 but have been relatively stable since. Recent average trends in London across different types of monitoring sites in London are shown in Figure 2.6.

Figure 2.6 Annual average trends in London at NO_2 monitoring sites since 2005



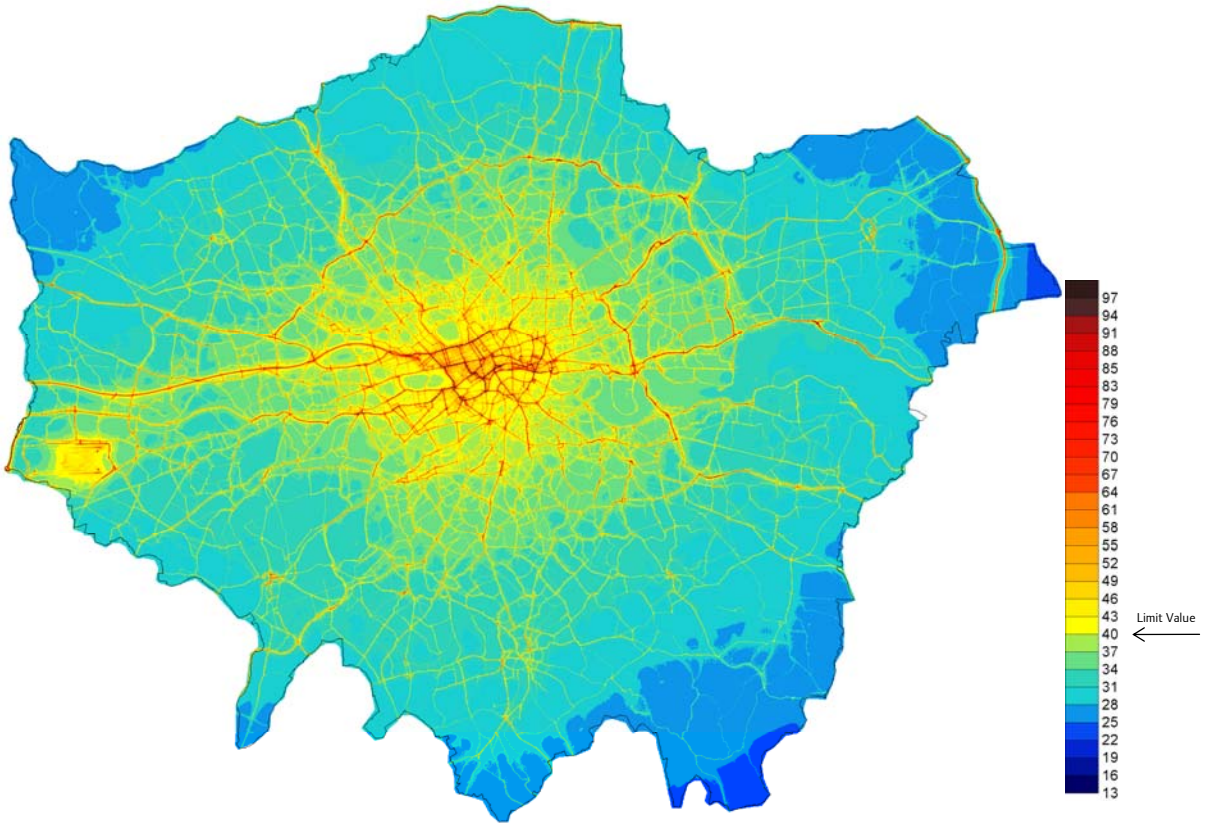
Outside central London, roadside concentrations have not declined since around 1997, and have been at a steady level over recent years. Annual mean concentrations monitored at the kerbside site in Marylebone Road have increased by around 30 per cent since 2002.

The EU limit value for annual mean NO_2 has been consistently met since 1999 at background monitoring locations in outer London, except around Heathrow airport. However, background concentrations monitored in inner London and at roadside locations across London have exceeded the limit value since 1999 and continue to exceed those limits. This lack of a decline in NO_2 concentrations is typical of any urban environment and is also observed in other UK and European cities; it is not just a London problem.

Modelling for NO_2 in 2008 shows that there remain areas that exceed the annual mean NO_2 (2010) EU limit value, (shaded yellow and red in Figure 2.7). In some of these locations the limit value is exceeded by a factor of two or more. Concentrations at a

number of kerbside or roadside monitoring sites near busy roads also exceed the hourly mean EU limit value, although these short-term concentrations can be strongly influenced by local conditions and sources (e.g. road works and traffic diversions) and are generally confined to locations within a few metres of main roads. This is not untypical for an urban environment and is also observed in other UK and European cities.

Figure 2. 7 NO_2 annual average concentrations ($\mu g/m^3$) for the year 2008



2.4 Projected future 'base case' air quality – modelling

Air quality modelling has been used to project future air quality across London excluding the additional policies identified within this Strategy. This future modelling scenario is based on trends of expected changes in emissions from transport and non-transport sources, including vehicle replacement and improved emissions standards. The model provides an indication of the scale of the air quality challenge that needs to be met by this strategy. The base case modelling incorporates Transport for London (TfL) and the

Department for Transport's (DfT) latest projections for traffic flows and speeds, fleet composition and emissions factors.

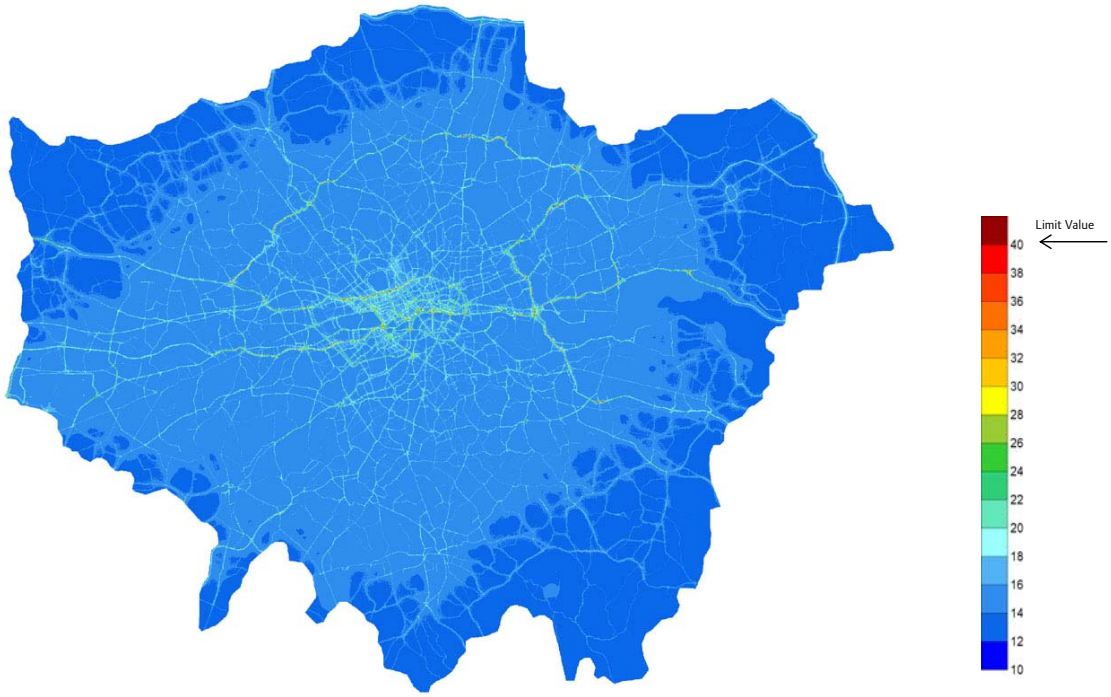
Central Government is in the process of applying to the European Commission for time extensions for compliance with the PM_{10} limit values until 2011 and NO_2 limit values until 2015. Therefore the future base case scenarios for this Strategy have been modelled on this basis for 2011 for PM_{10} and 2015 for NO_2.

Future base case modelling includes the removal of the Western Extension Zone to the Congestion Charging Zone, and the introduction of hybrid buses into the TfL bus fleet. The impact of the full policies and proposals identified in Chapters 3 and 4 of this Strategy (those that are reasonably quantifiable) is described in Chapter 5.

PM_{10} concentrations

Predicted concentrations of annual mean PM_{10} for London in 2011 are shown in Figure 2.8 and indicate that London will continue to meet the EU limit value for annual mean PM_{10}.

Figure 2. 8 PM_{10} annual mean concentrations ($\mu g/m^3$) for the year 2011

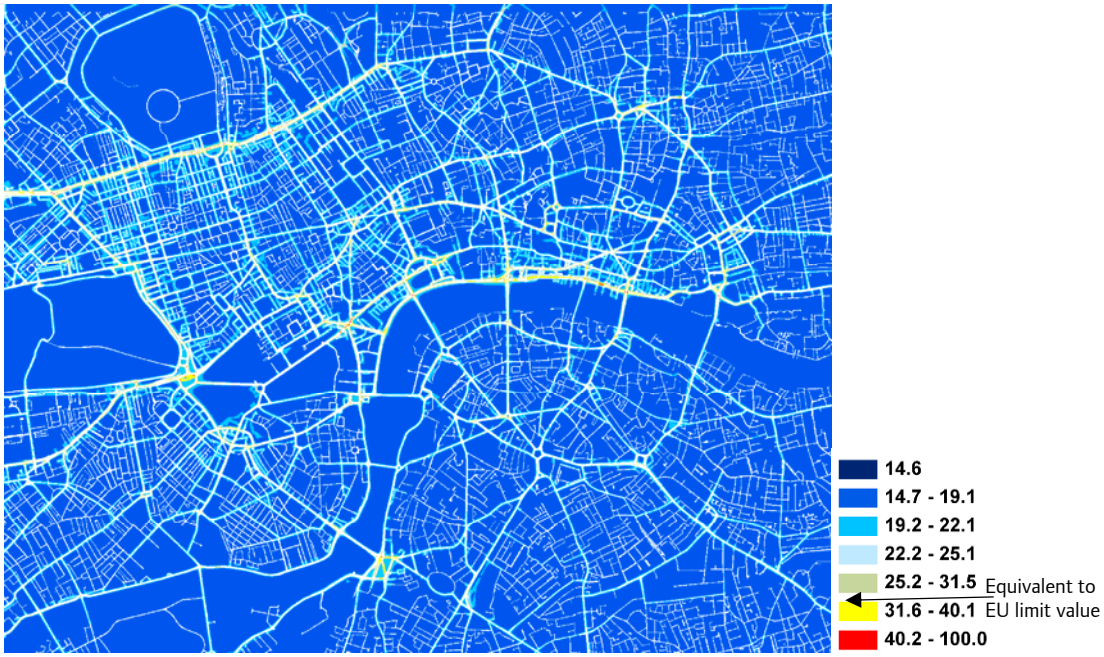


Predicted concentrations of daily mean PM_{10} for London in 2011 are shown in Figure 2.9 (indicated concentrations at road centre have been removed). Modelling suggests that there will be no locations with relevant public exposure that will exceed the annual mean limit value in 2011. However, there remain some areas near the busiest roads in central London where the margin of between modelled concentrations and the limit value is very small. These locations are:

- Marylebone Road
- Euston Road
- Marble Arch
- Hyde Park Corner
- Victoria Embankment
- Upper Thames Street
- Tower Hill.

The high concentrations at these locations are caused by a number of factors including the make up of the vehicle fleet going through the location, traffic speed and local road geography. In order to address these priority locations the Strategy focuses on three interconnected corridors that include the specific locations at risk of not meeting the extended 2011 deadline for daily PM_{10}. These are Marylebone Road and Euston Road, Marble Arch and Hyde Park Corner and Embankment to Tower Gateway.

Figure 2.9 PM_{10} annual mean concentrations for 2011 ($\mu g/m^3$) without the Strategy in 2011



This analysis provides a useful initial focus for further action to reduce PM_{10} levels to increase the certainty of meeting the EU limit values. However it is still desirable to continue lowering London wide PM_{10} concentrations below the EU limit values to reduce health impacts and to improve quality of life. The majority of the policies in this Strategy aim to provide for improvements in air quality beyond the requirements of limit values for PM_{10}.

$PM_{2.5}$ concentrations

Projecting forward to 2015 indicates that annual mean $PM_{2.5}$ limit values are likely to be met throughout London even without further action to reduce emissions. Modelling also indicates that the EU $PM_{2.5}$ exposure concentration obligation of 20µg/m^3 in background locations is likely to be met in its target year of 2015.

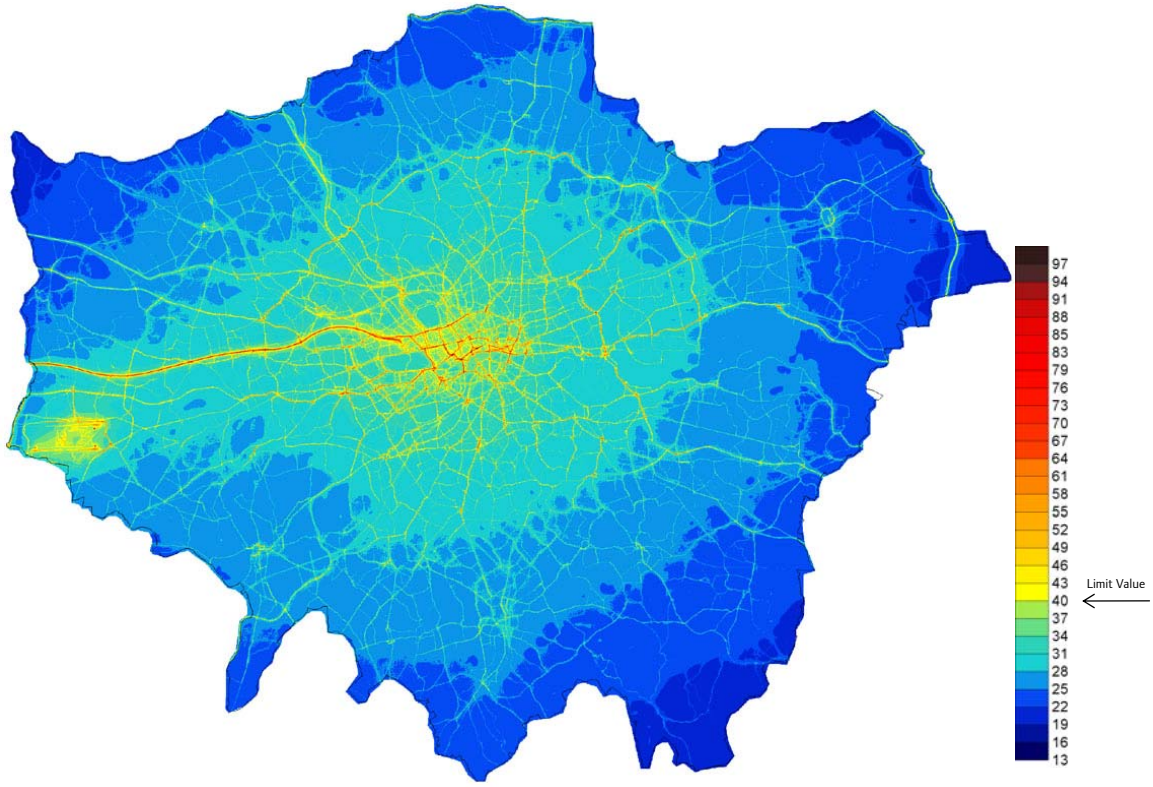
As with PM_{10}, to determine how challenging the $PM_{2.5}$ targets are in London, the relative contributions of emissions inside and outside London need to be considered. Emissions from outside London contribute greatly to high concentrations in central London and it is not expected that these will fall significantly in the next few years.

NO_2 concentrations

Projecting forward to 2015, Figure 2.10 indicates that the annual mean NO_2 concentrations will still exceed the limit value across less than 5 per cent of London (shaded yellow, orange and red in Figure 2.10), including roads in central and inner London and in the vicinity of Heathrow airport. Modelling for 2015 also indicates the limit value for hourly mean NO_2 concentrations may also be exceeded near a few major roads in central London

Action in Greater London alone will not be sufficient to meet the limit values by the extended target date of 2015. NO_2 pollution is not just a problem in London but is a problem in other urban environments within the UK and Europe. Serious action to reduce NO_2 concentrations needs to be taken at national and European level if London is to meet the EU limit values for NO_2.

Figure 2.10 NO_2 annual mean concentrations ($\mu g/m^3$) predicted for the year 2015



2.5 Focus on sources of emissions in London

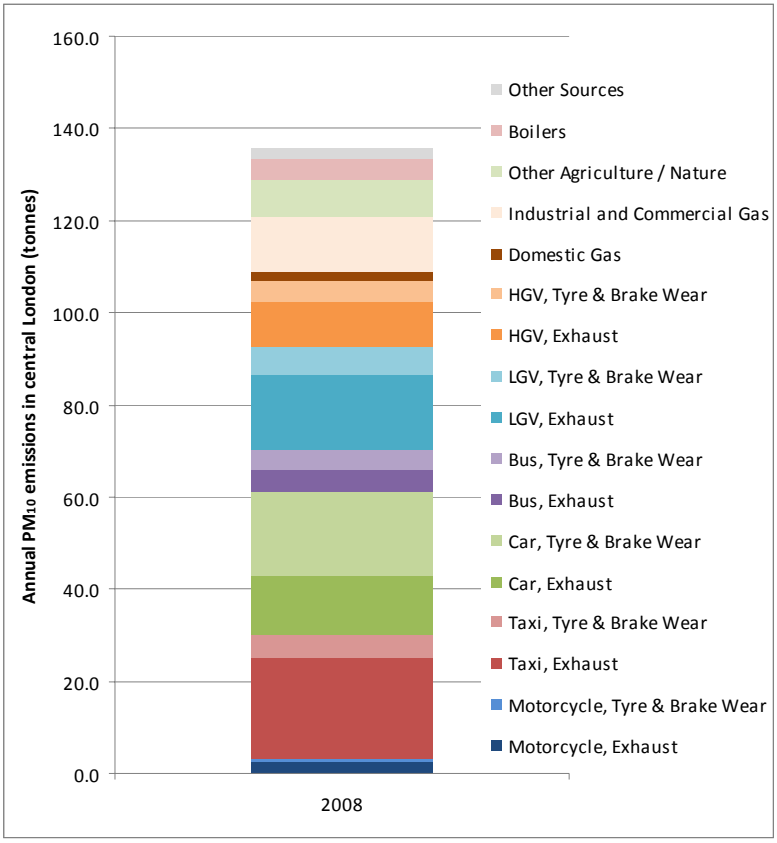
London's air quality is affected by sources of pollution from inside and outside London. This section focuses on the projected sources of emissions within London if no further action is taken beyond that which has already been announced or is underway.

PM_{10} Emissions

The areas identified as being at most risk of exceeding the PM_{10} EU limit value in 2011 are within central London, so this section focuses on PM_{10} emissions in that area. Road transport is the dominant source of PM_{10} emissions in central London, contributing 79 per cent in 2008. The contribution to PM_{10} emissions of different vehicle types also varies significantly at different locations in London, according to variations in the composition of traffic using the roads. Figure 2.11 shows the contributions of the different sources to PM_{10} emissions in central London.

Around 35 per cent of PM_{10} emissions in 2008 from road transport in central London come from tyre and brake wear. Emissions of PM_{10} from car tyre and brake wear are now greater than those from car exhaust emissions and over the next five years, this is also expected to become the case with heavier vehicles such as HGVs and buses. This reflects the fact that measures have been taken to reduce emissions from exhausts but similar reductions have not been achieved for tyre and brake wear emissions, largely because there are no technical improvements on the market. Other significant sources of PM_{10} within central London include cars (responsible for 23 per cent), taxis (responsible for 20 per cent) and LGVs (responsible for 17 per cent). Proposals for reducing emissions from these sources are discussed in Chapter 3.

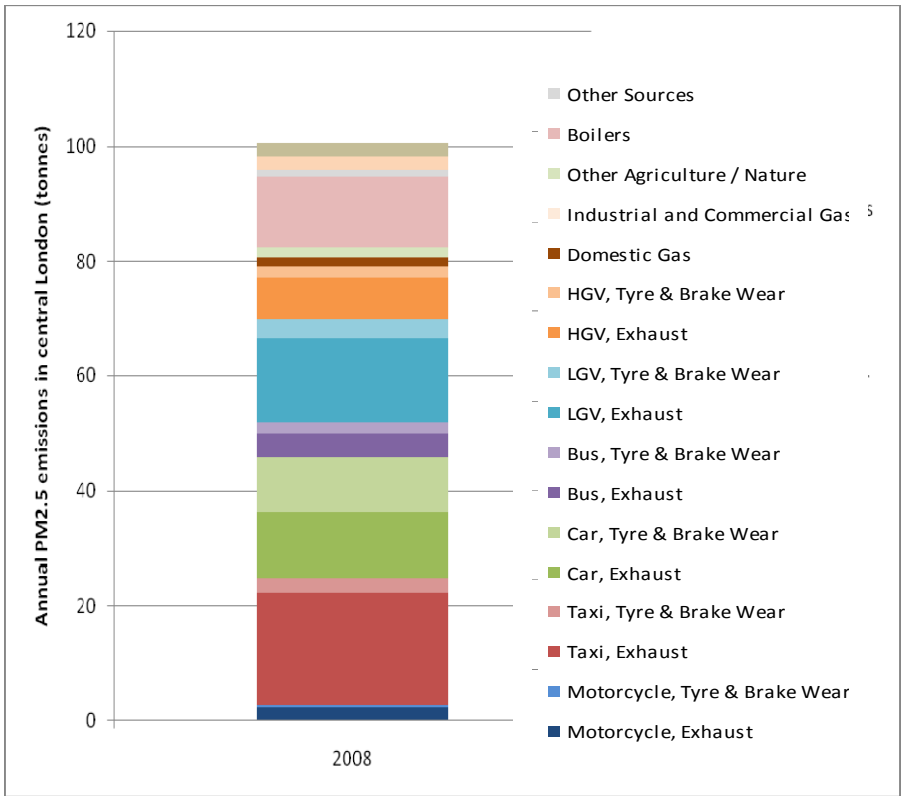
Figure 2. 11 PM_{10} emissions from all sources in central London in 2008



$PM_{2.5}$ Emissions

Road transport is the main source of $PM_{2.5}$ emissions in London; contributing around 80 per cent in 2008 (see Figure 2.12). The remaining 20 per cent are from non transport emissions, with industrial and commercial gas combustion contributing the biggest proportion in central London. LGVs, cars and taxis each contribute around 20 per cent of $PM_{2.5}$ emissions in central London and around a third of $PM_{2.5}$ emissions from road transport are from tyre and brake wear.

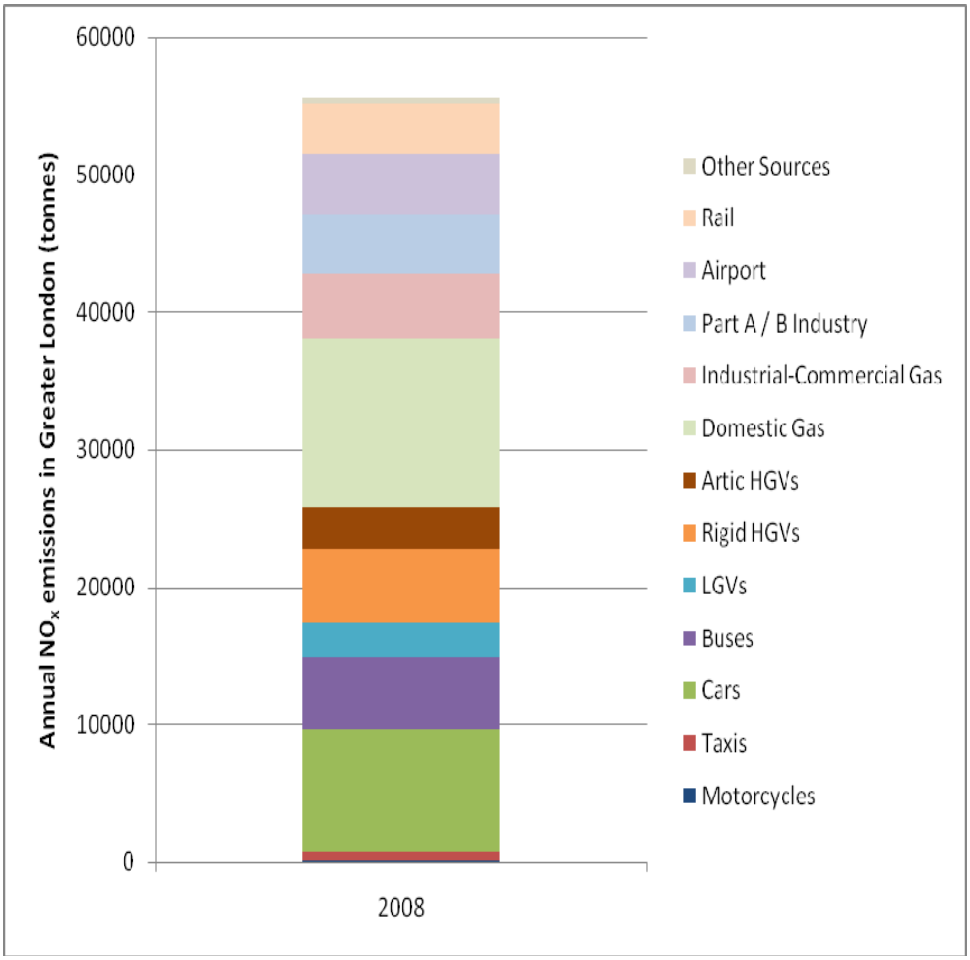
Figure 2. 12 $PM_{2.5}$ emissions in central London



NO_X emissions

Emissions from road transport and domestic gas dominated Greater London's NO_x emissions in 2008, contributing 46 per cent and 22 per cent respectively (as shown in Figure 2.13). The contribution to NO_x emissions of the different sources varies significantly in different parts of London. Emissions from domestic gas are of increasing significance in inner and outer London, whilst industrial and commercial gas use is more significant in central London. Road transport emissions are responsible for a higher proportion of emissions in central London than in outer London. The contribution of different vehicle types also varies by location - emissions from buses, for example, contribute a greater proportion in central London than elsewhere

Figure 2. 13 NO_x emissions in Greater London in 2008



3 Transport Measures

3.1 Actions underway or planned

The Mayor, through the GLA group, is already committed to taking bold action to reduce air pollution from London's transport system. Through TfL's Business Plan, billions of pounds are being invested in transport measures that will directly or indirectly help reduce emissions of PM and NO_x. Much of the detail for these measures is set out in the Mayor's draft Transport Strategy.

Measures already proposed or underway include:

- Promoting mode shift to cleaner forms of transport, including ongoing investment in public transport through schemes including Crossrail and the tube upgrades and significant increases in cycling and walking infrastructure, including Cycle Hire in central London and twelve Cycle Superhighways
- Bus emissions programme – from 2012 every new bus coming into the London fleet will be diesel-electric hybrid and the New Bus for London is expected to be hybrid
- Encouraging and funding car clubs, especially those which provide plug-in hybrid and electric cars
- Improving road maintenance to reduce the contribution of particulate matter to emissions from road surface wear
- Smoothing traffic through better traffic management and street works coordination through measures including the London Permit Scheme
- Making it easier for boroughs to implement and enforce 20mph zones
- The continuation of the Central London Congestion Charging scheme which reduces traffic congestion and associated emissions and helps promotes mode shift
- Operation of the London Low Emission Zone, which reduces emissions from older, heavier diesel vehicles
- Procurement and promotion of electric vehicles – the Mayor has a target of getting 100,000 electric vehicles on London's roads by as soon as possible.

- ‘Greening’ of transport fleets – for example, phased replacement for Dial-a-Ride vehicles and 1,000 electric vehicles in the GLA fleet by 2015.

- Freight Delivery and Service Plans - being implemented and promoted by TfL to reduce unnecessary freight mileage and increase freight efficiency.

In spite of these measures and the improvements in recent years that have already been seen, transport in London remains the most significant source of air pollutant emissions, contributing substantially to the overall concentrations of air pollution and adversely affecting public health. Consequently, further reductions in air pollutant emissions from transport are needed. While action to reduce transport emissions alone cannot remove the causes of poor air quality in London, it can play an important role in working towards the achievement of the EU limit values and delivering health benefits for Londoners.

3.2 Policies and proposals

The Mayor proposes a further package of air quality improvement measures for transport. This package is designed to deliver value for money. It secures important reductions in emissions of PM, NO_x and also CO_2 while seeking to minimise as far as possible compliance costs for those that would be affected by the proposals. It also seeks to manage the additional costs to TfL to avoid shifting investment from other planned projects which are essential to support London’s long term growth and economic development. The package consists of:

- **Encouraging smarter choices and sustainable travel behaviour** (Policy 1): these are broad measures that are relatively easy to implement that will have positive air quality impacts across London.

- **Promoting technological change and cleaner vehicles** (Policy 2): these measures will deliver a new generation of cleaner, greener private vehicles.

- **Identifying priority locations and improving air quality through a package of local measures** (Policy 3): these will focus on particular areas at most risk of not meeting EU limit values as well as promoting action by boroughs and others across a range of locations with particular air quality challenges.

- **Reducing emissions from particular sources in the public transport and public sector vehicle fleets** (Policy 4): these measures will focus on ensuring that public transport fleets lead by example in reducing emissions.

- **Emissions control schemes** (such as changes to the London Low Emission Zone) (Policy 5): these measures will promote further improvements in London's vehicle fleet.

- **Action days and special measures** (Policy 6): these measures will provide for additional action on high pollution days, as well as seeking to promote more lasting behavioural change.

Given the urgent need to meet the limit values, some of these measures will need to be progressed in parallel with the development of this Strategy and in tandem with the actions already being implemented.

The ultimate scale and scope of action will inevitably be dependent on the resources available. In developing his Strategy the Mayor has taken account of TfL's Business Plan, which is already allocated to 2017/18. While the Mayor is fully committed to improving London's air quality through the transport measures set out in this chapter, these can only be delivered in full if central Government support is forthcoming. Given that air quality is a problem in a number of urban areas across the country, and NO_2 limit values are being breached in most major cities in the UK, it is appropriate that the Government should take robust action to support the Mayor's policies in London.

Policies and Proposals

Policy 1 – Encouraging smarter choices and sustainable travel behaviour

Vision

Reduced vehicle emissions through people making smarter choices about which mode they use to travel and, for all vehicles, using them as efficiently as possible.

Policy

The Mayor, working with boroughs and stakeholders, will support Londoners and those working in and visiting the capital in making behavioural changes to the way they travel to reduce emissions from transport and promote more efficient use of vehicles by individuals and organisations.

Proposals

Promoting smarter travel

- Working with boroughs, the Mayor will develop further smarter travel schemes and initiatives.
- Working with boroughs, the Mayor will provide more information to ensure people can make informed choices about using low or zero emission forms of transport, including walking and cycling.
- The Mayor will support the development of a network of high-connectivity home working hubs in community locations including libraries and community halls to reduce demand for travel.

Promoting more efficient 'eco-driving'

- The Mayor will reduce emissions from the vehicles within his authority by implementing eco-driving[18] training for bus, taxi and GLA group drivers.
- The Mayor will reduce emissions from private vehicles by further supporting eco-driving training for members of the public.
- The Mayor will capture the air quality benefits of smoothing the flow of traffic in London, as proposed in the Mayor's draft Transport Strategy.

London No-idling Zone

- The Mayor will make London a 'no idling zone' with a particular focus on buses, coaches, taxis and delivery vehicles. Initially, he will work with boroughs and other stakeholders to target the priority locations set out under policy 3.

Enabling more efficient freight movement

- The Mayor, working with boroughs and businesses, will explore ways of reducing emissions from freight vehicles through better freight management, the use of eco-driving and encouraging development of consolidation centres. The Freight Operator Recognition Scheme (FORS) and Delivery Service Plans (DSPs) for commercial fleets will promote best practice.

- The Mayor, working with boroughs and businesses, will support modal shift of freight from road to rail and water.

Car clubs and car sharing

- The Mayor, working with boroughs, will provide on-street infrastructure (e.g. parking spaces and charge points) to support car clubs, especially those using electric or hybrid vehicles.

- The Mayor, working with boroughs and employers, will promote car sharing by harnessing new technologies (e.g. the internet, smart phones) to bring together commuters undertaking similar trips.

Providing the right information to the public

- The Mayor will provide clear information about emissions from transport and the public transport fleet, including taxis, to enable people and businesses to make more informed transport choices.

- The Mayor will provide air quality information to enable the public, particularly the vulnerable, to make informed choices about when, where and how they travel.

- The Mayor will encourage third parties (including SatNav companies) to provide real time disruption information to car drivers to enable them to plan their journey better.

Outputs

In combination, the implementation of these policies and proposals will reduce emissions from vehicle use in London. TfL estimates that as a result of the measures set out above and those in the Mayor's draft Transport Strategy, private car use in Greater London will reduce by approximately six per cent by 2031.

TfL estimates that delivering the Mayor's target to increase cycling mode share from two to five per cent by 2026 would remove around a tonne of PM_{10} and nearly 50 tonnes of NO_x. Approximately 90,000 tonnes of CO_2 would also be saved.

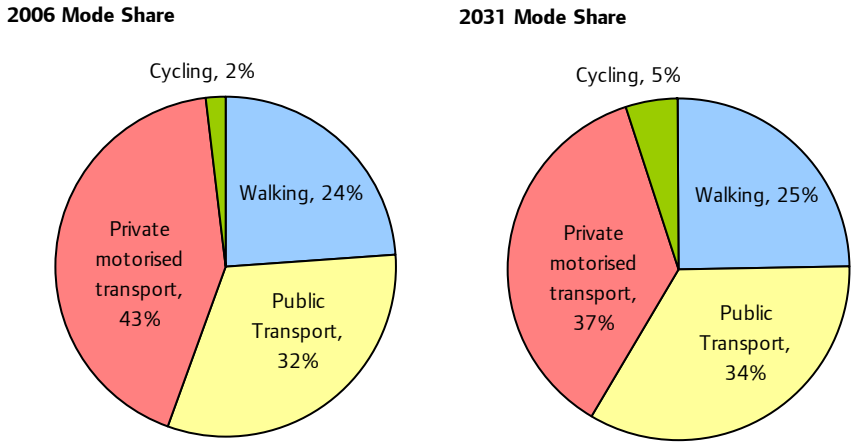
Eco-driving and better route planning can deliver reductions in vehicle fuel consumption of between five per cent and ten per cent, with the potential for associated reductions in emissions of air pollutants.

Why we need change

Promoting smarter travel

Too many people in London still choose to use cars for short journeys when more sustainable modes – public transport, cycling and walking – would be practical. In order to achieve a continuing and greater shift towards more sustainable modes, it is important to provide Londoners with the necessary information to make non-car mode choices. There have already been significant successes in this area. For example, Smarter Travel Sutton has used a range of initiatives, including personalised travel planning and work place and school travel plans which have resulted in roughly an 80 per cent increase locally in the rate of cycling in three years. More widely, TfL promotes smarter travel choices across London through workplace and school travel plans. In addition, TfL is introducing a number of schemes to encourage motorists to leave their car at home and use more sustainable modes of transport. These include the introduction of a cycle hire scheme in central London, Cycle Superhighways, the biking boroughs scheme and 66,000 new cycle parking spaces.

Figure 3. 1 Mode share (by trips)[19] within London in 2006 and 2031



Promoting more eco-efficient driving

For some journey, however, private cars will still be needed. For these journeys, the challenge is to persuade Londoners to purchase the cleanest vehicles available and to use them in the most efficient way. TfL is already supporting a fuel-efficient driving campaign through its Climate Change Fund but it is important to do more. Where the advice has been acted on, TfL's eco-driving marketing campaigns have achieved, on average, between five and ten per cent reduction in emissions.

Car clubs and car sharing

Car clubs are becoming increasingly popular with over 100,000 members in London alone. Car clubs enable those who require occasional access to a car to have this on a pay-as-you-go basis without the need to own a vehicle. Thus members have an incentive to avoid non-essential car journeys. The Mayor, TfL and London boroughs have worked to promote car clubs through funding and by providing dedicated parking spaces. Since May 2008, the Mayor and TfL have invested more than £1million in the development of car clubs and London, with 100,000 car club members, accounts for 84 per cent of the UK's car clubs. Car clubs primarily use new vehicles (some use hybrids and electric vehicle trials will begin later this year) that are well maintained, keeping their emissions comparatively low. However, more can be done to accelerate the adoption of the cleanest vehicles and new technologies such as electric cars.

Enabling more efficient freight movements

As population and employment continue to grow, the demands for freight and servicing are expected to increase. Growth in freight movements is therefore expected, with the number of vans (Light Good Vehicles) forecast to grow by 30 per cent between 2008 and 2031. It is therefore important that while the economic needs of the freight sector are met this is achieved in ways that, so far as reasonably practicable, minimise emissions of air pollutants.

Smoothing traffic flow and providing the right information

In addition to measures to smooth traffic flow, including more effective management of roadworks, it is important to provide road users with better and timely information to enable them to avoid problem areas and thus further reduce the impacts of congestion.

What needs to be done

Promoting smarter travel

TfL, working with boroughs and other stakeholders, will continue to promote smarter travel initiatives building on experience from schemes, for example in Sutton and Richmond, and continuing travel planning work with schools and employers. There will also be a focus on promoting walking and cycling, for example through better information for walking; improved and more inviting public spaces; cycle superhighways; and event days to encourage cycling. Combined with improvements to public transport, this is expected to achieve a significant mode shift from private car use to these more sustainable, zero-emission modes.

Promoting more eco-efficient driving

TfL will implement emissions efficient driver training for vehicles under the Mayor's control. For taxi and private hire vehicle (PHV) drivers, TfL will identify suitable courses that existing drivers and applicants wishing to become drivers will be required to take in order for their application or renewal of licences to be granted. TfL will work with bus operators to explore the potential for installing new on-board systems to provide detailed information to monitor driving performance and emissions.

Smoothing traffic flow

The Mayor's draft Transport Strategy sets out proposals to smooth traffic flow. 'Smoothing traffic flow' is the term used for the Mayor's broad approach for managing road congestion and, in particular, improving traffic journey time reliability and predictability. The aim of the smoothing traffic flow approach to management of the road

network is to improve conditions for cyclists and pedestrians as well as vehicular traffic. It includes measures to maximise the efficient and reliable operation of the existing road network and minimise the impact of planned interventions on the road network; including those that have the potential to disrupt traffic flows, such as roadworks, which are being addressed by the Mayor's lane rental scheme among other measures. Linked to the promotion of eco-driving, smoothing traffic flow has the potential to deliver significant air quality benefits for London.

Box 5: Case study - Lane rental scheme

The Mayor, through TfL, is working towards implementing a 'lane rental' scheme for works promoters and statutory undertakers wanting to excavate the most congested roads in the capital. The rental charge would reflect the cost to the economy of taking temporary possession of road capacity. It would aim to incentivise works promoters to reduce the number and duration of roadworks, and quicken the development of techniques that will minimise traffic disruption. The scheme will identify key junctions, times of the day and network links, where roadworks can cause significant traffic congestion and delay. The lane rental scheme, together with penalties for delay, will help to ensure that any organisation wanting to dig up London roads would make every effort to cause as little disruption as possible

London No-Idling Zone

The Mayor, working with the boroughs, bus operators and other organisations will establish a No-Idling Zone throughout London. Within this, there would be a focus on buses, coaches and taxis as well as particular problem areas such as around schools and transport interchanges. Boroughs have a patchwork of powers they can use to enforce against idling vehicles but these need to be streamlined and made more flexible to make them more effective.

Currently, it is an offence to leave a vehicle engine idling unnecessarily whilst parked under the Road Traffic (Vehicle Emissions) (Fixed Penalty) (England) Regulations 2002. These regulations enable local authorities in England to issue Fixed Penalty Notices to drivers who allow their vehicle engines to run unnecessarily while the vehicle is stationary – however it is problematic to define 'unnecessarily' and the penalty charge is fixed at £20, which is too low to be a powerful disincentive. The £20 penalty for idling compares unfavourably to the £120 penalty charge issued for parking offences such as parking on a

yellow line when it is not allowed. Consequently, penalty charges for no-idling offences should be brought into line with penalty charges used for parking offences in London.

The London Borough of Camden has led the way in enforcing against idling vehicles, obtaining additional enforcement powers against idling coaches by issuing a Road Traffic Order and using its existing Enforcement Officers (see box 6). The Mayor is keen to work with other boroughs, particularly in central London, to extend this approach to address idling across the whole of London.

TfL will work with boroughs and encourage central Government to improve enforcement processes and increase penalty charges. A priority for the No-Idling Zone will be to raise awareness, particularly at locations such as schools where parents who leave their cars running contribute to poor air quality affecting their children. Taxi idling, especially at taxi stations, is a particular issue. The current design of taxi ranks makes it difficult to prevent idling as taxis are required to move forward every few minutes and the stop-starting of engines would be worse for emissions. The Mayor will work with transport operators and the boroughs to address this where practical, potentially by making taxi passengers walk along the rank to the taxi rather than the taxi moving up the rank. Targeted action will also be needed at the priority locations identified in Policy 3.

Box 6: Case-study - Enforcing against idling vehicles

The London Borough of Camden is currently enforcing against idling coaches and buses using powers under the Camden (Coach Parking Places) (No. 1) Order 1992. The 1993 amendment to that order allows Camden to fine drivers leaving their engines running unnecessarily.

Under the order, a penalty can be issued when a vehicle is parked with the engine running at coach pay and display parking places in designated streets. A contravention will also occur when a vehicle is parked with the engine running at certain bus stands. Camden has authorised its Community Enforcement Officers to focus on particular problem locations such as outside the British Museum and in South End Green.

Enabling more efficient freight movements

TfL, working with boroughs and stakeholders, will explore ways of reducing emissions from freight vehicles. Policies and proposals in the Mayor's draft Transport Strategy will reduce the contribution of freight and service vehicles to poor air quality by, for example, the promotion of greater use of rail and river, the use of bulk-breaking and consolidation facilities, and requiring the use of Delivery Service Plans (DSPs). Policy 5 sets out

potential changes to the London Lorry Control Scheme and night-time deliveries which could enable more efficient freight movements with benefits for air pollutant emissions, concentrations and the broader economy.

Car clubs and car sharing

The Mayor has recently announced a further £1 million funding for car clubs in the capital and through TfL and working with the boroughs, he will promote the use of car clubs through measures including the provision of additional dedicated parking spaces. He will also focus on incentivising the adoption of the cleanest vehicles and new technologies including electric and electric-hybrid cars by providing street-side charging points on roads controlled by TfL. TfL, building on technologies such as Journey Planner, will work with employers to promote car sharing by developing mechanisms that link potential drivers and passengers.

Providing the right information

The Mayor will provide information on emissions to air from the public transport fleet. Providing information in an easily accessible way, allowing people to make comparisons between modes and even particular vehicles, will enable more informed choices about their journeys and the vehicles they use. For example, identifying, in a simple way, the taxis with lower emission ratings will enable members of the public and businesses to actively choose to use cleaner vehicles. New York City has already adopted this approach with their 'Green NYC' symbol and associated information campaign (see case study in box 7).

Information on CO_2 emissions is available at the point of purchase for new cars. This is displayed by the car retailer. While similar information is available for air quality emissions, this is not currently displayed in the same way as for CO_2. New cars will be designed to meet the latest Euro standards, but emissions differ between petrol and diesel engines and also hybrid technologies; while older cars have varying emissions levels depending on year of manufacture and engine type. Providing better and more accessible information will encourage the uptake of newer, cleaner vehicles. TfL will work with Defra and the DfT to explore options for improving cleaner vehicle information; for example, for car retailers to provide air pollutant emissions information in addition to information about carbon emissions.

Box 7: Case-study – Labelling taxis in New York City (NYC)

In order to promote the use of cleaner vehicles such as hybrids, the NYC Taxi and Limousine Commission allows certain types of taxi to use the 'Green NYC' logo. This is part of a wider public information campaign raising awareness about the environmental impact of an individual's travel choices. The use of a single marque integrated across all the City's green initiatives reinforces key messages and promotes brand awareness.

Policy 2 – Promoting technological change and cleaner vehicles

Vision

Improved air quality through a new generation of cleaner, greener private vehicles operating in London with a long-term aspiration of zero tailpipe emissions.

Policy

The Mayor, through TfL, working with central Government and boroughs and encouraging others will promote the transfer to and the uptake and use of low emission vehicles for both private and freight transport.

Proposals

Supporting the uptake of low emission vehicles and delivering a switch to electric vehicles

- The Mayor will support the uptake of low emission vehicles, such as electric cars and vans, through the Electric Vehicle Delivery Plan.

- The Mayor will encourage central Government to incentivise low emission vehicles through further changes to Vehicle Excise Duty and other tax regimes, with a focus on improved air quality as well as reductions in CO_2.

- The Mayor, working with the private sector and the freight industry, will promote the uptake of cleaner freight vehicles through green procurement standards.

Scrapping or retrofitting older, more-polluting vehicles

- The Mayor will encourage central Government to extend its scrappage scheme to target particular vehicles such as taxis, as well as introducing a grant scheme for retrofitting vehicles with pollution abatement equipment.

Improving the emissions from all vehicles through new technologies

- The Mayor will encourage the European Commission, the Government and vehicle manufacturers, to promote the continuing development of new technologies to make vehicle emissions cleaner to air, including the use of tyres which wear less, more sophisticated abatement technology and automatic hybrid fuel-switching.

Outputs

The uptake of electric vehicles is likely to be relatively small initially (compared to the total fleet) and therefore reductions in emissions resulting from the use of electric vehicles

will be small in the next few years. Electric vehicles, however, have the potential to significantly improve the emissions impact of the use of private vehicles in Greater London. Longer term, if 100 per cent of cars and Light Goods Vehicles using the Central London Congestion Charging zone were electric by 2020, this would save approximately eight tonnes of PM_{10} and 290 tonnes of NO_x in that year – as well as significant savings of CO_2.

Why we need change

Private vehicles (i.e. excluding buses, taxis, Private Hire Vehicles (PHVs) and heavy freight) are responsible for approximately 65 per cent of London's PM_{10} and 45 per cent of NO_x exhaust emissions. Even with continued mode shift, a significant share of journeys will still be in private vehicles and it is important that encouragement is given to the use of the greenest possible vehicles.

Improving the emissions from all vehicles through new technologies

Currently tyre and brake wear account for approximately 50 per cent of PM_{10} emissions from road transport sources across Greater London and about 35 per cent in central London. In working towards achieving PM_{10} emissions limit values, tackling tyre and brake wear emissions will become increasingly important as this source will make up a greater proportion of PM_{10} emissions in the future. Reducing the number of vehicles on the road network will deliver benefits in this regard but encouraging the use of lighter vehicles and smoother driving techniques will also help reduce tyre and brake wear emissions. In addition, some hybrid and electric vehicles may have reduced tyre and brake wear emissions. Further research, led by central Government and the European Commission, is required in this area to support potential action in partnership with the vehicle and tyre manufacturing industry to reduce the impact of tyre and brake wear on air quality and health.

What needs to be done

TfL will implement the Mayor's draft Transport Strategy, which sets out a range of proposals to encourage use of sustainable modes of transport and the reduction in the need to travel. By reducing traffic volumes, both tailpipe emissions and emissions from tyre and brake wear to air are reduced.

Alongside measures to reduce traffic, action is needed to encourage a switch to cleaner vehicles to reduce the impact of the vehicular traffic that will remain on the network. This includes a focus on reducing the impact of freight and service vehicles on air quality.

Supporting the uptake of low emission vehicles and delivering a switch to electric vehicles

A key priority for the Mayor is promoting a switch to electric vehicles; the Electric Vehicle Delivery Plan will deliver benefits for air quality as well as CO_2, with 1,000 electric vehicles introduced into the GLA fleet. A key part of the Delivery Plan is building a network of charging points and associated infrastructure throughout London, in partnership with London boroughs and the private sector.

The Mayor has set a target of 25,000 charging points across London by 2015. London has so far secured £17million of funding to deliver this, made up of £9million from the Government and £8million from the private sector and boroughs. An additional £6m will be provided by TfL, taking the total investment in the programme to £23million. This will deliver a network of around 7,500 charging points by spring 2013. This is expected to be made up of 6,000 points at work places, 500 on-street, 330 in public car parks, 50 at Tube stations, 140 in supermarket car park and 120 for car clubs. The Mayor aims to have 100,000 electric vehicles in use in the capital by 2020 or earlier if possible. More needs to be done, however, and London will work towards an aspiration of zero tailpipe exhaust emissions.

The Mayor has recently announced plans to create a 'Hydrogen network' in London by 2012. This aims to encourage a minimum of 150 hydrogen-powered vehicles on the roads by 2012, including 50 to be operated by the GLA Group. Since these vehicles will have zero emissions, this will result in benefits for London's air quality. The Mayor and the London Hydrogen Partnership are also working with BAA on ways to use hydrogen and fuel cell technologies at Heathrow Airport.

Action will be needed beyond London. The Mayor will encourage the Government to promote changes to the Vehicle Excise Duty (VED) regime to incentivise further the use of lower emission private vehicles and the reduction in local pollutant emissions including PM_{10} as well as CO_2.

Scrapping or retrofitting older, more-polluting vehicles

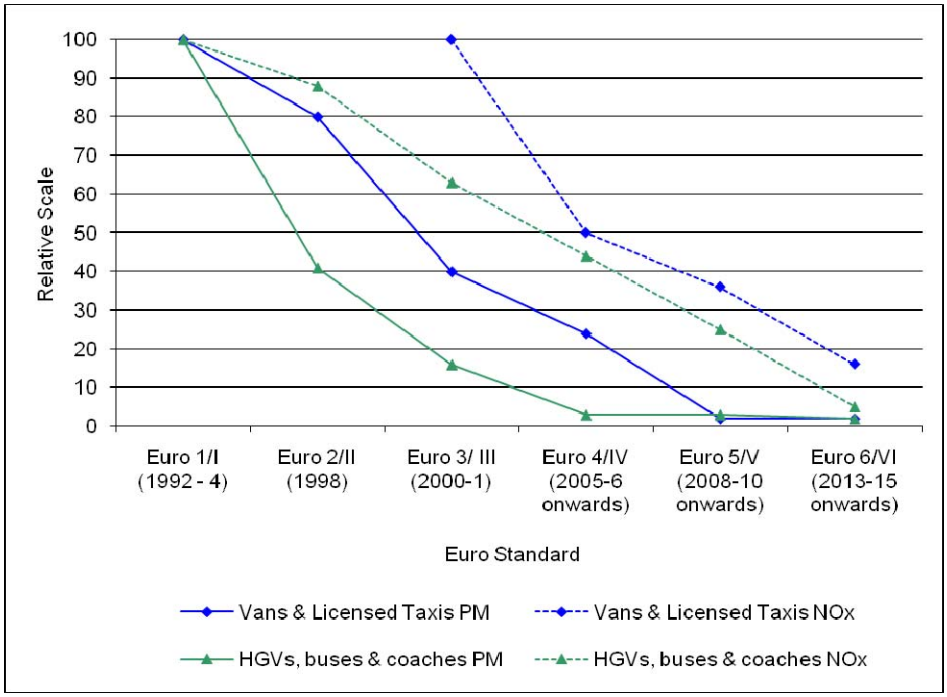
In 2009, the UK Government introduced a vehicle scrappage scheme to stimulate the national car market. The Mayor welcomed the announcement by the Government to extend the scheme, so that a further 100,000 vehicles could be updated. However, the scheme began winding down at the end of February 2010. The Mayor believes that the Government needs to do more. The introduction of further such schemes would help to achieve the objectives laid out in this Strategy and bring about a cleaner fleet in London.

The Mayor will continue to press for further scrappage schemes, including schemes that will have particular benefits for London, for example covering vehicles, such as taxis and, in the longer-term, future schemes to encourage the uptake of electric cars, vans and HGVs.

Improving the emissions from all vehicles through new technologies

Euro standards play an important role in driving improved performance on emissions (see Figure 3.2). They ensure that natural fleet replacement results in significant reductions in pollutant emissions. They are also used by policymakers to specify requirements within different policies and schemes. Their ongoing development is therefore important, with a focus on ensuring they are as effective as possible in delivering the benefits in reduced emissions that they have been designed to achieve, particularly when combined with abatement technologies. The Mayor will encourage the UK Government and the European Commission to ensure that future Euro standards continue to deliver improvements in air quality in London. The Mayor will all also seek to make the case for improvements to the enforcement processes for Euro standards; for example, the testing of Euro standards and vehicle approval processes could better reflect the actual on-road emissions of vehicles, as opposed to the figures obtained in laboratory conditions.

Figure 3. 2 Relative Scale of European Emissions Standard for PM_{10} and NO_x for Licensed Taxis, LGVs, HGVs, Buses and Coaches



There are currently no regulations to address tyre and brake wear in the same way that exhaust emissions are regulated by Euro standards. Consequently, the Mayor will encourage the European Commission and central Government to provide incentives to vehicle manufacturers to develop new technologies to improve brake and tyre wear; and to introduce new standards on non-exhaust PM_{10} emissions from brake and tyre systems.

Policy 3 – Identifying priority locations and improving air quality through a package of local measures

Vision

Better air quality in the areas which currently have the highest concentrations of air quality pollutants and which are most at risk of not meeting the EU limit values.

Policy

The Mayor, through TfL and working with the boroughs, will introduce targeted local measures to improve air quality at locations with high air pollution concentrations.

Proposals

Priority locations

- The Mayor will take targeted action at those locations most at risk of exceeding EU limit values to reduce emissions and exposure to high concentrations of air pollutants. These will be the 'priority locations'.

- Through TfL, the Mayor will work with boroughs to identify other locations that have poor air quality (but are not at risk of exceeding EU limit values) which would benefit from targeted action. Boroughs will be encouraged to include proposals to improve air quality in their Local implementation Plans and other relevant programmes.

Major transport interchanges

- The Mayor will encourage boroughs and other delivery agents, including Network Rail and airport operators, to put in place measures to tackle poor local air quality associated with road use at major transport interchanges.

- The Mayor will work with airport operators, London boroughs and central Government to further mitigate the air quality impacts of existing operations at airports.

- As set out in his draft Transport Strategy, the Mayor will oppose additional runway capacity at Heathrow airport.

Outputs

The transport measures outlined in this Strategy will reduce emissions and concentrations across London, including at priority locations. The proposed local measures will deliver important reductions in emissions at the locations where levels of exposure are particularly

high.

Based on evidence from other cities, a reduction of up to 2.5µg/m^3 at the priority locations can be reasonably expected – equivalent to reductions of between ten and 20 per cent in concentrations. Nevertheless, in order that a cautious and realistic assessment is given, it has been assumed that only half of the exceedence days that modelling suggests could be achieved by these measures will actually be avoided. This would translate into a reduction in daily exceedences at the priority locations of around six days. This is significant in the context of meeting the EU limit values, where in 2009 only a small number of days needed to be removed for the Marylebone Road priority location to meet the EU limit values for PM_{10} (see also box 8).

Why we need change

Priority locations

As set out in Chapter 2, analysis has identified specific points at seven sites which are most at risk of exceeding the EU limit value in 2011:

- Marylebone Road
- Euston Road
- Marble Arch
- Hyde Park Corner
- Victoria Embankment
- Upper Thames Street
- Tower Hill

At some of the sites, the exceedence areas are small – for example, small sections of pavement near a junction – yet the cause is a complicated mix of factors including the make-up of the vehicle fleet going through the priority location, traffic speed, local geography and other issues affecting a much broader area. This is reflected in the approach adopted in this Strategy where interventions will be focused on three

interconnected corridors that include the specific locations at most risk of not meeting the extended 2011 deadline for EU limit values for PM_{10}. These are:

- Marylebone Road and Euston Road
- Victoria Embankment through Upper Thames Street to Tower Hill
- Marble Arch to Hyde Park Corner

As localised air quality varies depending on local circumstances, these priority locations will be kept under review and additional locations could be included in the scope of local measures if needed to ensure compliance with the EU limit values by 2011.
It should also be noted that there are other locations in Greater London which have comparatively poor air quality in respect of both PM_{10} and NO_2 concentrations though they are not at risk of exceeding the EU limit values. It will be important that boroughs undertake action to improve air quality at priority sites that they have identified through their local monitoring. Through TfL, the Mayor will work with the boroughs to identify these additional locations and boroughs are encouraged to include proposals to improve air quality in their Local Implementation Plans and other relevant programmes.

What needs to be done

Priority locations

Experience from around the world shows that there is a range of effective measures that can be implemented on a local basis to improve air quality.

PM_{10}

To complement the London wide measures included in this Strategy, the Mayor will apply targeted local measures to help London meet the EU limit values for PM_{10} as soon as possible. Examples of the local measures the Mayor intends to use are listed in Box 9.

Targeted local measures are a pragmatic step allowing the areas with highest concentrations to be tackled swiftly in parallel with London-wide measures. Many of the proposed local measures could be commenced before the end of 2010.

Since the launch of the Assembly and Functional Bodies draft of the Air Quality Strategy, TfL has enhanced its understanding of the priority locations. Rather than as individual locations (or 'hotspots') these need to be understood in their broader context, as part of

the road network. For this reason the 'hotspots' have been amalgamated into the three road corridors identified above and are referred to in this Strategy as 'priority locations'.

TfL has developed a profile for each priority location, reflecting the composition of the traffic mix, flows of traffic, road layout and other local factors. This understanding has enabled TfL to develop a package of measures which can be deployed at the priority locations. This includes power washing roads and applying dust suppressants, focusing the cleanest buses on routes passing through the priority locations and better enforcement of existing no-idling and no-stopping rules (see box 9). Further improvements can be achieved by incorporating air quality measures into planned urban realm improvements and using scheduled refurbishment of the road surface to trial new surfaces. These measures will also deliver improvements for noise and CO_2 emission reductions.

Subject to funding being available, TfL is ready to implement a programme of local measures at the priority locations from 2010. These local measures will also help improve the urban realm and quality of life and therefore support the delivery of a green London for the 2012 Olympic and Paralympics Games.

NO_2

While local measures are most effective in reducing local PM_{10} concentrations, they will also assist in reducing concentrations of NO_2. TfL analysis shows that annual mean concentrations of NO_2 will still exceed the limit value by 2015 across less than 5 per cent of London, including 45 to 65 per cent of roads, unless further action is taken. The predicted exceedence areas are shown in Chapter 2, and are predominantly focused in central London and in the vicinity of Heathrow Airport. The modelling studies also indicate that the one-hour mean limit value for nitrogen dioxide may also be exceeded close to a number of major roads in London.

Given the large parts of London which are currently expected to exceed the limit value for NO_2 and as boroughs retain their own air quality responsibilities, it is appropriate for the boroughs to play a major role in developing solutions to reduce NO_2 concentrations. The Mayor will support these actions through TfL, which will develop a toolkit of potential transport measures and share other best practice. Boroughs will be encouraged to include proposals to improve air quality in their Local implementation Plans and other relevant programmes.

In developing local measures for NO_2, it is important to understand the different nature of the NO_2 and PM_{10} challenges that London faces. Whereas PM_{10} reduction measures need to target daily mean exceedences, the priority for NO_2 is the annual mean. Any local measures for NO_2 would, therefore, need to be more permanent changes (rather than temporary measures) aimed at reducing overall levels of traffic. Another important distinction is that exceedences of the annual mean NO_2 limit value extend over a very wide area of London. Particular care will need to be taken to ensure that local traffic management measures do not simply divert the problems elsewhere.

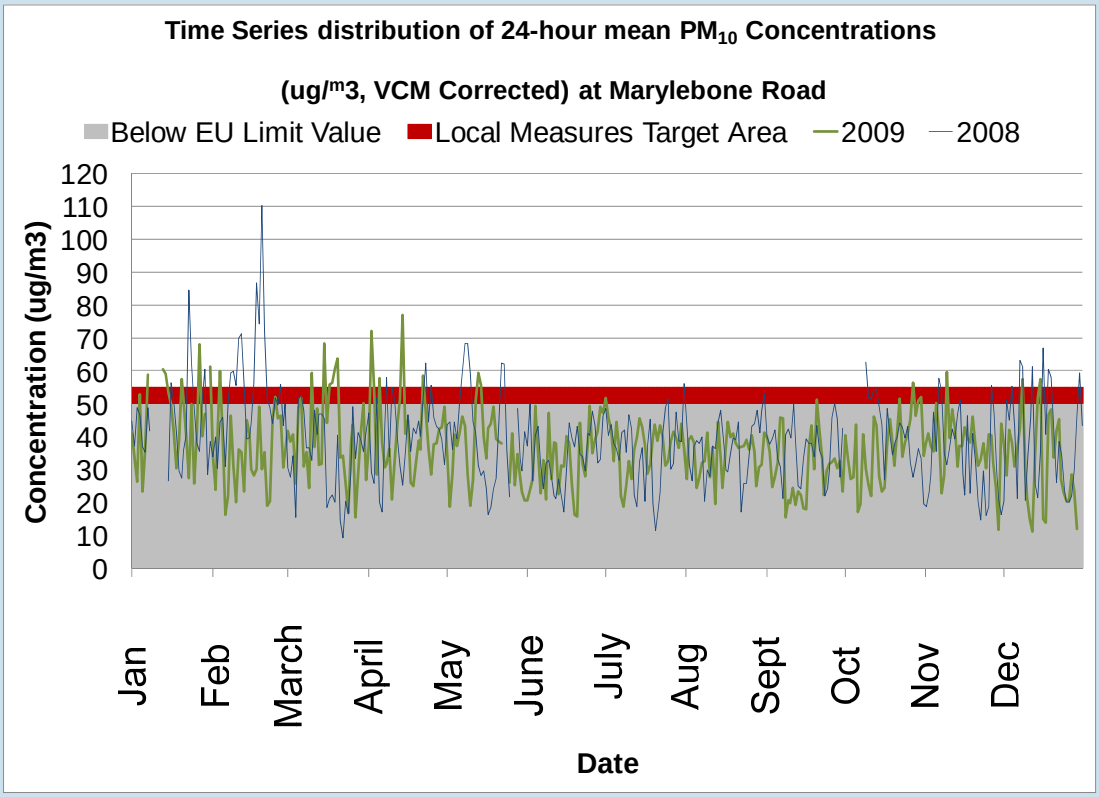
Major transport interchanges

Some major transport facilities such as train stations and airports have poor air quality caused in large part by associated local road traffic (e.g. taxis) TfL will work with the Government and delivery agents, such as Network Rail and airport operators, to explore measures to address local air quality problems at these locations. Airports are a particular concern; this is addressed below (see boxes 10 and 11).

The Western Extension Zone of the Congestion Charging Scheme

The Mayor is minded to remove the Western Extension Zone of the Congestion Charging Scheme. This is subject to public and stakeholder consultation on a Variation Order and further information will be provided at that stage. However, any impacts on air quality are expected to be slight. Any possible increases in air quality pollutant emissions arising from additional traffic would be mitigated by a number of other measures set out in this Strategy.

Box 8: What can local measures do?



Note: Readings in the grey area are within the EU limit value, anything outside it are exceedences (some of which last for more than one day). The red band indicates the exceedences that need to be eliminated for the EU limit value to be met. This graph does not represent expected conditions in 2011.

Around 40 per cent of central London's PM_{10} concentrations come from outside of London, but this varies day-to-day. On some days the contribution from external sources alone is greater than the daily mean EU limit value. Clearly, in these circumstances London-based measures will not prevent exceedences of the limit values in Greater London.

However, there are other days where a location only just exceeds the EU limit value (shown by the red band). In these circumstances a reduction in local emissions or concentrations (for example, by preventing re suspension) will help achieve compliance

The number of exceedences that would have needed to have been removed at Marylebone Road in 2008 in order for that location to have met the EU limit value has been calculated. This is shown in the graph above where the red band indicates the exceedences that would have needed to have been eliminated for the limit value to be met.

An estimated reduction in PM_{10} concentrations of up to 10-20 per cent within the priority locations on days with higher concentrations can be achieved by a package of local measures set out in Box 9, based on studies undertaken across many European and other cities. For example, studies show that the application of a dust suppressant (15 per cent solution of magnesium chloride) on a highway in Trondheim, Norway, resulted in an average reduction in PM_{10} levels of 17 per cent. In the Strømsås road tunnel in Drammen, Norway, the application of magnesium chloride reduced the concentration of PM_{10} by 56 per cent.

Box 9: PM_{10} local measures in practice

TfL commissioned a detailed study of measures to address concentrations at priority locations based on international best practice. A number of potential measures have been identified and are set out below. These can be deployed as necessary and appropriate, subject to funding becoming available. In some instances further scoping work is required to determine the precise format and application of these measures. Given the complexities in balancing the competing demands on the road network, it may be necessary to pilot some of these measures in order to understand their broader effects.

Power washing road surfaces and applying dust suppressants

Power-washing of road surfaces at the priority locations followed by application of dust suppressants can be applied as required to reduce surface particulate matter and re suspension (particles being blown back into the atmosphere). Evidence from studies suggests that applying these measures regularly in targeted areas can have a beneficial impact, reducing PM_{10} concentrations by as much as 20 per cent or more.

Construction site vehicle cleaning; reduced stacking of construction delivery vehicles to reduce idling

The GLA will work with boroughs to improve the enforcement of construction and demolition Best Practice Guidance for construction sites close to the priority locations. This could include ensuring vehicles working on and travelling to/from construction sites are properly cleaned before leaving the construction site. This will prevent dust leaving the site on vehicles and later becoming re suspended. The GLA and boroughs will encourage developers to improve planning for construction-related deliveries and waste removal to prevent stacking of vehicles and associated idling.

Deployment of lower emission buses

TfL will work with bus operators to focus the use of lower emission buses in the fleet on routes which travel through the priority locations.

Incentives for lower emission taxis

TfL is working with the taxi industry to investigate options to encourage the use of lower emission taxis around priority locations.

No-idling enforcement

TfL will work with boroughs to improve enforcement against idling vehicles (particularly coaches, taxis and delivery vehicles) in and around the priority locations. TfL buses are already contractually obliged not to idle while at bus stands and this will be enforced.

Regular weekend closures to promote walking and cycling (see also Policy 6)

A programme of regular planned weekend closures may be introduced on the Victoria Embankment. This would require consultation with boroughs and other stakeholders before being implemented. Similar measures will be considered at other priority locations as part of the broader TfL policy to promote walking and cycling.

Speed over distance cameras at Park Lane and Victoria Embankment

TfL will investigate introducing speed over distance cameras along Park Lane and Victoria Embankment to smooth traffic flow, reducing air pollutant exhaust emissions and tyre and brake wear.

Investigate potential to change speed limit along Park Lane to 30mph

TfL will investigate the potential to reduce the speed limit along Park Lane to 30mph. This would reduce the range of acceleration/deceleration patterns. This will have a positive impact on reducing air pollutant exhaust emissions and tyre and brake wear.

Better enforcement of no-stopping on the Transport for London Road Network (TLRN)

To ensure as smooth a flow of traffic as possible through the priority locations TfL will work with identified persistent offenders who regularly stop for long periods of time on the TLRN.

Changes to signal timings

All traffic light signals within the priority locations already operate under the Urban Traffic Control (UTC) system using Split-Cycle Off-set Optimisation Technique (SCOOT). This enables the flow of traffic to be optimised against given parameters (e.g. 'stops and delay' or emissions) or to be managed tactically to relocate queues. TfL will undertake an area specific trial initially through modelling simulation to see if/how SCOOT can be adjusted to optimise for emission reductions in London's unique urban conditions while continuting to keep trafffic moving effectively. If the modelling work is positive, this could then be followed by a street trial, which if successful could lead to further roll-out. This would need to be considered against the Mayor's broader duty to balance competing demands on the road network. Evidence from a similar trial in Leicester suggests that PM_{10} exhaust emissions can be reduced by changes to signal timings using SCOOT.

Preventing vehicles from turning across traffic

TfL will review opportunities to prevent vehicles from turning across traffic at the priority locations. This would improve the flow of traffic with consequential benefits for air quality.

Capture benefits of new powers to manage road works

As set out under Policy 2, the Mayor has proposed introducing a permit and lane rental scheme for road works enforced by penalty charge notices coupled with improved information systems. This would result in improved co-ordination and raise awareness about planned roadworks, allowing the travelling public to make alternative arrangements at the times affected. This would also result in better planning of road space use during road works and reduce the effects of the works on traffic flows, reducing overall emissions of air pollutants.

Integrating air quality improvements in planned urban realm schemes

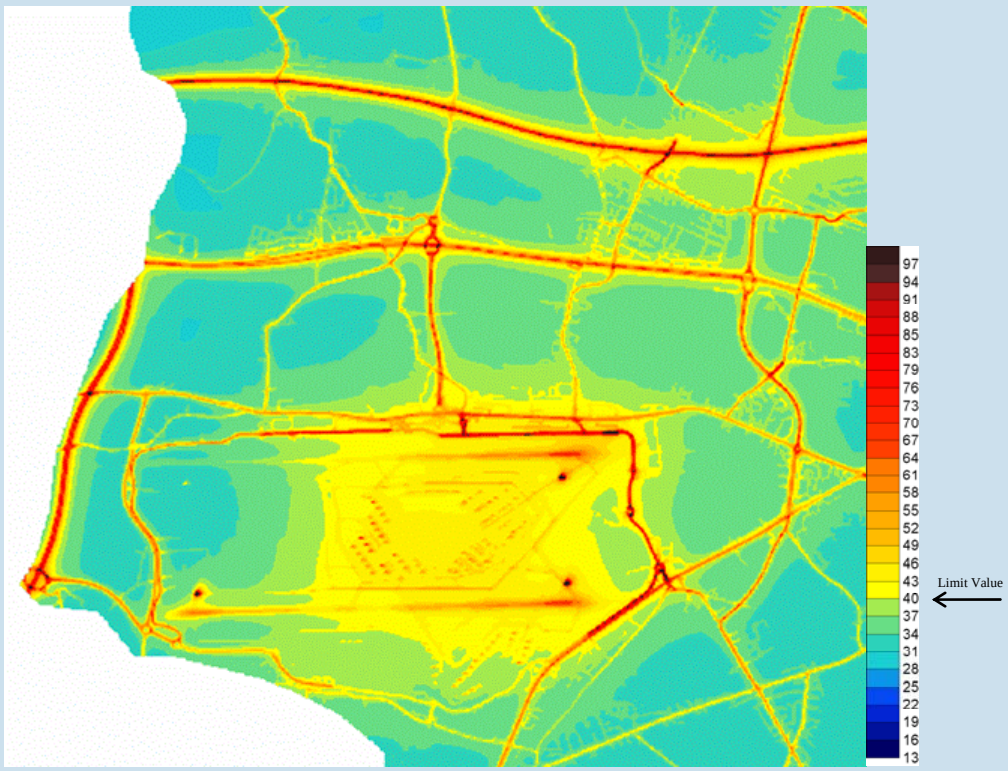
Air quality concentration reductions and measures to reduce exposure can be delivered through existing public realm improvement schemes. One example is the Euston Circus scheme, which is focused on improving conditions for pedestrians at the junction of Tottenham Court Road and Euston Road. The scheme presents a number of opportunities to reduce air pollutant emissions through improved traffic management.

Trial of green walls, green screens and low barriers

TfL is in the process of identifying suitable locations to trial green walls, green screens and low barriers. Evidence from other countries suggests that at a local level, these can reduce concentrations by around ten per cent. If a trial is successful, a further roll out will be considered.

Box 10: Ground based aviation, airport operations, and surface access at Heathrow airport

NO_2 concentrations are a cause for concern at and around Heathrow Airport. Ground-level aircraft operations emit large amounts of NO_x, as do landside vehicles. Non-airport sources, mainly road traffic on the M25 and M4, also contribute to air quality problems. This is shown below:



Annual mean NO_2 concentrations at Heathrow Airport (2008)

Heathrow has not yet reached its authorised capacity, currently serving 63 million passengers per annum (mppa). This is predicted to rise to 80mppa by 2015 when Terminal 5 becomes fully operational. This could have a significant adverse impact on local NOx emissions and concentrations of NO_2. Were permission to be granted for a third runway, this could have further detrimental impacts on air quality in the surrounding area.

Reducing emissions from aircraft

The Committee on Aviation Environmental Protection (CAEP) encourages reductions in aircraft emissions by specifying that engines must be manufactured to meet set emission standards. To encourage the use of aircraft with the lowest NO_x emissions, BAA has introduced a NO_x factor to their landing charges, which varies for each aircraft according to its level of emissions. The Mayor considers that further measures are required to encourage the use of cleaner aircraft and will engage with BAA, central Government and the aviation industry to push for this.

Reducing emissions from airport operations

BAA has made good progress in reducing emissions from on-site operations at Heathrow. Measures implemented include using more fixed electrical ground power and 'pre-conditioned air' so that auxiliary generators, which can emit high levels of PM_{10} and NOx, are not needed. BAA runs the Cleaner Vehicles Programme (CVP), a voluntary scheme, to incentivise companies to reduce emissions from their fleets. The proportion of vehicles in BAA's airside fleet that are new, or run on alternative fuels, is also being increased. Vehicles that operate at Heathrow must have a Vehicle Apron Pass from BAA, with criteria used to ensure that only the least polluting vehicles are allowed to operate. Even though vehicles operating on private land are not subject to the Low Emission Zone BAA Heathrow is working towards all of its vehicles meeting LEZ standards with only a few exceptions.

The Mayor will encourage BAA to continue implementing these and other measures to reduce the adverse impact of their operations on local air quality at Heathrow Airport.

Reducing emissions from surface access

BAA supports a reduction in the use of private vehicles to get to and from Heathrow, providing funding for public transport provision including the Heathrow Express railway, Crossrail and free bus travel around the airport via a grant to TfL. Heathrow has proposed Airtrack, an additional rail service to access the airport. While these types of measures are positive steps and the overall proportion of public transport trips to the airport is growing, the overall increase in travel expected to Heathrow means there will still be an extra three million trips per year to Heathrow by private car in the time period 2010 to 2015 with knock-on adverse effects on air quality. For this reason the Mayor is proposing additional measures to promote the use of public and other sustainable transport to gain access to the airport as well as to reduce local NO_2 concentrations through targeted local action where possible.

Box 11: Working with London City Airport

The Mayor is aware that local air quality is an issue of concern for residents within the vicinity of London City Airport, especially given the recently granted permission for the expansion in the number of flights from the airport. The material submitted by London City Airport and considered by the Mayor as part of his decision included an air quality assessment. The Mayor was aware that the proposed expansion of the airport raised a number of complex issues, in particular the need to balance environmental effects with the need to support economic growth and regeneration in one of the most deprived areas of London. The Mayor has written to the London Borough of Newham urging it to establish robust environmental controls and to guarantee that sufficient resources and enforcement mechanisms are put in place to protect air quality around the airport. The Mayor remains committed to working with the London Borough of Newham and London City Airport to ensure that local air quality does not deteriorate as a result of the airport expansion.

Policy 4 – Reducing emissions from particular sources in the public transport and public sector fleets

Vision

Improved air quality through a cleaner, greener transport system in London, including a new greener bus for London and lower emission taxis.

Policy

The Mayor, through TfL and working with central Government, boroughs and transport operators, will minimise the air pollution from London's transport system.

Proposals

Buses

- The Mayor will progress his commitment to introduce new hybrid buses into the fleet between now and 2012. From 2012, all new buses will be hybrid.

- The Mayor will introduce the 'new bus for London' which is expected to be hybrid and will deliver significant improvements in the reduction of climate change and air quality pollutant emissions. The new bus will incorporate the latest hybrid technology and will be both 40 per cent more fuel efficient than conventional diesel buses and 15 per cent more fuel efficient than current London hybrid buses.

- The Mayor will ensure that, subject to Government support, by 2015 all buses in London meet the Euro IV standard for NOx, through the specification of new buses and retrofitting of older buses.

- The Mayor will implement the London Hydrogen Transport Plan, which will include five hydrogen fuel cell hybrid buses joining the fleet in 2010, with EU funding for a further three buses being pursued.

Taxis

- The Mayor will seek ways to accelerate the take up of cleaner, new vehicles into the taxi fleet including introducing age-based limits for taxis. It is proposed that from 2012 no licence will be issued for a taxi over 15 years old. From 2015 it is proposed that this age limit will tighten to ten years.

- The Mayor will introduce a requirement for all new taxis entering the fleet to meet a minimum Euro 5 standard from 2012.

- The Mayor will encourage central Government and industry to develop approaches that would mitigate as far as possible any costs of these measures, for example through extensions to the Government's vehicle scrappage scheme.

- The Mayor will work with the taxi manufacturing industry to develop an affordable zero-emission taxi such that all new taxis entering the fleet are zero emission by 2020 and 60 per cent more fuel efficient than today by 2015.

- The Mayor, through TfL and working with the taxi industry and boroughs, will reduce idling and empty running by exploring the potential for additional taxi ranks and suspension of stopping and waiting restrictions where appropriate. The Mayor will also support the development of new technologies which encourage taxi sharing and enable electronic hailing.

- The Mayor, through TfL, will work with the taxi industry to introduce eco-driving training from 2012 to promote efficient driving techniques to reduce emissions.

Private Hire Vehicles (PHVs)

- The Mayor will introduce into the licensing regime age-based limits for PHVs. A ten year rolling age limit will be applied for vehicles being re-licensed from 2012 onwards.

- The Mayor will introduce a requirement for all new PHVs entering the fleet to meet a minimum Euro 4 standard from 2012.

- The Mayor, through TfL, will work with the PHV industry to introduce eco-driving training from 2012 to promote efficient driving techniques to reduce emissions.

- The Mayor, through TfL, will seek to provide incentives for the use of low-emission vehicles through variable or reduced licence fees.

- The Mayor will work with vehicle manufacturers to develop zero-emission vehicles that will be suitable as PHVs by 2020.

Rail

- The Mayor will ensure new diesel rolling stock for London Overground meets the latest European standards on emissions.

- The Mayor, working with central Government, Network Rail and the rail industry, will

support the electrification of the whole national rail network in London.

River

- The Mayor, working with river-based transport providers, will encourage the use of ultra-low sulphur diesel and other clean fuel technologies on passenger river services.

GLA, borough and public sector fleets

- The Mayor, through the functional bodies, and working in partnership with central Government, boroughs and other public sector bodies, will develop a 'low emissions strategy' for all of London's public sector vehicles with the objective of achieving zero tailpipe emissions.

- As part of the 'low emissions strategy' the Mayor will develop minimum emissions requirements for GLA and functional body fleet vehicles to reduce their environmental impact, subject to meeting operational requirements and obtaining value for money for London's taxpayers.

- The Mayor will work with boroughs and other public sector bodies to promote the adoption of similar minimum emissions standards for their vehicle fleets.

Outputs

The measures laid out in this section will reduce emissions from the public transport fleet in London. TfL estimates that achieving the Euro IV standard for NO_x across the entire bus fleet by 2015 will save around 650 tonnes of NO_x across London.

Age limits for taxis would provide environmental, safety and passenger amenity benefits. Around 1,200 black cabs are likely to be more than 15 years old in 2012. A new taxi in 2012 will emit less than a quarter of the amount of PM_{10} of a vehicle more than 15 years old. Introducing age limits will save eight tonnes of PM_{10} in 2012, increasing to 13 tonnes in 2015 and will deliver particular benefits in central London where taxis account for a significant percentage of PM_{10} emissions.

The impact of measures associated with rail and river transport are not yet quantified.

While it is not possible at this stage to quantify the impact of measures to promote cleaner public sector vehicle fleets, it is important that such organisations set a clear example and adopt best practice.

Why we need change

Emissions from the public transport fleet have reduced significantly over the past ten years. London Underground trains run on electricity, resulting in no direct emissions, and air quality is monitored to ensure that staff and the travelling public are not exposed to harmful levels of dust. All London Overground trains (which are under TfL contract management), except for the Gospel Oak – Barking line, are electric and do not emit air pollutants. For the Gospel Oak – Barking line, new diesel trains are currently on order which will meet the latest European standards; a significant improvement compared to the current rolling stock.

Buses have also achieved dramatic improvements with respect to emissions, particularly in relation to PM_{10} emissions, with reductions of 90 per cent (from the start of the bus retrofit programme in the late 1990s until its completion in 2003/04). However, buses (and coaches) continue to account for around 25 per cent of all NO_x emissions within central London and around ten per cent across Greater London as a whole. With approximately 8,300 buses in operation there is significant potential to reduce NO_x emissions by targeting a relatively small number of vehicles.

Despite the success of the Taxi Emission Strategy in ensuring that taxis are equivalent to Euro 3 for PM and NO_x, taxis continue to be responsible for approximately 20 per cent of transport PM_{10} exhaust emissions within central London. It is therefore important to make further improvements to the taxi fleet. Experience suggests that PM abatement equipment is not always effective on the oldest taxis. As with buses, important benefits can be delivered by targeting action on a relatively small number of the worst polluting vehicles. The Mayor is also proposing a requirement that from 2012 all newly-registered taxis must meet the Euro 5 standard and the proposed age limit.

Given that the Mayor expects others to take action to improve their emissions it is important that he takes a lead in promoting best practice by reducing the emissions from vehicles more directly under his control or influence. More widely, the public sector and transport operators share a broader responsibility to demonstrate best practice. Consequently further action must be taken to ensure that the public transport fleet is as green as possible.

What needs to be done

By improving emissions from buses, taxis, PHVs and the GLA and boroughs' own vehicle fleets, overall levels of emissions, particularly of PM and NO_x, can be reduced. To do this it will be necessary to introduce new requirements for the vehicles used as buses, taxis and PHVs and to promote new technologies which will help achieve long-term improvements in air quality.

Buses

For buses, significant action is already underway with the introduction of hybrid buses to the fleet and the commitment that, from 2012, all new buses will be hybrids, which reduces their emissions of air quality pollutants. The new bus for London is also expected to be hybrid. Beyond this, TfL will require all buses to meet the Euro IV standard for NO_x by 2015. This will involve the retrofitting of approximately 2,800 buses. In addition, the Mayor will continue exploring the potential of new technologies, such as hydrogen, which may deliver further emissions improvements and other benefits.

Through the London Hydrogen Transport Plan, five hydrogen fuel cell hybrid buses will join the London buses fleet in 2010, with EU funding for a further three buses being actively pursued. These buses will emit nothing but water vapour from their exhausts. It is also expected that London's first hydrogen refuelling facility will be available from 2010.

Taxis and PHVs

TfL, working with the industry and stakeholders, will develop a detailed plan for reducing emissions from taxis and PHVs in the course of 2010, which will set out more detailed actions, timescales and costs and an implementation plan to 2020. This is already underway, including extensive discussions with drivers, trade bodies and manufacturers. This approach will reflect changes taking place in the taxi industry, for example, increasing use of leasing arrangements. In the meantime, a number of measures are being proposed to take early action to address and reduce these emissions.

To further promote the use of newer, cleaner taxis, the Mayor will use the licensing regime to remove the oldest vehicles from the fleet. The Mayor will introduce age-based limits for taxis and PHVs. From 2012 a rolling fifteen year age limit will be set for taxis so that no taxis over fifteen years old could be licensed to operate in London unless by a special exemption. From 2015, it has been proposed that this would tighten to ten years. For PHVs, a ten year rolling age limit will be introduced from 2012. This reflects the differential values of the vehicles used for private hire and taxis and the broader structures

and licensing requirements of the two industries. As part of the ongoing discussion on these proposals, possible incentives to reward lower-emission taxis are being explored.

The Mayor strongly believes that London's famous taxi trade can and should lead the world in moving towards a zero emission future. He will work with the trade and manufacturers to create a viable road map to this end. The taxi must be affordable for drivers and enhance the passenger experience. The aim is to produce a taxi which has 60 per cent lower fuel consumption by 2015 (based on current levels) and zero tail pipe emissions by 2020, which will deliver significant air quality benefits. The Mayor will also work with the vehicle manufacturing industry to develop zero emitting vehicles that are suitable as PHVs by 2020. The Mayor and TfL will assist the industry in identifying funding opportunities to help cover the costs of development from EU, central Government, industry investment and sponsorship sources. As part of this, the GLA is working with partners to deliver 20 fuel cell taxis on London's streets by 2012. To promote the use of cleaner taxis, the Mayor will provide information on the air quality emissions from taxis, potentially through a symbol or colour code.

For PHVs, the licensing regime will be amended to incentivise the use of lower emissions vehicles. Further steps will be taken to promote the use of the cleanest vehicles, potentially by branding these vehicles and giving their operators additional benefits.

For both taxis and PHVs, the Mayor will seek to eliminate situations where drivers are effectively forced to keep engines running – for example at taxi ranks at stations. A number of boroughs have indicated that they would be supportive of this approach if it would reduce the amount of empty running by taxis and private hire vehicles and that they may be able to provide additional space for taxi ranks and private hire stands, especially at stations.

Given the large number of kilometres driven by taxi and private hire vehicle drivers there are particular benefits to be had from optimising driving style and the way a vehicle is generally operated. For this reason the Mayor will introduce eco-driving training for taxi and private hire vehicle drivers. This can also deliver very significant fuel can costs savings to drivers, with no expense to them.

The Mayor will work with the industry to mitigate any potential negative economic impacts of these measures as far as possible; for example, by pressing central Government to extend the size and scope of the vehicle scrappage scheme to include taxis and PHVs.

It should also be noted that there are considerable potential savings in terms of reduced fuel and running costs which will benefit taxi drivers adopting newer, cleaner taxis, financially.

There are also opportunities to work with organisations such as the Olympic Delivery Authority and the London Organising Committee for the Olympic Games to ensure that the transport vehicles used in the Games are fuel efficient. The GLA is already in active discussions with both organisations to ensure that the cleanest possible vehicles are used in the over 4,000 strong vehicle automotive sponsor fleet and the similarly sized fixed support fleet.

Further measures to promote the use of the cleanest taxis are considered as part of the local measures set out under Policy 3.

London Underground

TfL monitors air quality in tunnels and stations to ensure that staff and the travelling public are not exposed to harmful levels of particulates (mainly dust) and other air pollutants. Particulate levels are well below the Workplace Exposure Limit set by the Health and Safety Executive. Measures taken to reduce particulate generation include regular cleaning of trains and tunnels to prevent dust build-up, and fitting improved braking systems on rolling stock.

River

River transportation is an often-overlooked source of emissions. The Mayor will work with river-based transport providers to encourage the use of ultra-low sulphur diesel and cleaner technologies on passenger river services.

Rail

Approximately 150km of railway track in London remains unelectrified. Detailed proposals for upgrading the Gospel Oak to Barking line, which travels through many deprived parts of inner London, are contained with the Electrification Route Utilisation Strategy prepared by Network Rail. The Mayor strongly advises the Government to fund this as part of the High Level output Specification 2 (HLOS2) process. In addition, Network Rail should draw up detailed proposals for the electrification of the Chiltern Line, the Dudding Hill line and various short routes in the Acton/ Kew area.

GLA, borough and public sector fleets

The Mayor will work with the GLA group and boroughs to facilitate the adoption of best practice and cleaner vehicles. This will include exploring opportunities to promote best practice more widely through procurement and the combined purchasing power of the public sector. Recognising that he must set an example, the Mayor will specify ambitious green standards for GLA group fleets. The first step in this direction is the already-initiated procurement framework for zero emission vehicles for the GLA Group. This has been specifically designed to be used by other public sector bodies in London, including London boroughs. A number of boroughs have already expressed interest in taking part ion this framework.

Policy 5 – Emissions control schemes

Vision

Improved air quality by discouraging the most polluting vehicles from driving within London along with incentives to adopt the cleanest vehicles.

Policy

The Mayor, through TfL, will continue to operate the London Low Emission Zone for HGVs, buses and coaches and will tighten the standards to include NO_x - subject to technical feasibility and central Government support. The Mayor will introduce emissions standards for PM for heavier LGVs and minibuses in 2012. From 2012, a tougher standard for PM for HGVs, buses and coaches will be included with the London Low Emission Zone.

Proposals

- Phases 1 and 2 of the Low Emission Zone will continue to operate to reduce emissions from the heaviest vehicles. The implementation of the next phase of the scheme in 2012, introducing a further tightening of emission standards (to Euro IV for PM) for HGVs, buses and coaches, will deliver benefits for air quality.

- The Mayor will include heavier LGVs and minibuses in the Low Emission Zone from an appropriate point in 2012.

- In 2015, the Mayor will, subject to central Government support in establishing a suitable certification and testing regime and subject to Government funding, introduce an emissions standard for NO_x (Euro IV across London) into the Low Emission Zone for HGVs, buses and coaches.

- The Mayor will support boroughs that decide to take local action to address air quality through local low emission zones or similar measures.

- The Mayor encourages the Government to explore options for scrappage schemes focused on particular vehicle types or the provision of grants for the fitting of pollution abatement equipment to reduce compliance costs for operators.

Other steps to reduce freight emissions

- The Mayor, through TfL, will work with London Councils, the freight industry and other partners to explore ways of reducing emissions from freight. This could include

changes to the incentives in the London Lorry Control Scheme, further use of Delivery Service Plans and further promotion of the Freight Operator Recognition Scheme.

Outputs

The introduction of new LEZ standards for LGVs and minibuses in 2012 would reduce emissions of PM_{10} in 2011 by around 8 tonnes and emissions of NO_x by around 100 tonnes.

Tightening the standards of the London wide Low Emission Zone to include a NO_x Euro IV standard in 2015 for HGVs and coaches is expected to save around 380 tonnes of NO_x in that year. As highlighted in Policy 4, the retrofitting of buses to comply with this would save around 650 tonnes of NO_x. Significant earlier benefits are expected through pre-compliance.

Why we need change

Measures to promote behavioural change, technological improvements, localised action, and reduced emissions from the London transport system and public sector fleets will not be enough to meet EU limit values by themselves; so further action to reduce emissions from private vehicles is needed. Policy 2 set out a range of measures to promote a switch to cleaner vehicles but additional measures to discourage the use of the most polluting vehicles are needed.

Air quality will be improved through the continuing operation of the Low Emission Zone. From 2012, the next phase of the LEZ will require HGVs, buses and coaches to meet the Euro IV standard for PM to continue to drive within Greater London without charge. This will reduce PM emissions and NO_x emissions to a lesser extent. However, further reductions in NO_x emissions are needed across London, particularly from these heavy diesel vehicles which are responsible for a significant proportion of NO_x emissions in London (approximately 2,700 tonnes or 24 per cent).

What needs to be done

The proposed extension of the LEZ to heavier LGVs and minibuses from 2012 will reduce emissions of PM_{10} and NO_x including early benefits through pre-compliance. Phase 4 of the LEZ, which introduces a Euro IV standard for PM for buses, coaches and HGVs from 2012, will also result in significant benefits.

The Mayor will also introduce a London-wide standard (Euro IV) for NO_x emissions in 2015 for HGVs, buses and coaches to reduce emissions across Greater London. Critically, support from central Government is required in the form of a national certification and testing scheme for NO_x abatement equipment as well as funding to implement the scheme. To enable an operator to retrofit their vehicle to meet this standard, rather than purchase a newer vehicle, a certification scheme for NO_x abatement equipment is required. Without this certification scheme, which would be relatively simple to introduce and could be modelled on the existing scheme for PM abatement equipment, operators have no certainty that equipment they buy will be effective, and TfL, which operates the scheme, would have no easy way of establishing the acceptability of particular NO_x abatement equipment.

TfL will need to consult on a Variation Order to extend the Low Emission Zone for heavier LGVs and minibuses from 2012. A statutory consultation will also need to be conducted to include a standard for NO_x emissions for HGVs, buses and coaches from 2015. In order to minimise costs to business, the Mayor will announce proposed alterations to the existing Low Emission Zone as early as possible, to maximise compliance time. The Mayor will press the Government for funding to be made available to help small businesses meet emission standards through a scrappage scheme or similar grant scheme for abatement equipment. This will be important to minimise compliance costs for operators.

London boroughs may wish to explore establishing their own low emission zones in response to local circumstances. Where appropriate and consistent with Mayoral strategies, the Mayor will consider supporting these, for example through the Local Implementation Plan (LIP) process and other measures.

Reducing emissions of NO_x is a challenge for many other parts of the UK. In this context, to avoid confusion about standards, and to minimise compliance costs for operators, the Mayor will encourage the Government to introduce a common framework for LEZ schemes across the country. Such a common framework would need to take account of, and reflect, the approach within London in order to ensure that action already underway is not compromised. The Mayor strongly supports the recommendation of the House of Commons Environmental Audit Committee that central Government should complete research into the options for a national framework for LEZs as soon as possible and he is willing to assist the Government further in its considerations. The Mayor will also press the Government to take a major role in funding further LEZ schemes, including any in London.

Other steps to reduce freight emissions

Currently around 80 per cent of deliveries are made between 7am and 5pm. Promoting out-of-hours freight deliveries would contribute to less congestion and reduced emissions. Any move towards a greater proportion of out-of-hours freight deliveries would need to be balanced with maintaining quality of life for Londoners and keeping night-time noise in residential areas to a minimum.

The London Lorry Control Scheme (LLCS) has played an important role in delivering quieter streets at night since its introduction in 1985. At many sites in London planning conditions are also used to control night-time deliveries. Currently freight vehicles may have to make detours through London at night which can result in higher levels of emissions. Alternatively, freight vehicles will tend to deliver during the day peak period, when there is more congestion and air pollutant concentrations are higher.

There have been recent improvements in vehicle noise emissions from heavy vehicles and changes in working practices which are not reflected by the current LLCS arrangements. The Silent Approach trial at Sainsbury's Wandsworth superstore appears to have been successful, with no complaints about night-time noise. This suggests that it might be timely to revaluate how freight noise and emissions are tackled in London.

The Mayor is working with London Councils to explore options to identify types of vehicles (which meet 'green' standards) which, allied with best practice at the end delivery point, could qualify for specific exemptions from the London Lorry Control Scheme and normal planning restrictions on deliveries. This would ensure that the scheme continues to reduce night time noise but also plays a part in reducing emissions.

Box 12: Case Study: The Silent Trial Approach in Wandsworth

In 2007 Sainsbury's, the Noise Abatement Society and the London Borough of Wandsworth undertook a pilot to explore the feasibility of undertaking out of hours deliveries in London without disturbing local residents. Using a 'Silent Approach' based on a Freight Transport Association toolkit, it was agreed that night-time restrictions on vehicles delivering to Sainsbury's would be lifted between 1.30am and 3am.

During the trial, the London Borough of Wandsworth received no related complaints from local residents and Sainsbury's had positive feedback from customers in-store. There were also significant environmental benefits, with Sainsbury's calculating it used 25,000 less litres of fuel and saved 68 tonnes of CO_2 per year. On average, each journey from the depot (round trip) was reduced by 60 minutes.

The measures used during the trial included requiring all engines to be switched off when stationary, the use of dock curtains to 'seal' noise from inside the trailer, no loading of empty roll cages, rubber matting to be installed at appropriate locations to reduce the noise of roll cages and providing a telephone line for complaints to be evaluated and acted upon immediately.

Policy 6 – Action days and special measures

Vision

Putting in place a package of measures to reduce and manage air quality on exceedence days and changing the way people think about travelling in and experiencing their city

Policy

The Mayor, working with boroughs and other stakeholders, will develop a series of special measures focused on traffic management and information provision to reduce the number and impact of EU emission limit exceedence days if needed. In addition, a series of "action days" or other events will be designated to encourage people to walk and cycle by restricting vehicle access to parts of the city at certain times.

Proposals

- The Mayor will work with boroughs to put in place a package of special measures for the highest air pollution days to reduce exposure in particular areas of high air pollutant concentrations and also to reduce concentrations more widely if necessary. These will include traffic management measures and diversions. If necessary, they may also include wider measures to reduce traffic levels.

- The Mayor will encourage the Government and authorities outside London to reduce emissions that contribute to poor air quality in London.

- The Mayor will work with the freight industry and boroughs to encourage operators to sign up to airText and similar systems which will allow air quality to be considered in route planning.

- TfL will explore ways to provide better information about air quality in journey planning systems and travel information.

- The Mayor will promote a series of planned regular events focused on encouraging people to walk and cycle and improving the amenity of central and other parts of London

Outputs

Introducing measures to promote more active travel in particular locations or more widely across central London will help encourage longer term behavioural change and could

deliver broader benefits for quality of life. These initiatives will be linked to planning for the Olympics, cycling events or community activities.

Developing a package of special measures will be necessary in the short term to tackle exceedence episodes, ensure better management of them and enable people to make more informed choices about how and where they travel.

Why we need change

This Strategy outlines a number of ways to achieve sustained reductions in air pollutant emissions from road transport. However, it may be necessary to deploy shorter-term measures to help London reduce the worst exceedences of PM_{10} by 2011, depending on a number of factors, particularly weather conditions.

A small number of locations in central London are at risk of exceeding the daily mean EU limit value for PM_{10}. Compliance with the limit value requires there to be no more than 35 exceedences each year at each location. Pollution episodes tend to last for a number of days and are often localised. Forecasting pollution episodes up to 24 hours in advance is now reasonably accurate.

Other cities and countries in Europe have adopted a range of special measures which can be implemented when there is a risk of exceedence. It is important for London to plan as far as possible for such events and to help provide people with information that minimises the impact on their health.

What needs to be done

The PM_{10} EU daily mean limit value restricts the number of days per year when average concentrations are over $50\mu g/m^3$. Episodes that last several days are caused by a number of complicated factors including emissions from outside London, London's emissions (including local road transport), weather and geography. Therefore localised action during pollution episodes may be needed in certain specific circumstances to continue to meet the EU daily mean limit value for PM_{10}.

Local measures which will deliver sustained improvements at the priority locations are already planned (see Policy 3). However, under extreme circumstances there may be a role for more stringent special measures used intensively for short periods of time which primarily affect how many and which kinds of vehicles can travel to and through the

relevant area. These measures could include restricting vehicle access or movement into or within an area or diverting traffic away from that location.

In the development of such measures, TfL will undertake a feasibility study into the potential for lane and road closures as emergency actions in response to particularly poor air quality. This will include developing a model to understand traffic impacts on air quality across the network. Depending on the outcome of this feasibility study, TfL may consider using powers available under the Road Traffic Regulation Act 1984 to close lanes or whole roads or otherwise restrict certain types of vehicles at certain times.

The Mayor appreciates that the impact of special measures could be particularly high for boroughs and businesses in central London in terms of congestion. However, the precise mechanism for identifying conditions and the implementation of appropriate interventions would only be determined following consultation with boroughs, businesses and other stakeholders. It should also be noted that these are only expected to be used in the most extreme circumstances.

However, it is important to note that, as set out under Policy 3, sources of pollution from outside London are responsible for a particularly high proportion of the pollution present during these episodes and thus wider action by central Government and others across Europe is also needed.

As a preference, and in order to promote more lasting change, a wider package of measures focused on planned "action days" will be developed. These measures, such as cycling days or zones would be focused on broader behavioural benefits – encouraging Londoners to use cleaner transport modes (e.g. cycling and walking) and demonstrating potential wider benefits, for example in terms of public realm and amenity, that longer term and wider change could bring. This may include a number of "action days" in central London during the year or more regular (e.g. weekly or monthly) events in certain areas. These could also be linked to major events such as the Olympics and other initiatives.

4 Non-transport measures

4.1 The policy development process

Since the creation of the GLA in 2000 a number of measures have been implemented to reduce emissions from non-transport sources. The London Plan has ensured that new developments are more sustainable; and the GLA and London Councils published Best Practice Guidance on construction and demolition in 2006, and has promoted its implementation on construction sites across the capital. However, there is still more that can be done.

Not all of the policies in this chapter can be quantitatively assessed in the same way as most of the transport policies, though this does not diminish their importance.

4.2 Policies and proposals

The Mayor is proposing a further package of measures for non-transport sources. This package is designed to deliver value for money – delivering important reductions in emissions of PM, NO_x and also CO_2 while seeking to minimise as far as possible compliance costs for those affected. The package consists of:

- **Reducing emissions from construction and demolition** - through the review and full implementation of the Best Practice Guidance for construction and demolition sites across London.

- **Making new developments 'air quality neutral or better'** - by making better use of the planning system to ensure no new development has a negative impact on air quality in London.

- **Energy efficiency schemes** – implementing programmes that will make London's buildings more energy efficient and lobbying central Government to provide additional funding for these programmes to increase their scale.

- **Improved air quality in the public realm** - by planting urban vegetation and by discouraging anti-social burning of waste.

- **Encouraging innovation** – by making London a centre for new ideas that will improve air quality.

- **Raising awareness** - by highlighting the impact of poor air quality on health to encourage Londoners to take action to reduce emissions and by making them aware of any potential personal health risks.

Policy 7 – reducing emissions from construction and demolition sites

Vision

Responsibly managed construction and demolition sites that pose no health risk to people working or living nearby.

Policy

The Mayor will work with London boroughs, the GLA group and the construction industry to encourage implementation of the Best Practice Guidance for construction and demolition sites across London.

Proposals

- The Mayor will review and update the Best Practice Guidance (BPG) for construction and demolition sites. The Mayor will also create Supplementary Planning Guidance to assist implementation.
- The Mayor will ensure that strategic planning applications include BPG implementation.
- The Mayor will require the GLA Group to include full implementation of the BPG in its procurement policy (including through the supply chain).
- The Mayor will work with London Councils to encourage boroughs to adopt the BPG.

Outputs

It is difficult to assess accurately the potential impact of measures to reduce emissions from construction and demolition sites, as the number of sites within London fluctuates, as do their size and nature. However, reducing emissions from these sites could reduce emissions of PM_{10} significantly at these locations, which would be particularly critical in and around areas with high air pollution

Why we need change

London Councils and the GLA published the Best Practice Guidance (BPG)[20] on construction and demolition in 2006. This Guidance provides clear advice for air pollution mitigation measures to be included within a Code of Construction Practice (CoCP) during demolition and construction. These mitigation measures fall broadly under the headings of effective site planning, construction traffic measures, demolition works and site activities. Reducing emissions though implementation of the BPG will work towards

improving local air quality, which will have benefits not just for people who live near construction sites but also for workers on sites who are exposed to emissions at close proximity day in day out.

Most boroughs are already implementing the BPG to a significant extent, either through planning conditions or section 106 agreements. It is now standard practice for mitigation measures from the BPG to be included in CoCPs that developers must adhere to. Such measures include dust dampening, hard surfacing haul roads, minimising dust generating activities, covering skips and ensuring stockpiles are securely sheeted.

However, the BPG is not being fully implemented on all construction sites within London. Measures that are not widely implemented include the use of ultra low sulphur diesel for construction plant and the use of real-time dust monitors across sites. This is partly because the BPG is not a statutory document in the planning process and boroughs are not obliged to consider it. Even where planning authorities have included implementation of the BPG as a requirement, they sometimes lack resources to provide advice and enforce it as necessary.

In particular, the element of the BPG that promotes retrofitting with particulate traps of non-road mobile machinery (NRMM) on all high-risk sites to reduce emissions has not been implemented to date. This is because some sections of the construction industry have concerns over the cost-effectiveness of this equipment and health and safety issues regarding hot surfaces, sight lines and noise.

As there are a number of large construction sites across London at present, there is an opportunity to work with industry to reduce emissions from construction and demolition activities further.

What needs to be done

The BPG is an important tool to reduce emissions from building demolition and construction sites, which are often located in areas of dense population. For that reason, the Mayor is fully committed to full implementation of the Guidance by all developers across London, and will continue to push for this.

There are some very good examples of best practice implementation throughout London. Box 13 below highlights examples of initiatives that are being implemented in London boroughs. Through the LAQM process and the updated BPG, the Mayor will encourage

the spread of such best practice. The Mayor will encourage boroughs to include the BPG in Considerate Contractor Schemes, which would also help to promote best practice.

During 2010, the GLA will work with organisations across the construction industry on studies and field trials into the use of retrofit equipment on NRMM to resolve any concerns regarding this equipment. These studies will be used to inform a wider review and update of the BPG, to be completed early in 2011 in cooperation with London Councils and boroughs. This review is expected to be minor, allowing new techniques and best practice that have been developed since 2006 to be included. The BPG would also become a more streamlined document contained within Supplementary Planning Guidance, which would be easier for boroughs to enforce. The Mayor, through the GLA, will encourage boroughs and other developers to include the BPG in their agreements and CoCPs, both during and after the review. The GLA Group will also include the BPG within their procurement policies for all construction projects. Finally the GLA will promote awareness of the BPG through workshops and information on its website.

Box 13: Best practice initiatives implemented across London to minimise the impacts of construction and demolition

- The London Borough of Islington, through section 106 funding, has created two Construction Impact Manager Officer (CIMO) roles that actively manage large construction sites within the borough. A database of complaints and construction sites has been set up and the CIMOs respond to the complaints and proactively work with other key stakeholders such as the Highways department, the planning team and developers. Since the creation of the roles in 2007, the council has received positive feedback from the public and has responded to over 800 complaints. At present there are over 40 sites being dealt with and there are plans to purchase monitoring equipment and carry out more enforcement activities throughout the borough.

- The City of London has published its own Code of Practice that includes the requirements of the BPG and specifically refers to it. Demonstrable compliance with the Code of Practice is specified within section 106 agreements for larger sites within City of London. Construction is closely monitored within the City and specific staff within the team visit sites daily.

- The Royal Borough of Kensington and Chelsea has published a draft Supplementary Planning Guidance on air quality that highlights the BPG and encourages developers to risk assess their construction site and incorporate the measures within their environmental plan.

Policy 8 – Using the planning process to improve air quality

Vision

A planning process that ensures that no new development has a negative impact on air quality in London.

Policy

The Mayor will ensure that new developments in London shall as a minimum be 'air quality neutral' through the adoption of best practice in the management and mitigation of emissions.

Proposals

The Mayor will use his planning powers to:

- Require new biomass boilers in AQMAs for PM_{10} to be fitted with suitable PM emission reduction technology.
- Apply emissions limits for both PM and NO_x for new biomass boilers across the whole of London.
- Develop a checklist to guide boroughs and developers in the assessment of the potential emissions from new developments.
- Ensure air quality benefits are realised through the promotion of low emissions strategies in section 106 agreements.
- Prepare template Supplementary Planning Guidance on air quality for boroughs to assist them in determining planning applications.

Outputs

Ensure that measures to improve air quality are embedded in the planning process

Why we need change

The planning process can play an important role in ensuring that proposed new developments do not detrimentally affect local air quality. Air quality can be a material consideration in the determination of a planning application and the planning process should be used to protect and improve local air quality and ensure developments are appropriately and sensitively designed to mitigate negative impacts on air quality. The

planning process presents further opportunities to reduce air quality impacts through appropriate planning conditions and use of section 106 agreements.

Air quality assessments are often required for new developments. These focus on the impact of the development on pollutant concentrations. This concentration modelling is important, as it shows clearly the impact a development will have on the achievement of limit values. Concentration modelling, though, is not always sensitive to small changes in emissions. The cumulative impact on air quality of a number of developments will therefore not always be identified. For this reason attention needs to be paid to the emissions predictions for new developments, alongside concentration modelling.

It is important that through the planning system an appropriate balance is struck between ensuring London drives down its carbon emissions and ensuring that development does not have a negative impact on air quality. The Mayor is committed to reducing London's carbon emissions. One important aspect of that commitment is the use of renewable heat. Increasingly biomass boilers are being included within developments as a low carbon fuel to produce energy. The vast majority of biomass fuel is wood or other energy crops. Whilst biomass boilers should continue to play an important role in reducing London's carbon emissions, greater consideration needs to be given to their impact on air quality and measures put in place to minimise emissions where air quality is already poor.

Depending on the type of fuel used and the design of the particular device, unabated biomass boilers can emit at least 20 per cent more PM_{10} than gas-fired boilers and sometimes significantly more, though they are cleaner than oil-powered boilers. There is therefore a risk that without controls, the widespread inclusion of biomass boilers in developments could compromise the achievement of local air quality objectives in London. Research has shown that biomass boilers can be effectively fitted with abatement equipment (such as ceramic filters) for PM. Such equipment is available on the market, though for smaller biomass boilers, the cost of retrofitting can be as high as 30 per cent of the installation costs. The cost of abatement equipment for PM is expected to fall over time. However, at present there is no realistic equivalent abatement equipment to reduce NO_x emissions from all but the largest biomass boilers.

What needs to be done

Biomass boilers

For planning applications within an AQMA that include proposals for the use of biomass boilers, the Mayor will require that an assessment of its emissions is undertaken.

Guidance issued by Defra[21] , and more recently, Environmental Protection UK[22] provides a suitable assessment method that should be followed. This guidance recognises that biomass boilers can be valid tools to help developers meet their carbon dioxide reduction targets, but uses a risk-based approach to help local authorities mitigate any negative air quality impacts from their use. The guidance covers:

- The location of the boiler;
- Comparison with the type of boiler it is replacing (if relevant);
- The standard of the boiler; and
- The type of fuel to be used.

The Mayor will use his planning powers to ensure that in AQMAs for PM_{10} biomass boilers will only be approved if they are fitted with suitable emission reduction equipment for PM. The Mayor will encourage the Government to introduce type approval for PM abatement equipment to ensure that the abatement equipment used is effective.

Outside AQMAs for PM_{10}, biomass boilers would be acceptable without additional abatement, but only if they met emission limits for PM_{10} and NO_x (the NO_x limits would also apply to biomass boilers within PM_{10} AQMAs). These limits will be determined once the Government has implemented the Renewable Heat Incentive (RHI) , which is expected to include emissions criteria for biomass boilers. At present abatement equipment is not available for NO_x other than for large industrial plant. When such equipment is available on the market, the Mayor will seek to include within the planning process a requirement for biomass boilers in NO_2 AQMAs to be fitted with NO_x abatement equipment.

The Mayor expects local authorities, through their planning processes to implement a similar approach and to be satisfied there are no adverse impacts on local air quality before granting planning permission for biomass boilers when considering local planning applications. The Mayor will include this requirement in the Supplementary Planning Guidance template he will produce to assist boroughs when considering planning applications (see overleaf).

Planning process

The Mayor believes that within AQMAs, the planning system should be used to deal with the cumulative effects on air quality of development. For developments that require an air quality assessment, both at strategic and local planning level (such as those that fall within the criteria for an Environment Impact Assessment, or as described in Highways Agency Advice, Government planning advice and EPUK's Planning Advice) the Mayor encourages boroughs to require emissions assessments for new developments to be carried out more often alongside concentration modelling and included within submitted planning applications. For some sources, such as construction work, it may not be possible to make detailed estimates of emissions, but an outline risk assessment would still be useful. The GLA will work with boroughs and London Councils to develop a checklist of emissions sources that should be included in assessments, under the following categories:

- Construction stage (including associated traffic);
- On-site (eg. Water and space heating systems); and
- Off-site (eg. transport-related).

The checklist will be published on the GLA website to enable developers to carry out air quality assessments and boroughs to analyse and evaluate assessments. Such assessment of emissions will enable boroughs to identify where emissions reductions targets can be achieved. It would also be used in conjunction with concentration modelling to show whether new developments could exacerbate local poor air quality and to propose offsetting provisions if necessary.

National guidance Planning Policy Statement 23 (PPS23) states that air quality can be a material consideration within the planning system and that where planning conditions are not appropriate then section 106 funding agreements should be pursued (under the Town and Country Planning Act 1990). There are excellent examples in London where boroughs have secured section 106 agreements that have had positive impacts on local air quality or have been used to offset potential detrimental effects to local air quality (see below).

Many boroughs are now requiring developers to fund Low Emission Strategies. The Low Emissions Strategy concept is an important tool for mitigating the transport impacts on air quality of a proposed development. Defra, in association with the Low Emissions Strategy

Partnership[23] has produced best practice guidance to reduce transport emissions through the planning process and the Mayor encourages boroughs to use this guidance.

It is also important to mitigate negative impacts from construction and on-site sources. The Mayor encourages boroughs to include relevant elements of the construction and demolition Best Practice Guidance within planning agreements (see Policy 7). Energy efficiency measures and low-emission boilers can reduce projected on-site emissions. The GLA will work with boroughs to publish advice on reducing on-site emissions from new developments on its website.

In the future, the Mayor hopes that funds from the Community Infrastructure Levy (to be implemented under the Planning Act 2008) could be used in similar way to section 106 agreements to contribute to Low Emissions Strategies.

In order to secure contributions, this approach should be set out in strategic documents such as Core Strategies and Area Action Plans for individual London Boroughs. At a strategic level, the draft London Plan includes policies to enable this to happen. The Mayor will also use this approach for developments that are referred to him and will promote best practice through training workshops with boroughs.

Some boroughs have produced Supplementary Planning Guidance on air quality which needs to be taken into account in development proposals and which can be used in determining planning applications. The Mayor will work with boroughs to produce template air quality Supplementary Planning Guidance, which would cover:

- Circumstances in which an air quality assessment would be required for a new development;

- Guidance on the process of air quality assessments, including assessment of on site and off site emission sources; and

- Guidance on suitable mitigation measures, including use of section 106 funding and the Community Infrastructure Levy.

The Mayor will encourage boroughs to publish such Supplementary Planning Guidance to ensure that air quality is fully embedded within the planning process.

Box 14: Best practice initiatives implemented across London

Examples of mitigation measures achieved through Section 106 Agreements include**:**

- The London Borough of Waltham Forest adopted a Supplementary Planning Document (SPD) in 2008 that provided a funding contribution formula to the implementation of the Air Quality Action Plan. This is based on the type of development proposal, such as commercial above 250m in size, and residential with and without parking. Formulae such as these provide a helpful framework to assess the developer's contribution based on the impacts of the proposed development.

- The Five Boroughs Group (Greenwich, Newham, Tower Hamlets, Hackney and Waltham Forest) for the 2012 Olympics has secured; public transport provision, maximised use of Channel Tunnel Rail Link to reduce air travel, implementation of a low emission zone for the Olympic Park, low/zero emission Olympic fleet, active spectator programme for walking and cycling, carbon offset programme.

- The London Borough of Greenwich has secured:

  - A 'low emission zone' for the development and construction of the Warren development.
  - Site travel plan and funding for air quality monitoring for Tripcock Point development.
  - Greenwich Millennium Village – emission based parking policies
  - Ten electrical vehicle charging points
  - For a superstore opening in the Zone, requirement for 50 per cent of delivery vehicles and 50 per cent of home delivery vehicles to meet Euro V standard.
  - For the superstore to report to the Council on the implementation of the Low Emission Zone measures and targets five and ten years after opening.

Policy 9 – Energy efficiency buildings

Vision

Energy efficient buildings in London in which the need for energy use from heating is minimised.

Policy

The Mayor will encourage the retrofitting of existing homes and workplaces to make them as energy efficient as possible in order to reduce NO_x emissions from gas heating systems.

Proposals

- The Mayor will work with London boroughs, the London Development Agency (LDA), London Councils, London Futures and the Energy Saving Trust (EST) to deliver the Homes Energy Efficiency Programme (HEEP), a pan-London programme to retrofit residential properties to improve energy efficiency.

- The Mayor will work with the GLA group, London boroughs and other public sector organisations in London to implement the Buildings Energy Efficiency Programme (BEEP) to improve energy efficiency in public sector buildings.

- The Mayor will work with commercial landlords and tenants through the Better Buildings Partnership to share knowledge in the commercial sector and produce a suite of guidance on implementing sustainable upgrades.

- The Mayor will work with businesses through the Green500 to reduce their energy use.

- The Mayor will support London boroughs to deliver Low Carbon Zones, to demonstrate the potential for energy savings which will reduce emissions of NO_x resulting from physical measures and community engagement.

- The Mayor will set CO_2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. The energy efficiency measures will result in reductions of NO_x emissions.

Outputs

- By 2015, it is estimated that if 1.2 million homes in London have been retrofitted with a package of easy measures, this could reduce emissions of NO_x by over 1,200 tonnes per year. With increased funding, even more energy efficiency measures could be

introduced in these homes.

- The BEEP Programme, Green500, Better Buildings Partnership and Low Carbon Zones could between them save almost 400 tonnes of NO_x per year by 2015.

Why we need change

Most buildings in London use gas heating systems. While gas is a relatively clean fuel and improvements have been made in recent years to make heating systems more efficient, gas burning is still responsible for considerable emissions of both NO_x and carbon monoxide (CO), as well as CO_2, which contributes to climate change. More detail is included in the Mayor's draft Climate Change Mitigation and Energy Strategy, published on 9 February 2010 for consultation with the London Assembly and functional bodies.

The Mayor is committed to driving down London's CO_2 emissions by 60 per cent of 1990 levels by 2025. Using our energy more efficiently is a crucial component of delivering this. By being more energy efficient we will use less gas and consequently reduce our emissions of NO_x.

Gas use from heating systems, including water heating systems, is responsible for more than 20 per cent of all NO_x emissions in London. As emissions from other sources are expected to fall, by 2015 it is predicted that gas used for heating will account for as much as a quarter of all NO_x emissions in London. There is thus an urgent need to use gas more efficiently when heating homes and other buildings in London.

Too many buildings in London lose heat through the building fabric because they are poorly insulated. This combined with many buildings having old, inefficient heating systems, means that more gas is used to heat space and water than is actually needed, leading directly to emissions of NO_x. Simple measures to improve the energy efficiency of London's homes and public and commercial buildings would therefore have benefits in terms of reducing emissions of NO_x and CO_2 as well as reducing energy bills for Londoners and London's public sector organisations and businesses.

Energy could also be saved by replacing old domestic boilers which are inefficient with new energy efficient models. The Mayor welcomed the implementation by the Department of Energy and Climate Change (DECC) of a boiler scrappage scheme. This entitles up to 125,000 householders with old, 'G-rated' boilers to £400 of the cost of a new 'A-rated' boiler. These 'A-rated' boilers tend to be more energy-efficient, so emit

lower levels of NO_x. The Mayor hopes that Londoners will take advantage of this scheme in large numbers. Nevertheless, the Mayor will lobby central Government to extend this scheme so that many more Londoners will have the opportunity to upgrade their inefficient boilers.

What needs to be done

The Mayor's priorities for reducing CO_2 emissions are to improve energy efficiency and to use cleaner and greener supplies of energy. The Mayor's Climate Change programmes, many of which are underway and which are described in detail in the Mayor's draft Climate Change Mitigation and Energy Strategy, will have a knock on benefit of reducing NO_x emissions by reducing the use of gas.

The Mayor is already using the planning process in London to ensure new buildings are sustainable. However, new buildings account for just two per cent of London's building stock in any year. Much more can be achieved in the short term by making energy efficiency improvements in London's existing homes and buildings.

Retrofitting homes

The GLA is currently working with boroughs, the LDA, London Councils, London Futures and the Energy Saving Trust on a joint energy efficiency programme for London's existing homes called Homes Energy Efficiency Programme. This is based initially on a combination of simple energy efficiency measures and face-to-face energy efficiency advice, coupled with cavity and loft insulation as far as possible, before addressing harder measures such as solid wall insulation and micro generation. Simple energy efficiency measures may include blocking gaps in floors and skirting boards, draught proofing, radiator reflector panels and water-efficient shower heads.

Analysis shows that by 2015, if 1.2 million homes in London took up some of the easy measures, the overall CO_2 saving would be 900,000 tonnes per annum and over 1,200 tonnes of NO_x. A further million tonnes of CO_2 savings and significant NO_x savings could be made from harder measures such as installing double-glazing, solid wall insulation, boiler upgrades and renewable energy technologies.

The Programme will build on existing energy efficiency retrofit schemes and establish a framework and model for the delivery of a pan-London area-based energy efficiency scheme. As a single focus for programmes in London it will reduce fragmentation, increase uptake of measures, benefit from economies of scale and place London in a better position to attract funding. The LDA has a budget for initial phases of the Programme,

but will seek additional funding, for example from central Government and energy suppliers, to maximise its impact. Work is also underway to develop financing models to help the large-scale roll out of this programme, such as Pay As You Save (PAYS) models.

The Mayor will also set CO_2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. The resulting energy efficiency measures will result in reductions of NO_x emissions.

Retrofitting commercial properties

Just as emissions of NO_x from domestic heating can be reduced, London's workplaces can also be made more energy efficient. The Mayor would support the extension of central Government's domestic boiler scrappage schemes to commercial properties to increase further energy efficiency. The Mayor, through the LDA, is working with public sector organisations across London to develop an innovative commercial model, the London Buildings Energy Efficiency Programme (BEEP), to create a cost neutral means for improving the energy efficiency of their buildings.

The BEEP project has piloted 42 GLA group buildings including fire stations, police stations, and TfL head offices. This pilot will produce energy savings worth more than £1million per year. A further 58 GLA group buildings will be retrofitted in the next stage of the project which is available to all public sector organisations in London and the UK. There has already been significant interest from boroughs, universities and NHS Trusts. A framework of Energy Savings Companies (ESCOs) has been procured to support the rapid delivery of cost-effective retrofitting schemes in London's public sector buildings which will reduce emissions of NO_x and CO_2.

The Mayor has also chosen ten London neighbourhoods to become Low Carbon Zones. The Zones aim to show the extent of savings achievable when the full range of low/ zero carbon technologies and services available are concentrated at the neighbourhood scale, and local communities are fully engaged. The Zones have a target to deliver 20.12 per cent of CO_2 emissions savings by 2012 and aim to bring together local authorities, community organisations, residents, businesses and utilities to work in partnership. The energy efficiency programmes will also have benefits for reducing emissions of NO_x from heating and boiler systems. It is proposed that the Low Carbon Zones become focal points of borough-led and Mayoral schemes, allowing them to lever greater funding from central Government and energy suppliers.

The Zones cover over 13,000 residential properties, around 1,000 shops and businesses and 20 schools, as well as hospitals, places of worship and community centres. The Mayor selected the successful zones in September 2009 and the LDA has committed between £200,000 and £400,000 per zone. The boroughs are leading delivery with support from other private/public sector partners.

The Mayor is also working with commercial landlords through the Better Buildings Partnership to produce a suite of guidance on implementing sustainable upgrades, including: green lease guidance; guidance on commercial and financial models for retrofit; guidance on the role of property agents; and a significant contribution to the debate on energy consumption benchmarking in the commercial property sector.

The Green500 is a membership scheme to help London's biggest organisations significantly reduce their carbon footprint. Nearly 200 members have signed up so far including Marks & Spencer and Chelsea Football Club.

Energy supply

The Mayor is committed to providing 25 per cent of London's energy supply through decentralised energy. The vast majority of London's electricity is currently imported from remote large-scale power plants. This is very inefficient, typically operating at efficiency levels of less than 50 per cent because vast amounts of useful heat and because of the distances over which electricity is transmitted. Generating power locally means that the otherwise wasted heat can be used to warm (and cool) buildings. London has over 200MW of existing combined heat and power (CHP) capacity, with the potential for many times more. Once again by using resources and energy more efficiently we can reduce overall emissions of NO_x, though further research is needed into the air quality impacts of different types of CHP plant.

The GLA group is investing £100million in climate change mitigation programmes over the next four years. These programmes will have to be scaled up to London-wide levels to support achievement of the Mayor's targets for reducing CO_2 emissions. This will require the programmes to develop new financing and investment models that will enable them to attract the necessary levels of public and private sector funding. The Mayor is actively discussing the development of such models with industry, financial institutions, central Government and the boroughs.

Policy 10 – Improved air quality in the public realm

Vision

A green city in which people can enjoy spending time outdoors without risk to their health and the annoyance of unpleasant pollutants.

Policy

The Mayor will encourage the improvement of air quality in the public realm by planting urban vegetation to trap particulate matter and by discouraging anti-social burning and the illegal use of wood burning stoves to reduce smoke annoyance.

Proposals

The Mayor will work with the London Boroughs and other organisations to:

- Include air quality improvement measures in schemes being implemented as part of the London Great Outdoors programme.
- Use the planning system to encourage green roofs and living walls, particularly on major new developments.
- Develop a fund for green roofs and living walls on existing buildings
- Plant trees in areas of poor air quality under the 'right place, right tree' principle through the Mayor's Street Trees programme and other schemes.
- Put information on the GLA website and support borough campaigns to make people aware of how to burn waste safely and responsibly.
- Promote campaigns to make Londoners aware of the type of wood burning appliances that can be used legally in the capital.

Outputs

- Vegetation could reduce PM_{10} concentrations locally by around 20 per cent[24].
- Improved education and enforcement of anti-social bonfires will reduce complaints from residents and improve quality of life.

Why we need change

Public spaces

In many locations in London, pollution from road traffic tends to be greatest close to ground level on busy streets, where it is most likely to affect large numbers of people. This is a particular problem on still, summer days, when there is nothing to cause the particles to disperse. It is also a particular problem in 'street canyons', which are roads flanked by tall buildings on either side, which prevent the pollutants from dispersing. This can lead to significant concentrations of $PM_{2.5}$, PM_{10} and NO_2 in the most built-up areas in London.

Anti-social burning of waste

Another problem, particularly in suburban London, is anti-social burning of waste – especially of tyres and domestic waste. Every year, London boroughs receive many complaints from residents about smoke annoyance caused by the burning of tyre and plastic waste and even garden waste. Outer London boroughs can receive as many as 500 complaints per year from residents. Such fires generate high levels of particulate pollution. While much of this is heavy and falls quickly to earth, smaller particles have the potential to remain airborne. Under certain conditions they can accumulate, causing local air quality to worsen.

Most complaints about annoyance from waste burning are made in summer, when people tend to spend more time in their gardens and washing is drying outside. Most boroughs have provided information through leaflets or websites about responsible burning of waste. However, where people persist in burning waste so that it causes annoyance, the enforcement processes can be complex. Under section 80 of the Environmental Protection Act 1990, local authorities can serve an abatement notice once they are satisfied that a nuisance exists. However, local authorities are often unwilling to proceed with this prosecution option, as it is highly resource intensive to prove that the smoke constitutes a statutory nuisance, or to prove conclusively the source of the smoke annoyance. A study looking at data from 2000 showed that while local authorities in the UK received almost 30,000 complaints about burning of waste, only 300 notices were served and only five prosecutions brought to court.[25]

Accidental fires

Another source of pollution in urban areas is accidental fires. While this is not a pollution source that can be easily monitored or modelled, when a major fire occurs it can increase concentrations over a wide area. Monitoring shows that large industrial fires in London

can cause concentrations of PM_{10} to be as high as 130 $\mu g/m^3$, which in a densely populated city, has the potential to damage health.

Wood burning stoves

There is anecdotal evidence that in parts of London, especially outer London, more and more people are installing wood burning stoves in their homes. These small stoves are not generally subject to planning controls. While wood is generally considered to be a 'carbon neutral' fuel, wood burning in urban areas can contribute significantly to local pollution. All London boroughs have declared their whole areas to be Smoke Control Zones, under the Clean Air Act 1993. Wood is not allowed to be burnt as a fuel in these areas, unless the appliance being used has been tested to ensure that it can burn wood without creating smoke. Defra maintains a register of these 'exempt' appliances on its website, but it is thought that many Londoners are unaware that they live in a Smoke Control Zone and are installing non-exempt appliances.

Waste sites

The Environment Agency is responsible for the regulation of pollution from waste transfer and disposal sites in London, as in the rest of England and Wales and Environment Agency Officers liaise directly with boroughs about these sites.

In 2006 the Thames Region of the Environment Agency (which includes London) established a working group in response to reported high levels of particulate pollution around a number of waste transfer stations in London. These sites are jointly regulated by the Environment Agency and boroughs. The group includes officers from the Agency and the relevant boroughs. It addresses a number of complex regulatory and planning issues, including on site processes and transport access to the sites. The Group also commissioned the Environmental Research Group at Kings College London to carry out analysis of monitoring data around two of the multi operator sites in an attempt to establish the sources of pollution. The results of these studies can be used as evidence by the Agency and boroughs to enable more efficient and targeted dust mitigation measures to be implemented. It is also hoped that they will help the formulation of best practice guidance for the management of emissions from such sites.

As a result of joint working between the Environment Agency, borough officers and site operators, air quality improvements have been achieved at a number of sites. However there is still work to do to ensure that these and other sites in London do not produce emissions which contribute to unacceptable levels of local air pollution. The Mayor has

recently published his draft Municipal Waste Management Strategy, which advocates an increase in recycling and energy recovery as opposed to landfill. It is important that the Mayor works with partners to manage the challenges and opportunities presented by this new approach to assist in achieving air quality improvements for local residents.

What needs to be done

Public spaces

In November 2009, the Mayor launched his manifesto for public space, London's Great Outdoors. This sets out how over the next three years over £225 million will be invested in projects to ensure that London has a truly great public realm. This will be delivered through two programmes, 'Better Streets' and 'Better Green and Water Spaces'.

The Mayor will ensure that the Better Streets programme includes measures that will improve air quality in London. This could include the planting of street vegetation which helps to trap particles or which can act as a barrier between pedestrians and road vehicles. Other schemes would encourage mode shift to clean forms of transport such as cycling and walking. It is likely that some of the schemes will include traffic management elements, which could make traffic run more smoothly so that it is less polluting.

Through the Mayor's Street Trees Programme, over 1,400 trees have already been planted in ten boroughs in London. The Mayor has pledged that overall 10,000 trees will be planted on streets in 40 priority areas. Poor air quality has been one of the criteria used to determine these locations. Some research has shown that at a local level, trees can reduce concentrations of PM_{10}, as the leaves and branches act as a filter to trap toxic particles. Care will be taken to ensure that trees are not planted so that they form a canopy that traps pollutants causing local concentrations to increase, using the 'right tree, right place' principle. The Mayor will also seek other funding opportunities to encourage the planting of trees on streets in London. The GLA will seek to remain informed of the latest research into which types of tree are most effective at trapping particles, to ensure that the benefits of tree-planting are maximised.

The Mayor will use the planning process to encourage the development of green walls and roofs on major new developments and will prepare a prospectus to raise funds to subsidise green roofs on new and existing buildings. Once again, poor air quality will be one of the criteria used to determine the location of new green roofs and walls. As well as acting as a filter to trap toxic particles, green roofs and walls have other benefits. For example, they can keep buildings warm in winter, reducing the need for heating, which contributes to lower emissions of NO_x. They also make urban areas more pleasant places in which to live

and work. TfL is in the process of identifying suitable locations to trial green walls, green screens and low barriers. If this trial is successful, a further roll out will be considered.

Waste burning

The Mayor will work with boroughs to encourage people to use alternatives to burning when disposing of waste. These include composting or using borough waste disposal services. Where people feel that burning is the best option, the Mayor will work with boroughs to educate people about doing this responsibly and safely and will put advice on the GLA website.

If following these awareness campaigns problems of antisocial waste burning persist, the Mayor will urge the Government to introduce legislation that would allow local authorities to create byelaws to impose restrictions on burning of waste in residential areas – for example during daylight hours in the summer. Boroughs have powers under section 80 of the Environmental Protection Act 1990 to serve an abatement notice if burning of waste causes a statutory nuisance. However, these are rarely enforced, largely because proving a fire constitutes a statutory nuisance can be a time consuming process and boroughs have limited resources.

Restrictions or selective bans would be easier to enforce and easier for residents to understand. These restrictions could be imposed borough-wide or in selected areas, such as AQMAs. However, the restrictions should focus on antisocial burning of waste and clearly would not restrict the responsible lighting of fires on special occasions such as Bonfire Night.

Introducing powers to apply such byelaws might require primary legislation, though amendments to the Clean Air Act (1993) could be made so that it covered domestic as well as commercial waste. The GLA will explore these options with boroughs.

Accidental fires

In recent years the London Fire Brigade has undertaken major fire prevention campaigns and has also improved response times to calls. As a result, the number of major fires in London has fallen in recent years, and 2008/09 had the fewest number of major fires in London for 40 years. The London Fire Brigade will continue its efforts to ensure that this trend continues, which will minimise the harmful pollution from fires in urban areas in London.

Wood burning stoves

The GLA will work with partners including boroughs and EPUK to educate homeowners about the legal use of wood burning stoves in London. This will include putting information on the GLA website, including a link to Defra's list of 'exempt' appliances.

Waste management

Officials from the Greater London Authority have recently joined the waste working group referred to above, representing the Mayor of London. The GLA will ensure that any impacts resulting from the implementation of the Mayor's draft Municipal Waste Management Strategy can be included in air quality abatement measures. Where the Mayor or the GLA become aware of complaints about air pollution from these sources, either through boroughs or from residents, where appropriate, they will work directly with the Environment Agency to resolve the problems.

Policy 11 – Encouraging innovation

Vision

London to be a centre for testing innovative approaches to improve air quality.

Policy

The Mayor will promote research into the causes and effects of air pollution in London, testing new techniques for improving air quality and encouraging their use of when they are proven to be effective.

Proposals

- The Mayor will use his influence and his role in the Local Air Quality Management process to publish the results of research and trials and to promote the use of new techniques to improve air quality in London.
- The Mayor will support continued improvement to the London Atmospheric Emissions Inventory (LAEI) to ensure that boroughs and other organisations have access to accurate emissions information to help develop effective policies.
- The Mayor will support the continued improvement and promotion of the air quality monitoring network in London to provide easy access to boroughs and other organisations of accurate and up to date information about air quality trends and current conditions in London.
- The Mayor will work with boroughs to identify locations where air quality is poor and jointly develop measures to improve it.
- The Mayor will work with boroughs and the business sector to identify funding opportunities for measures that will lead to air quality improvements.
- The Mayor will encourage central Government to support and fund research and development of innovative techniques that could improve air quality in London.
- The Mayor will encourage central Government to ensure that Air Quality Grants to boroughs support trials and research that will contribute directly to achieving the

objectives of this Strategy.

Outputs

- Research and trialling of techniques to improve air quality in London and elsewhere.
- Quicker dissemination of information about innovative and effective measures to improve air quality in London and shorter periods from trial to implementation.
- Further development of London as a centre for the green economy

Why we need change

Much of this Strategy is focussed on meeting EU limit values in the period up to 2015. Given this requirement, it is important that London makes the best use possible of existing resources, quickly implements new technologies and promotes behavioural change. This will need the rapid sharing of best practice so that measures that are proven to work in one location can be implemented across London. At the same time new but unproven techniques must not be ignored, as they could be the measures that improve air quality in the mid to longer-term.

London is already a centre for innovation in air quality improvement methods. However, there is still not enough research into issues that are relevant to London, and there is no structured network for disseminating results. Examples of areas in which London practitioners urgently need research to be carried out include:

- Causes and impacts of tyre and brake wear on air quality (including research into different types of tyres and vehicle brake systems).
- The behaviour and health risks of re suspended particulates.
- Which types of street vegetation are most effective at trapping or blocking pollution from road sources.
- Possible uses of materials or chemicals such as photocatalytic paint and titanium-coated fabrics to reduce NO_2 concentrations.

- Air quality impacts of the increased use of biofuels in vehicles and in biomass boilers.

- Development of biomass boilers and abatement equipment to lower emissions of air pollutants from these sources.

What needs to be done

Through the Mayor's statutory role in reviewing all boroughs' Local Air Quality Management (LAQM) documents, the GLA is at the centre of a network of air quality expertise in London. The GLA has access to information about new techniques being tested across London and beyond. The GLA will organise workshops for sharing best practice and will encourage the development and use of on-line forums to encourage discussion. The Mayor will also use his role in appraising LAQM documents to help boroughs develop targeted solutions to their particular problems.

The Mayor will seek to ensure that the LAEI and air quality monitoring networks are maintained and enhanced. The LAEI will be regularly updated to help ensure the accuracy of borough monitoring and modelling and the GLA will work with boroughs and central Government to review and update the air quality monitoring network in London, which is funded by the boroughs. It is vital that air quality monitoring stations are sited where people are most likely to be exposed to pollution. Access to accurate information about real-world concentrations, emissions sources and trends in air quality is required to ensure that boroughs and others involved in air quality management can develop appropriate policies. The Mayor will also work with boroughs to identify their priority areas for air quality so that joint action can be taken to make improvements. Through the LIP process, the Mayor will ensure that measures to improve air quality at these locations are prioritised.

Across the country, the worst air quality problems are in major urban areas. The Mayor will encourage central Government to ensure that air quality issues that are relevant to urban areas such as London are properly examined. To this end, the Mayor, through the GLA, will work with the Air Quality Expert Group (AQEG), the Government's independent advisory group, so that London's experiences and particular needs are considered when developing research programmes.

While Government-led research is important, London needs to retain its position as a leader in air quality research and innovation. Many of the measures included in this Strategy are highly innovative – such as high-pressure street washing and the on-road application of dust suppressants at hotspots. The Mayor will work with London's research

centre organisations to make sure that London's air quality problems are better understood, to develop innovative solutions to these problems and to analyse rigorously new techniques when they are deployed in the capital.

The GLA group, boroughs and the business sector also need to make full use of funding opportunities when developing innovative techniques to improve air quality in London. London's Science and Industry Council, Catalyst, aims to strengthen links between London's research organisations and businesses, and the Mayor will work with Catalyst to ensure that new technologies that could improve air quality are developed in the capital. In addition, the Mayor will lobby Research Councils UK, the strategic partnership of the UK's seven Research Councils to ensure that air quality is a priority in future research programmes.

Defra runs an Air Quality Grant programme which helps local authorities implement measures that will improve local air quality. It is important that boroughs get a fair share of this programme, and the Mayor will encourage Defra to ensure that it most effectively supports the objectives of this Strategy.

The GLA group participates in a number of European Commission projects and the Mayor will ensure that it continues to profit from EU funding to progress projects that will improve air quality. The Mayor also urges boroughs to apply for funding for innovative measures to improve air quality. In the last two years, the Commission has funded schemes in major European cities focussing on:

- Freight planning;
- Car sharing;
- Home energy efficiency; and
- Air quality information.

Authorities in London should be taking a lead in such schemes. Working with London Councils, the GLA will provide boroughs with regular updates on possible EU and central Government schemes and sources of funding and will provide advice on bidding to ensure that opportunities to improve air quality are maximised. Where appropriate, the GLA will also promote joint applications between boroughs, the GLA and functional bodies.

Box 15: Biofuels

Biofuel use has been widely promoted as a measure that will reduce CO_2 emissions and national and European legislation has been enacted to encourage its use. There have also been claims that biofuel use can reduce emissions of air quality pollutants.

Most research on the use of biofuels suggest that they emit roughly the same levels of PM and NO_x as conventional fuels. This Strategy does not therefore encourage the use of biofuels over other fuels. However, TfL has recently commenced tests of biodiesel produced from food waste in London, with a view to starting trials using TfL vehicles. The Mayor will also seek partners to trial the use of biomethane-fuelled fleets in London. These trials will look at air quality impacts and will help to inform any further policy decisions on biofuels. The Mayor will also encourage the Government to carry out further research into the air quality impacts of biofuel use in road vehicles.

Policy 12 – Raising public awareness of air quality issues and encouraging behavioural change

Vision

Londoners taking responsibility for improving air quality and being able to enjoy time outdoors without risk to their health.

Policy

The Mayor will encourage individuals to take action to improve air quality and will encourage the provision of targeted information about air quality to people most at risk from the health effects of air pollution.

Proposals

The Mayor, through the GLA and the functional bodies, will work with London boroughs, central Government and the private sector to:

- Develop a central air quality website for London on the GLA website, which would include data, technical information and advice on how to improve air quality.
- Support the development and take-up of targeted information schemes such as airTEXT through lobbying, publicity campaigns and funding streams.
- Target those most at risk by working with doctor's surgeries, pharmacies health professionals and major employers on information campaigns to increase their awareness of how to minimise the impacts of poor air quality.

Outputs

- Reduce the health impacts of air pollution.
- Increased awareness of actions that individuals can take to improve air quality.
- airText aims to have 250,000 subscribers within the next five years.

Why we need change

The Mayor is committed to improving air quality in London to improve the health of Londoners. Air pollution can cause respiratory disorders, aggravates asthma and has been

shown to impair development of lung formation in children[26]. Those particularly at risk are the elderly, the young and those with existing respiratory problems and chronic illnesses like asthma and chronic obstructive pulmonary disease (COPD). There are approximately 690,000[27] asthma sufferers in London and 230,000 with COPD[28] . Recent research has also shown that exposure to poor air quality can cause the onset of asthma in adults, not just exacerbate the problem. In 2008/09 breathing problems were responsible for 12 per cent of all non life-threatening calls made to the London Ambulance Service[29] , the second most common cause for such calls.

Raising public awareness has two main purposes. Firstly, it is important to demonstrate to Londoners the link between poor air quality and health, ensuring that people understand how taking action to reduce emissions can improve their health and that of their family. Secondly, it is important to make people most at risk aware of pollution episodes so that they can adapt their behaviour to reduce the health impacts of pollution.

What needs to be done

The House of Commons Environmental Audit Committee's recent report into air quality stressed the need for the health impacts of air quality to be better communicated by all levels of Government. It also urged the Government to improve information to the public about how they can limit their exposure to pollution and take action to improve air quality. The Mayor will work with national and local Government to raise awareness of air quality and health issues through publicity campaigns. The GLA will also create a central information website that provides easily accessible information for the public about air quality conditions and health effects associated with exposure. As part of this, the GLA will work with media organisations to provide widely available air quality information.

There are many excellent examples of borough campaigns aimed at encouraging the general public to take local action to improve air quality. The London Borough of Wandsworth has recently run a campaign to raise awareness of the impacts of engine idling. Aimed specifically at primary schools, the borough has created a leaflet with smarter driving tips and primary schools now have signs asking drivers to turn off their engines when dropping off or collecting children from school. This has been followed up by a lesson plan aimed at key stage 2 pupils (in particular eight and nine year olds) that has been very well received by teachers and pupils alike. In the future it is envisaged that officers will visit the schools to talk to parents about limiting engine idling. This scheme is a good example of raising public awareness and will help other boroughs to establish similar schemes.

Targeting those most at risk is important. Research has shown that informing the vulnerable population can encourage behavioural change and can give a feeling of empowerment, preparedness and the ability to help prevent the impacts of pollution where the individual's quality of life is improved.

The Department of Health has indicated that it is willing to provide funding to the airTEXT alert system and the Mayor encourages this support. The system was set up as a pilot project, funded by the European Space Agency and trialled in the London Borough of Croydon in 2005. It now operates across London providing air quality information and health advice when forecasts are made for moderate or high pollution levels (according to the Department of Health classification). Alerts are sent via SMS, telephone or email to people with illnesses like asthma, bronchitis, emphysema and heart disease for which symptoms can be exacerbated by air pollution.

Over 5,000 people have signed up to the service, including patients identified by their GP. The London boroughs of Sutton and Wandsworth have successfully met with pharmacies and PCTs within their boroughs to promote the use of airTEXT and have also signed up for a subscription to the Life Channel in GP surgeries to advertise this service. Other boroughs have publicised airTEXT at chest and asthma clinics, NHS Walk-In Centres, as well as in locations such as libraries and council offices and on public transport. The Mayor will work with the NHS in London, through the implementation of the Health Inequality Strategy, to ensure that the health sector in London plays a full role in publicising the scheme, for example by distributing leaflets with asthma medication and by making doctors and nurses treating at-risk patients aware of it, so that they can pass on relevant information.

The Mayor will work with national Government and other potential partners to continue the airTEXT service and supports its aspiration to sign up a further 250,000 participants over five years. The Mayor believes that major employers in London including the GLA group could benefit from promoting airTEXT to their staff. The Mayor will also consider the feasibility of extending this type of service during the 2012 Olympic Games to inform competitors and spectators of local air quality conditions.

Another service that has been established within London is the walkit website (www.walkit.com) which is an interactive urban journey planner for walkers run by a small independent company. For some parts of London, this website includes options to avoid pollution hotspots. In April 2009 just under 4,000 of the individual journey requests were

for the ‘low pollution’ option . There is growing interest in using this sort of website as a tool to reduce exposure to poor air quality. The Mayor supports this self-management tool and will work with boroughs to promote such schemes, while investigating what information could be included on the TfL website.

5 Implementing the Mayor's Air Quality Strategy

5.1 What the Strategy will deliver

The Mayor's Air Quality Strategy, in conjunction with his other relevant strategies, will achieve significant reductions in emissions to air of air pollutants in Greater London, in particular from road transport.

The figures below focus on measures for which emissions reductions can be quantified. In addition to these measures, however, local action will deliver further important air quality improvements in key areas where there are currently high concentrations of air pollutants and the impacts of these measures is described in Chapter 3. Some of the benefits of measures proposed for 2012 and beyond will be delivered earlier, in 2011, due to pre-compliance. Pre-compliance occurs when a standard or limit value is adopted in advance of legal or other requirements, e.g. an LGV operator purchasing a Euro 3 LGV in advance of the proposed requirement to meet the Euro 3 standard in 2012 prescribed in the LEZ scheme.

A number of measures are already announced or underway in London, such as LEZ Phase 4, smarter travel schemes and measures to smooth traffic flow. These are included in the baseline for the modelling. The following policies included in this Strategy have been quantified and modelled to determine the likely impact of the Strategy on emissions of PM_{10} and NO_x and their overall impact on reducing concentrations of PM_{10} and NO_2 in Greater London.

- Eco driving and better journey planning for road transport by 2015
- London Freight Plan to reduce vehicle kilometres by 2015 including Delivery Service Plans (DSP), the Freight Operator Recognition Scheme (FORS), use of consolidation centres and increased use of river and rail
- Electric vehicle delivery plan which is expected to deliver infrastructure for 100,000 electric vehicles by 2020
- Roll out of hybrid buses across the network from 2012
- Fitting of NO_x abatement equipment to older buses by 2015
- Age limits for black cabs and PHVs from 2012

- Introduction of LEZ Phase 3 from 2012
- Introduction of LEZ Phase 5 (Euro IV for NO_x) for HGVs, buses and coaches in 2015
- Delivering a pan-London programme to retrofit residential properties for energy efficiency by 2015 (Homes Energy Efficiency Programme)
- Implementing energy efficiency programmes for homes and workplaces.

As yet, full details of some proposals, such as changes to the London Lorry Control Scheme, a zero-emission taxi and incentives for green taxis are not yet completely developed. It is therefore not possible to include the impact of these measures in the modelling with any accuracy.

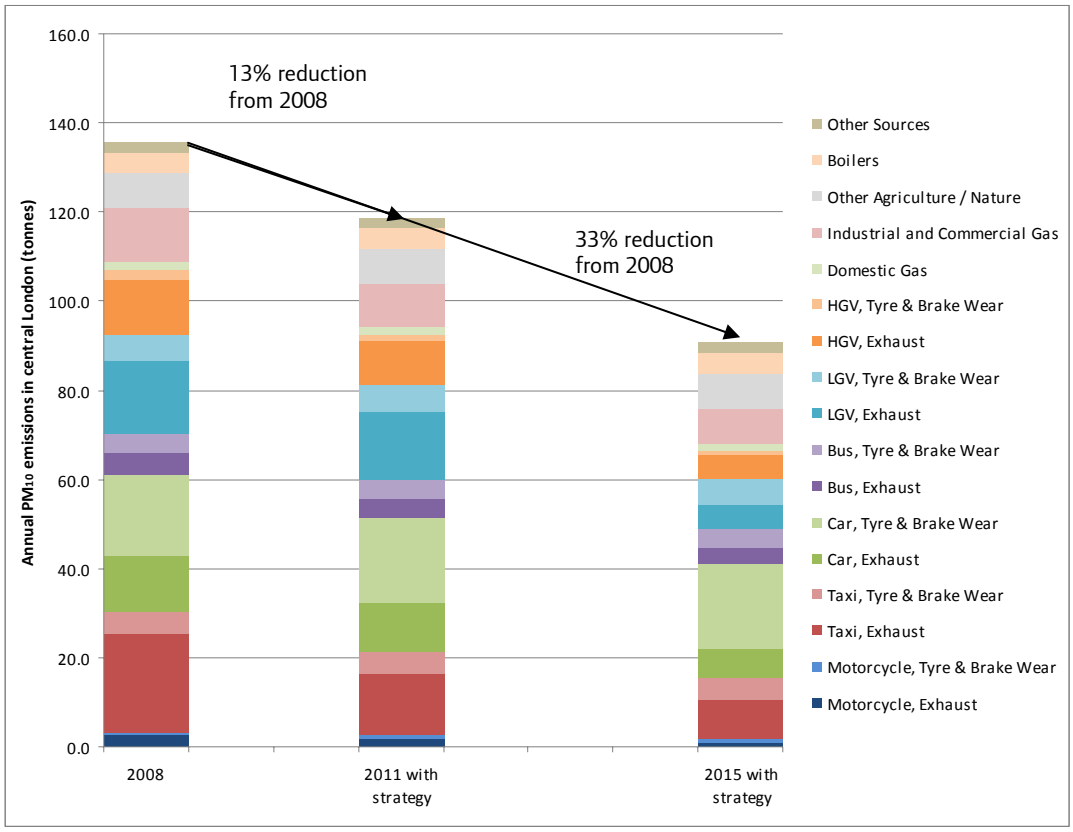
Other policies in the Strategy, including those related to planning, raising public awareness of sustainable modes of transport, and wider implementation of the GLA and London Council's Best Practice Guide for construction and demolition are not readily quantifiable but these will also contribute to improvements in London's air quality.

Particulate matter

Most areas of Greater London already meet the annual mean EU limit values for PM_{10} and all areas will meet it in 2011. There are currently, however, a small number of areas in London that may be at risk of exceeding the EU limit values for daily average PM_{10} in 2011, depending on certain conditions, without further measures being taken. Such measures are included in this Strategy and provide even greater confidence that all parts of Greater London will meet these EU limit values by 2011.

Implementation of the policies and proposals in the Strategy along with natural fleet turnover is expected to reduce PM_{10} emissions in central London by around 13 per cent by 2011 and by about a third by 2015 (compared to 2008) – see Figure 5.1. In central London, emissions are estimated to reduce from about 135 tonnes in 2008, to 119 tonnes in 2011, and to about 91 tonnes in 2015. These reductions will be achieved through the range of measures included in this Strategy, in addition to the air quality improvement measures that are at present being undertaken.

Figure 5. 1 Estimated reductions in PM_{10} emissions from all sources in central London



HGV emissions will fall by approximately three tonnes in 2011 and eight tonnes in 2015. These reductions will result from the tightening of the LEZ standards in 2012, further implementation of the London Freight Plan (including DSPs and FORS) and natural fleet turnover of the vehicle fleet to low emission vehicles. The modelling does not take into account any potential benefits that would result from the introduction of LEZ Phase 5, nor from the proposed improvements to the London Lorry Control Scheme.

Taxi PM_{10} exhaust emissions are expected to reduce significantly (by around 60 per cent between 2008 and 2015), due to the impact of the extended Taxi Emissions Strategy, including the proposed introduction of age limits from 2012, and reductions in taxis idling. The reduction in taxi related PM_{10} emissions is estimated to be eight tonnes in 2011 and 13 tonnes in 2015. Reductions in emissions of PM_{10} resulting from the

proposed age limit for private hire vehicles in Greater London amount to one tonne in 2011 and four tonnes in 2015 (included in the 'cars' category in Figure 5.2). The modelling does not take into account further proposed incentives for lower-emission taxis or the proposed move towards zero-emission vehicles.

The introduction of LEZ Phase 3 for heavier vans and minibuses will reduce PM_{10} emissions from heavier LGVs and minibuses by about five per cent (equivalent to eight tonnes of PM_{10}) in 2011. The inclusion of these vehicles in the LEZ will provide ongoing benefits compared to the baseline.

Bus and coach PM_{10} emissions do not show the same magnitude of reduction between 2008 and 2015, as action to reduce significantly PM_{10} emissions from London's bus fleet has already been undertaken through the fitting of particulate traps so that all buses meet the Euro IV standard for PM. This achieved PM_{10} bus emissions reductions of 90 per cent, from the start of the bus retrofit programme in the late 1990s until its completion in 2003/04.

Measures including promoting smarter travel choices and eco-driving, encouraging a shift to more sustainable transport modes, support for cleaner vehicles such as electric vehicles and smoothing traffic flow will collectively reduce PM_{10} emissions by about 11 tonnes in 2015 (from 2008 levels).

Tyre and brake wear emissions are projected to remain at similar levels to those between 2008 and 2015 (about 40 tonnes in central London), due to the technical difficulties of tackling this source of emissions, as discussed in Chapter 3. It is expected that other initiatives outlined in the Strategy will have an impact, but some of these are difficult to quantify at this stage and are not therefore included in the projections.

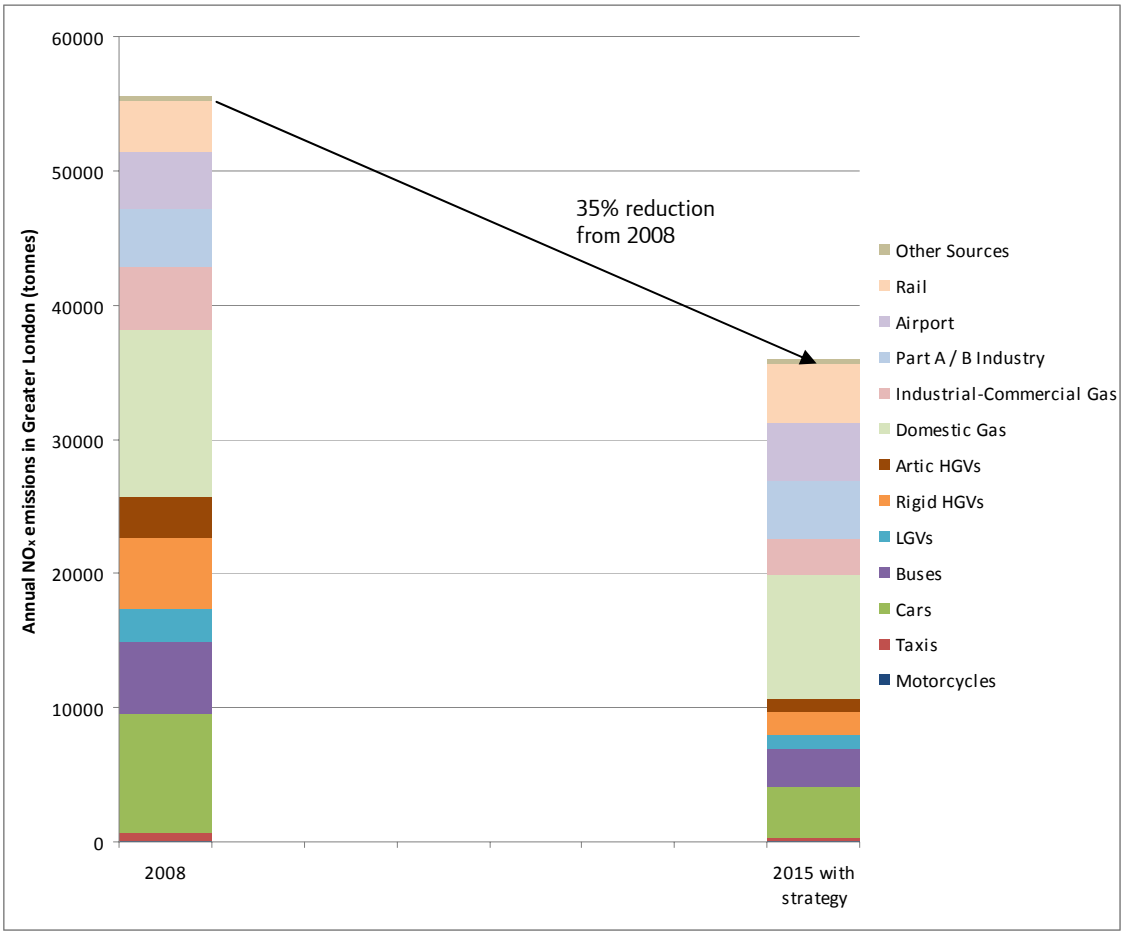
The Strategy also projects reductions in PM_{10} emissions more widely across Greater London. Modelling suggests that, compared to 2008, emissions of PM_{10} in Greater London will be reduced by around ten per cent by 2011 and by around 20 per cent by 2015. This does not take into account particulate matter from sources outside London

Nitrogen Oxides

Modelling shows that NO_x emissions in Greater London will fall from 56,000 tonnes in 2008 to 46,000 tonnes in 2011 and 36,000 tonnes in 2015 as a result of the quantified measures in this Strategy and natural fleet turnover. This amounts to a reduction in NO_x

emissions across London of 35 per cent by 2015 (compared to levels in 2008) – see Figure 5.2. This will be achieved by implementation of the range of measures included in the Strategy, as well as by measures already being undertaken and natural fleet turnover.

Figure 5. 2 Estimated reduction in NO_x emissions from all sources in Greater London (including planned measures, natural vehicle fleet turn over etc)



The largest reductions in NO_x exhaust emissions will be from HGVs, which are projected to reduce by almost 70 per cent from 2008 to 2015 across London. The reductions in HGV emissions are in the order of 2,200 tonnes by 2011 and 5,700 tonnes by 2015. This reflects the tightening of the LEZ standards in 2012, implementation of the London Freight Plan (including Delivery Service Plans (DSPs) and the Freight Operator Recognition Scheme (FORS)) as well as natural HGV fleet turnover. The addition of the

proposed LEZ Phase 5 (Euro IV NO_x standard for HGVs, buses and coaches) contributes about 280 tonnes to the overall reduction in HGV related emissions of NO_x.

Taxi NO_x exhaust emissions are also expected to reduce significantly (by around 50 per cent between 2008 and 2015), due to the taxi emissions proposals, including the proposed introduction of age limits for taxis in Greater London from 2012, reductions in taxis idling and natural fleet turnover. The reduction in taxi-related NO_X emissions is estimated to be 240 tonnes in 2011 and 310 tonnes in 2015, though further reductions would be expected from the development of a zero-emission taxi by 2020 (it is not yet possible to estimate the impact of this proposal).

Reductions in emissions of NO_X due to the proposed age limit for private hire vehicles (included in the 'cars' category in figure 5.2) amount to 24 tonnes in 2011 and 50 tonnes in 2015.

The introduction of LEZ Phase 3 for heavier vans and mini buses will reduce NO_x emissions from these vehicles by about 70 tonnes in 2015. The London Freight Plan (including DSPs and FORS) will reduce LGV emissions of NO_x in 2015 by about 80 tonnes.

NO_x emissions from buses and coaches are expected to fall significantly between 2008 and 2015 – by around 2,600 tonnes. Fitting SCR abatement equipment to pre Euro IV buses will reduce NO_x emissions by around 670 tonnes and the introduction of hybrid buses (including the new bus for London) will reduce NO_x emissions by around 70 tonnes in 2015. The introduction of a NO_x standard to the LEZ in 2015 would reduce NO_x emissions from coaches by over 100 tonnes.

Significant reductions in NO_x emissions are also expected from non-transport sources. The HEEP and BEEP programmes are primarily aimed at reducing domestic and commercial CO_2 emissions, but will also result in reductions of NO_x emissions. It is estimated that almost 1,300 tonnes of NO_x will be saved in 2015 through HEEP and 400 tonnes saved through the BEEP Programme, Green500, Better Buildings Partnership and Low Carbon Zones.

Modelling does not predict any changes in emissions of NO_x from heavy industry, rail sources and airport operations, though it is likely that measures taken by the Government, airport operators and other organisations will reduce emissions by 2015.

5.2 What this will achieve

Particulate Matter

By 2011, with the introduction of the measures included in this Strategy, all of Greater London is expected to meet the EU Directive requirements for the annual limit value for PM_{10} of 40µg/m^3 (as shown in Figure 5.3). On this basis Greater London is predicted to be compliant with the PM_{10} annual limit value. It should be noted that some high concentrations shown on the map below will be within the road carriageway and will not spread to the pavement where pedestrians are likely to be exposed, which can be examined through more detailed area-specific modelling.

Figure 5.3 PM_{10} annual mean concentrations (µg/m^3) for the year 2011 with full implementation of the MAQS

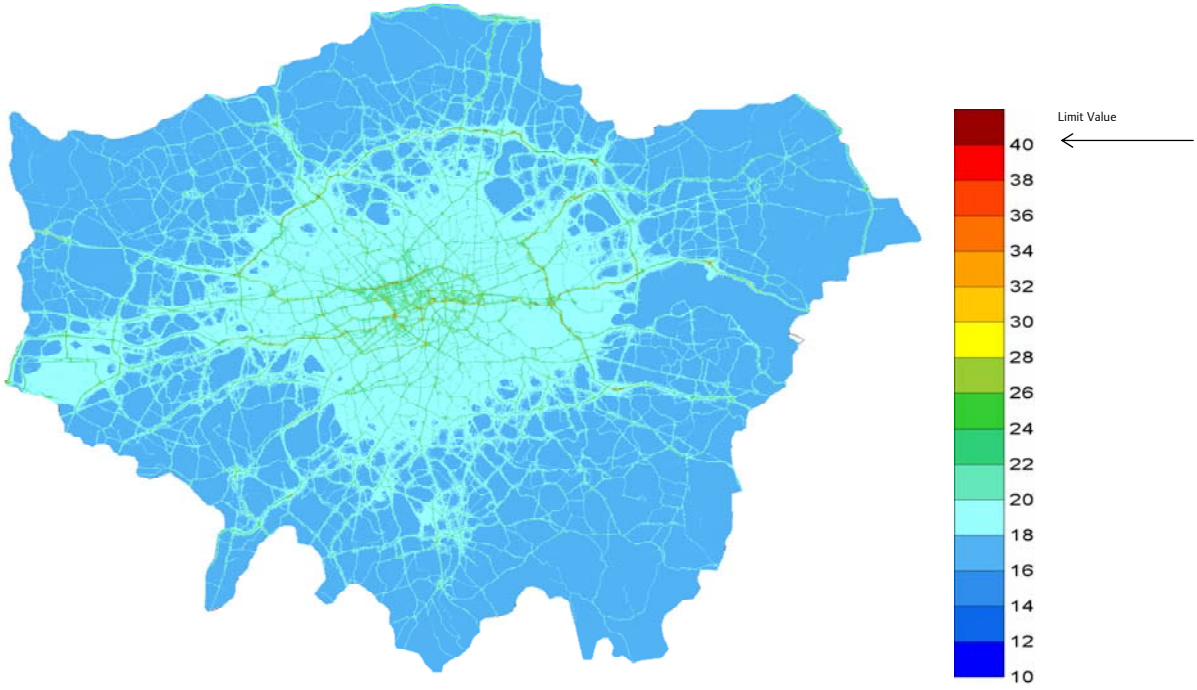
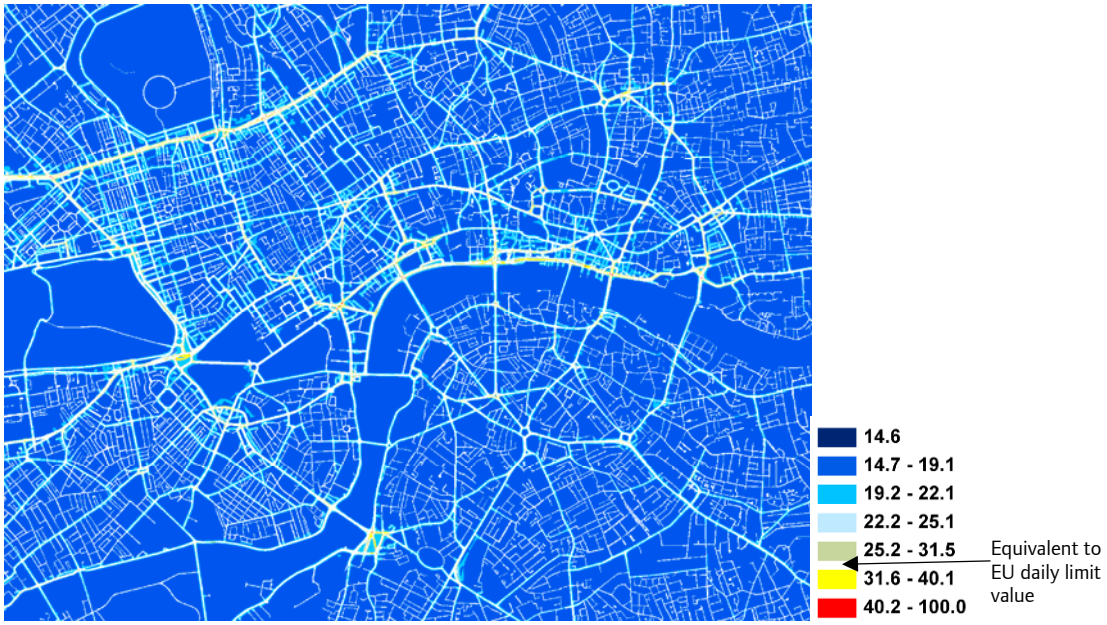


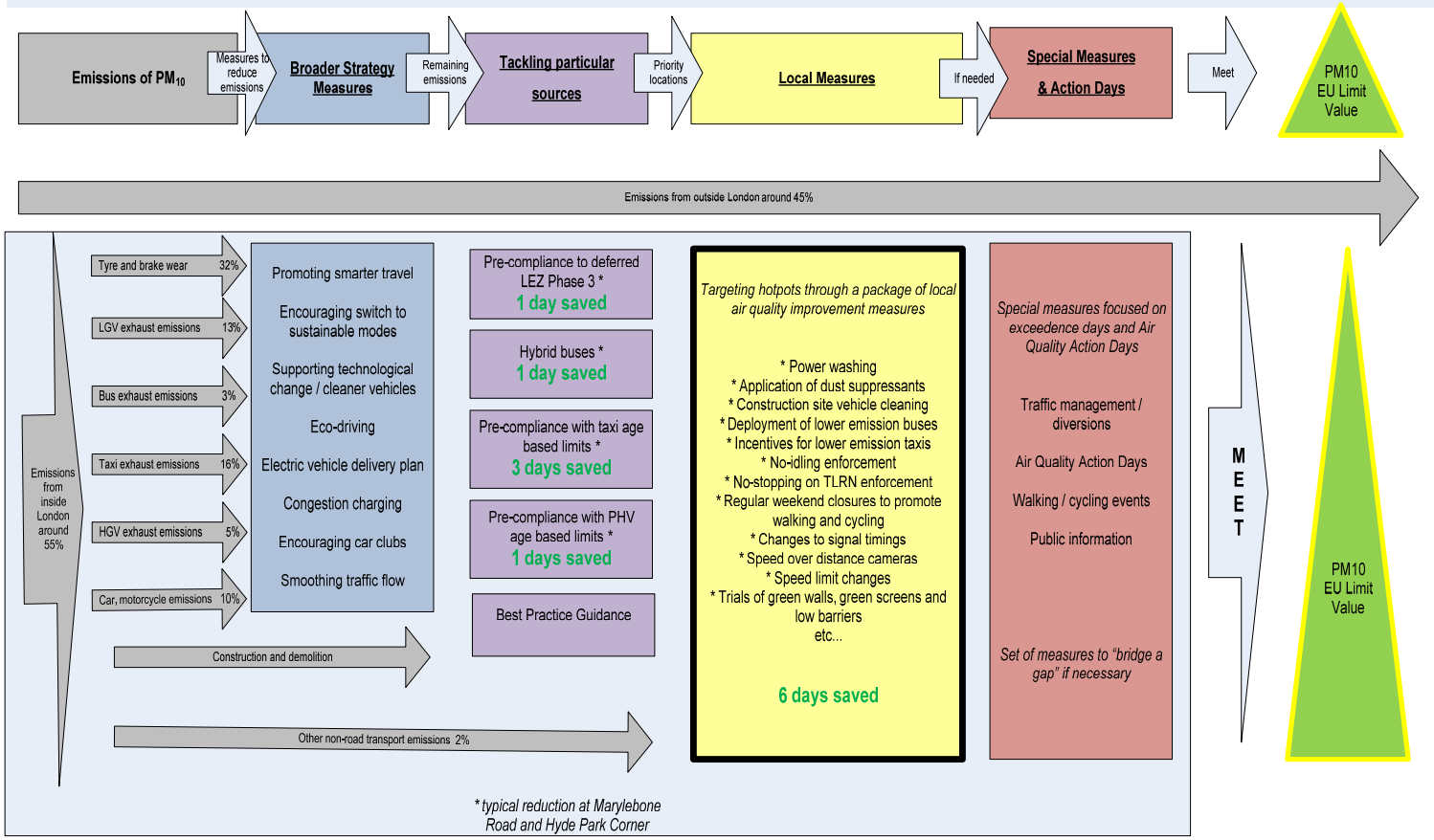
Figure 5.4 below shows projected compliance in London with the daily mean limit value for PM_{10} in 2011 (indicated concentrations at road centre have been removed). At some locations where the margin of compliance will be narrow, the Mayor considers that locally targeted measures should be implemented to provide greater confidence of compliance in 2011 (as set out in Policy 3). The impact of these measures, however, is not shown in Figure 5.4 below.

Figure 5. 4 PM_{10} annual mean concentrations for 2011 ($\mu g/m^3$) with full implementation of the Strategy



Evidence from other European cities suggest that local measures could reduce concentrations of PM_{10} at a local level by around ten to 20 per cent, equivalent to reducing the number of exceedences of the daily limit value by around six days. Including heavier LGVs and minibuses in the LEZ, along with the measures included in this Strategy to reduce emissions from taxis, PHVs and buses are also expected to reduce the number of exceedence days at priority locations by around six days. Therefore the combined impact of the Strategy at these locations will be to reduce the number of exceedence days by around twelve. This is significant in the context of meeting the EU daily limit values for PM_{10}, where only a small number of exceedence days need to be removed at priority locations. This will provide greater confidence that the daily PM_{10} limit value will be achieved everywhere in Greater London by 2011. Policy 6 also sets out the special measures that they Mayor will consider taking on exceedence days. The flow chart overleaf shows the relative contribution of the various measures set out by the Mayor to reduce PM_{10} emissions in London.

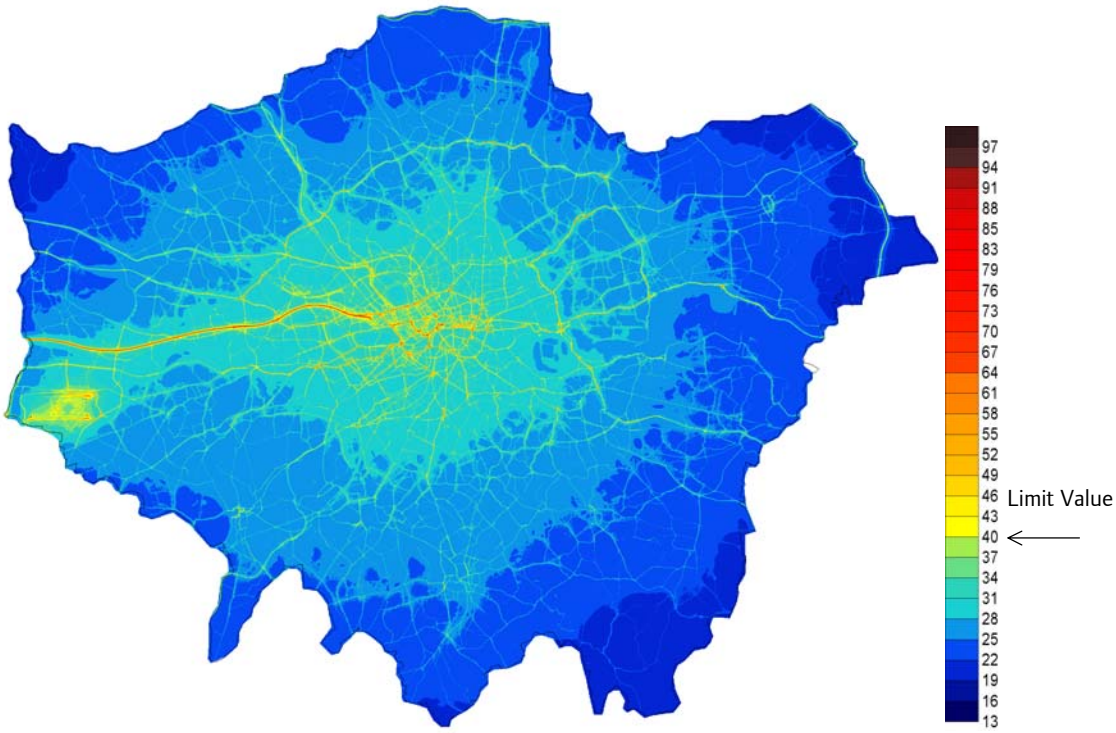
Reductions in emissions across London, from particular sources and in specific locations to meet EU Limit Values



Nitrogen Dioxide

This Strategy provides a significant step forward in reducing NO_x emissions within London, resulting in lower concentrations of NO_2 and health benefits for all Londoners. However, modelling shows that even with the scale of transport and non-transport measures detailed in this Strategy being implemented, there are still roadside locations in inner London and next to major roads, along with areas near Heathrow, which are expected to exceed the NO_2 limit values in 2015 (shaded yellow, red, orange and black in Figure 5.5). Locations further from the roadside of main roads including background and urban background locations are expected to meet the objective for NO_2 in 2015.

Figure 5.5 NO_2 annual mean concentrations with full implementation of the Strategy in 2015



Modelling indicates that the measures included in this Strategy (those that are quantifiable) together with natural fleet turnover will reduce the number of roads in London which would exceed the EU limit value in 2015 by between ten and 15 per cent, providing a significant improvement in air quality.

At some locations closest to major roads, limit values will be exceeded to such an extent that a further reduction in emissions of 80 per cent would be needed to meet limit values for NO_2. The Mayor will work closely with boroughs through the LIP process to explore options and develop potential local interventions for emissions reductions at these locations, as set out in Policy 3. However, for most roads still exceeding limit values, a reduction of on average 4 $\mu g/m^3$ – which is roughly equivalent to a further reduction of NO_x emissions of 20 per cent - would be needed to meet NO_2 limit values in 2015.

NO_2 is a national issue requiring further action from central Government. This Strategy includes policies for encouragement to be given to central Government and other organisations in developing a package of measures which together with the measures in this strategy will meet NO_2 limit values in London by 2015.

5.3 Delivering the Strategy

The Strategy includes a number of measures that are aimed at enabling Greater London to achieve European Union limit values for PM_{10} and NO_2 and ensuring that London's air quality continues to improve.

The Mayor, through the GLA and the functional bodies, will be directly responsible for delivering a number of the measures included in this Strategy. For example:

- The transport policies in this Strategy will principally be delivered through the Mayor's Transport Strategy.
- Both TfL and the LDA are investing millions of pounds in urban realm improvement projects, which will include measures to improve air quality.
- The LDA is delivering major energy efficiency schemes for homes and workplaces.
- All the functional bodies are making their buildings more energy efficient and their vehicle fleets cleaner.

Other organisations, notably central Government, boroughs and businesses will need to take action if EU limit values are to be achieved in London.

The Mayor is aware that many of the objectives and proposals set out in this Strategy can only be delivered by working with other organisations and individuals. Importantly, many

of the measures are aimed at helping individuals make small but significant changes to their behaviour

The Mayor, through the GLA and the functional bodies will: promote understanding and awareness of air quality issues; provide a framework for action and implementation; fund specific measures; supply information, technical advice and support; and press for wider support and change from, among others, central Government. This section describes how the Mayor will work in partnership with other organisations. Appendix A sets out in more detail which organisation will take the lead on each of the proposals included in this Strategy, as well as an outline timescale for implementation.

Policy 13 – Working with central Government

Policy

The Mayor will encourage the development and implementation of action plans by central Government and other authorities aimed at achieving EU emissions (PM_{10} and NO_2) limit values in Greater London

Proposals

- The Mayor will encourage central Government to develop and implement a national plan that will contribute to further reductions of NO_x emissions in Greater London and reduce the level of NO_x emissions from outside London that contribute to poor air quality in the capital.

- The Mayor will encourage central Government to identify and allocate additional resources that can be made available to fund the measures included in this Strategy for achievement of EU limit values in London.

Outputs

Joint working between the Mayor and the Government that will lead to improved air quality in London.

The Mayor has been working closely with the Government to develop measures that will improve air quality in London. London has a small number of locations at which there is a risk of the PM_{10} limit values not being achieved but modelling suggests that the measures included in this Strategy will allow air quality at all locations in London to be compliant by 2011.

The GLA's modelling, however, shows that even with affirmative action by the Mayor, many areas of inner London and Heathrow exceed NO_2 limit values and are at risk of continuing to exceed those limit values in 2015. NO_2 is also a problem in most urban areas in the UK, so national measures are needed to address this problem. During 2010/2011, it is expected that the Government will submit an application to the European Commission for a time extension until 2015 for the NO_2 limit values. The Mayor will work closely with the Government to develop a joint plan that will ensure that the NO_2 limit values are achieved in London by 2015.

The Mayor will discuss with Government how it can help to fund and deliver measures in this Strategy. The current GLA and functional body settlement from Government did not include provision for this level of action on improving air quality. Over the coming months, the Mayor will continue to work with Government to develop a joint action plan for air quality in the capital to ensure this is adequately resourced.

The Mayor has limited scope over the extent to which he can influence the type of vehicles using London's roads. In addition, the Mayor has no power to reduce the emissions that originate from outside London that contribute significantly to London's poor air quality. As well as action better suited to the national level (for example using the tax regime to further incentivise cleaner vehicles and remove perverse incentives for more polluting vehicles), specific support is needed from central Government to facilitate measures within Greater London, such as a national certification and testing scheme for NO_x abatement equipment to enable a NO_x standard to be introduced to the LEZ. The Mayor will therefore encourage central Government to put in place a number of measures, including:

- **Extended scrappage schemes for particular vehicles** - In 2009, the Government introduced a vehicle scrappage scheme to stimulate the national car market. The scheme, which allowed up to 400,000 older vehicles to be replaced, involved the Government giving a £1,000 grant to motorists of cars over ten years old and vans over eight years old. The Mayor has asked that the Government extend the scrappage scheme, so that it would target vehicles that contribute significantly to pollution in urban areas, including heavier vans, minibuses and taxis. This would support the introduction of LEZ Phase 3 in 2012, as well as the proposed introduction of age-based limits for taxis.

- **Grants for vehicle retrofit** – Vehicle retrofit is a cost-effective means for many operators of heavy vehicles (HGVs, buses and coaches) to make their fleets cleaner. Since these vehicles are the most individually polluting, a Government scheme that encouraged retrofit would significantly improve air quality in urban areas, particularly if linked to LEZ schemes or tax incentives. British companies are market leaders in vehicle retrofitting technology and a scheme that encourages retrofitting would assist the continued growth of this sector of British industry. The Mayor has asked the Government to consider the introduction of such a scheme.

- **Consumer labelling schemes for vehicles at point of sale** – Car showrooms now routinely include information about the CO_2 emissions levels of new vehicles. This has greatly enhanced public understanding of the impact of their buying decisions on the environment and has led to CO_2 levels becoming a factor in consumer choice. While all new vehicles have to meet Euro standards for emissions, these vary depending on the type of vehicle (diesel, petrol, hybrid etc.). The Mayor believes the Government should introduce a labelling scheme that informs purchasers of the actual emissions of NO_x and PM from a vehicle. This would help consumers make informed decisions based on the impact the vehicle would have on air quality, while raising public awareness of air quality issues.

- **Use of tax regime** – At present, the vehicle tax regime is focussed on reducing CO_2 emissions. This means that it can create perverse incentives in favour of diesel vehicles, which tend to have lower levels of CO_2 emissions, but higher emissions of PM and NOx. The Mayor encourages the Government to introduce an element into the vehicle tax regime so that it better takes into account emissions of CO_2, PM and NOx. The tax regime could also be used incentivise the early uptake of Euro standard and to incentivise vehicle retrofitting.

- **Euro standards** – Euro standards which regulate pollutant emissions from new vehicles, are the most effective way of ensuring air quality benefits result from natural fleet turnover. It is vital that the European Union pushes the development of further Euro standards (Euro VII/7) as quickly as possible. The Mayor will argue for this, but the Government needs to take an active role at the European level to accelerate Euro standards for all vehicle types.

- **Funding for development of low-emitting vehicles and related technologies** – Through its Plugged in Places programme, the Government recently announced £9million of funding to develop the infrastructure for electric vehicles in London. However, there needs to be significant increase in funding for development of electric vehicles and other low-emission technology such as hydrogen fuel cells, as well as the rollout of supporting charging and refuelling infrastructure.

- **Electrification of the London overground rail network** - In 2015, it is expected that the rail network will be responsible for 12 per cent of all NO_x emissions in London – around 4,000 tonnes. An electrification programme would reduce emissions significantly across London.

- **Reducing emissions from airport operations** – The Government should work with airport operators and the aviation industry to ensure that airside fleets are upgraded, more use is made of fixed electrical ground power and 'pre-conditioned' air so that auxiliary generators are not needed and continued improvements are made to aircraft efficiency.

- **Restructuring of funding for energy efficiency schemes –** The GLA Group is investing £100million in climate change mitigation and environment programmes over the next four years. These programmes require further investment to support achievement of the Mayor's targets for reducing CO_2 emissions and to reduce NO_x emissions. This will require the programmes to develop new financing and investment models that will enable them to attract the necessary levels of public and private sector funding. The Mayor is actively discussing the development of such models with industry, financial institutions, central Government and the boroughs. Changes to Government incentives and regulatory structures will be essential to deliver reductions in the percentage of NO_x being emitted by heating systems in buildings.

- **Extending the boiler scrappage scheme** – In 2010, the Government announced a boiler scrappage scheme. This entitles up to 125,000 householders with old, 'G-rated' boilers to £400 of the cost of a new 'A-rated' boiler. These 'A-rated' boilers tend to be more energy-efficient, so emit lower levels of NO_x. However, in order for the scheme to deliver significant benefits for both CO_2 and NO_x emissions. The Mayor believes the scheme should be extended to commercial properties.

- **Promoting the development and certification of abatement equipment for biomass boilers** – Biomass boilers are becoming an increasingly popular low-carbon heating option. However, in some urban areas with poor air quality, it will be necessary to limit air pollutant emissions from biomass boilers. PM abatement equipment for all sizes of biomass boiler is available on the market. However, to allow developers to have confidence that the equipment they buy will be effective and to allow planning authorities to be sure that suitable emission reductions will be made, the Government needs to develop a certification scheme for biomass boiler abatement equipment, in the same way that a certification scheme for PM vehicle abatement equipment has been developed.

- **New monitoring stations in London** – In recent years, monitored concentrations of NO_2 have not decreased in urban areas in line with modelling forecasts. New

monitoring stations are required to assist understanding of this issue, so that policies in urban areas can be more effectively developed.

- **Support for publicity campaigns** – The House of Commons Environmental Audit Committee has recommended that the Government should raise the profile of air quality issues by making clear the benefits of reduced pollution. These are most appropriately designed and delivered nationally. The Government should undertake information campaigns which highlight the health risks associated with poor air quality and which will help individuals to change behaviour.

- **Support for targeted information to vulnerable people** – Schemes such as airText which provide air quality information to people at risk of health effects related to pollution are vital in helping people manage their conditions. This could lead to cost savings for the NHS in terms of reduced need for treatment, and the Mayor encourages the Government to fund the expansion of such schemes and information campaigns. In particular, the Mayor has been seeking active engagement form the Department of Health and the NHS to ensure all vulnerable Londoners (such as children, elderly people and those with existing medical conditions) are aware of the impacts of air pollution and how they can manage their exposure to pollution. This requires a coordinated approach to information that does not exist at the moment.

In addition, the Government should take the lead on commissioning and supporting research projects. Knowledge gaps hinder effective policymaking. At the moment, for example, there is insufficient understanding concerning the sometimes unpredictable relationship evident between emissions and concentrations, the impact of tyre and brake wear on air quality and the air quality impacts of biofuel use. The Mayor will work with research organisations, including the Government's advisory group the Air Quality Expert Group to support research and trials that can contribute to the improvement of air quality in London.

Modelling shows that in 2015, a reduction in NO_x emissions of around 50 per cent from 2008 levels would allow NO_2 limit values to be met in the vast majority of London. The measures included in this Strategy, along with natural fleet turnover, will reduce NO_x emissions by 35 per cent by 2015. To close the remaining gap would require a further 7,000 tonne reduction in NO_x emissions in 2015 across London. The GLA's preliminary analysis indicates that the following measures (to be implemented by central Government and others) would close this gap:

- Electrification by Government of the overground rail network in London would save around 4,000 tonnes of NO_x emissions in 2015.

- Reducing airport emissions by 25 per cent would save around 1,000 tonnes of NO_x emissions in 2015. This would contribute significantly to making the area around Heathrow compliant with NO_2 limit values.

- Better use of the vehicle tax regime to remove perverse incentives for older diesel vehicles, along with incentives for early uptake of Euro standards and retrofitting could reduce emissions from road transport by around 10 per cent – amounting to 1,000 tonnes of NO_x emissions in 2015.

- The installation of more extensive measures through London wide home retrofit, as well as larger scale rollout of energy efficiency schemes in workplaces, could save over 1,000 tonnes of NO_x in 2015. This will require more effective delivery and financing structures being enabled by the Government.

Together with the proposals in Chapters 3 and 4 of this Strategy, and reduced pollution blown into London from outside the capital as a result of national measures, the measures listed above would lead to all of outer and inner London being compliant with NO_2 limit values in 2015. This would mean that only a few locations in central London would still be in breach of NO_2 limit values in 2015. At these locations the Mayor is proposing further close joint working with the Government and boroughs to apply targeted local measures to ensure limit values are met. The overall approach would be similar to that taken on PM_{10}. However, the measures would be targeted more on NO_x at sources, including targeted programmes for roads and the adjoining built environment in the affected areas. The end results of all these interventions would deliver NO_2 compliance by 2015, but it must be strongly emphasised that implementation at pace and with adequate resourcing will be absolutely vital to deliver these results.

Policy 14 – Working with boroughs

Policy

The Mayor will assist, where possible, boroughs in carrying out the exercise of their statutory duty to improve air quality in London.

Proposals

- The Mayor will use the Local Implementation Plan (LIP) process to ensure that air quality improvement measures are included in borough transport plans.
- The Mayor will consider with boroughs any changes to the Local Air Quality Management process which would improve delivery of air quality improvement measures in London.
- The Mayor, through the GLA and the functional bodies, will organise workshops and participate in borough forums to share best practice on air quality improvement measures and to ensure close joint working at locations with high pollution concentrations in particular.

Outputs

Comprehensive borough plans to improve air quality which are consistent with the Mayor's Air Quality Strategy.

The Mayor has a statutory duty to improve air quality in London, and it is therefore his responsibility to set the strategic direction for London. However, many of the measures included in this Strategy need to be implemented by London's boroughs. Air quality policy cuts across a number of different policy areas within boroughs, including the environment, planning, transport and health. It is therefore vital that air quality improvement plans are developed and implemented by all relevant departments of boroughs and the Mayor will promote this approach.

Reducing emissions from the transport network is key to improving air quality in London. This Strategy, together with the Mayor's Transport Strategy and London Regional Transport Plans will provide the overarching framework for the development of Local Implementation Plans (LIPs). However, it is important that the LIPs also link effectively with Local Area Agreements, Local Development Frameworks, Local Strategic Partnerships

and Air Quality Action Plans to ensure delivery of wider community and economic development priorities.

In light of the fact that road transport is the major source of both PM_{10} and NO_x emissions in London, borough teams dealing with transport and air quality need to work closely together. TfL's LIP Guidance to boroughs includes requirements for specific outputs that will ensure that air quality management and transport management are systematically joined up. These include:

- Cycle parking
- Electric charging points
- Cleaner local authority fleets
- Net increase in street trees
- Packages of measures to improve air quality at locations at risk of not meeting EU limit values for PM_{10} and NO_2.
- Inclusion of air quality improvement measures as part of traffic and urban realm improvement projects.

The transport measures implemented by boroughs to achieve these outputs should be included in their Air Quality Action Plans.

TfL is already working closely with central London boroughs to develop and implement the package of local measures for air quality priority locations. The Mayor will look to spread best practice when these measures are implemented so that they can be applied at other locations across London as necessary.

The boroughs and the GLA are working closely together to deliver the energy efficiency programmes (see Policy 9). Many boroughs have signed up to National Indicators that commit them to making energy efficiency improvements.

Boroughs will continue to be responsible for local planning processes, within the framework set by the London Plan. Through the requirements they set, boroughs can

ensure that new developments are 'air quality neutral' or better. The GLA will work with boroughs to assist in the development of methodologies that will allow an accurate assessment of the impacts on emissions of new developments and will provide advice on reducing emissions on-site (energy efficiency), off-site (transport impacts) and in the construction phase (see Policy 8).

London boroughs, like other local authorities in the United Kingdom, must adhere to statutory Local Air Quality Management (LAQM) processes. These set out procedures for assessing air quality and developing plans where air quality is deemed to be a problem. The Mayor is a statutory consultee for all the documents produced by boroughs as part of their LAQM procedures. This is the primary means by which the Mayor, through the GLA, monitors the actions taken by boroughs to improve air quality and ensures that they are consistent with his Air Quality Strategy. Ultimately the Mayor has powers to direct London boroughs in their air quality duties.

However, it is the Mayor's intention to use the LAQM procedures constructively as a means of sharing information on air quality issues and providing support. The GLA funds, and will continue to fund, a telephone and e-mail helpdesk for boroughs which provides advice on the formal LAQM process, assessment methodologies and air quality improvement measures. The Mayor's assessment of LAQM reports submitted by boroughs will also aim to provide constructive advice, rather than focusing on processes. Through the LAQM process, the GLA will ensure that best practice is widely communicated across the boroughs (see Policy 11). The Mayor will also encourage boroughs to revise their Air Quality Action Plans so that they are consistent with the Mayor's new Air Quality Strategy, once it has been published. It is particularly important that boroughs develop further measures to help meet the NO_2 limit values by 2015 and sooner if possible.

The Government's in-house policy consultants have recently published a review of the LAQM process across the UK[30] . This recommended few overall changes to the LAQM process but suggested that the GLA should discuss with boroughs a different pattern and content of assessment and reporting requirements in the capital, with the aim of enabling more effective action planning and implementation. Any potential changes could then be discussed with Defra. The Mayor will take this forward with boroughs.

There is a lot of excellent activity underway to tackle air pollution across London. For this reason, the GLA will organise annual workshops for exchange of ideas with and between boroughs. In addition, the GLA will offer to participate in air quality groups run by London

Councils and will offer to attend Air Quality Borough Cluster Group meetings, which address air quality issues at the sub-regional level.

Private Sector

Many of the measures in this Strategy will affect the business community in London. Fundamentally, it will make London a cleaner and more pleasant place for businesses and their customers. Some of these impacts will be as a result of incentives or disincentives introduced to encourage the use of cleaner vehicles, or more fuel-efficient driving and delivery practices. Other measures, such as the HEEP and BEEP energy efficiency programmes will be partly shaped and implemented by the private sector.

It is important that businesses recognise the economic benefits that can result from improved air quality. Many measures that encourage fuel efficiency, both in buildings and in vehicles, reduce bills and therefore save money as well as reducing emissions. Companies that actively aim to reduce their impact on the environment also tend to benefit from an improved image. Furthermore, London's economy will benefit from the healthier workforce that will result from improved air quality.

A report published by Ernst and Young[31] in March 2009 suggested that the Mayor's plans to make London greener could bring 10,000 to 15,000 jobs and contribute £600million a year to the capital's economy. Measures included in this Strategy, such as building retrofitting and developing the infrastructure for low-emitting vehicles, will develop the skills of the London workforce and keep London at the forefront of new, high-technology industries. This will allow London to maintain its edge over other cities in terms of attracting successful and innovative companies. Developing the green economy will not only improve health and quality of life in London, it will help to develop new industries and create new jobs in the capital. Measures in the Strategy will also help the UK maintain its reputation as a market leader in areas such as low emission vehicle technologies and pollution abatement technology.

Individuals

Many of the things individuals do every day – how we choose to travel or the type of car we drive - can contribute to air pollution. If each of us took just a few small actions such as using public transport instead of a car to go the shops or fitting insulation to reduce heat loss from the home, the cumulative effect would be enormous. A survey in 2009 showed that poor air quality was the second most important environmental concern for Londoners. However, often people are not aware of the impact their own decisions can

have in contributing to the problem. Many of the policies and proposals in this Strategy are designed to provide information and support to Londoners to help them make these decisions. As part of this process, during 2010, the GLA will develop a website which will provide practical advice to Londoners (see Policy 12).

5.4 Monitoring progress and reporting

Policy 15 – Monitoring progress and reporting

Policy

The Mayor will monitor changes to air quality in London and will take additional action where necessary to achieve the objectives of his Air Quality Strategy if necessary.

Proposals

- The Mayor, through the GLA, will make information about air quality in London available to the public on the GLA website in a clear format.
- The Mayor will publish an annual Progress Report on his Air Quality Strategy and will amend the Strategy should changes be necessary.

Outputs

Clear progress reports showing changes to air quality in London, allowing clear evidence-based policy making.

The Strategy sets out a range of initiatives designed to improve air quality in London. It also describes the complex technical nature of the challenges faced, including areas where the available information and level of scientific understanding are incomplete. It is important that progress towards meeting air quality limit values is monitored, and that the wider air quality community continues to fund research so that a truly collaborative approach to tackling poor air quality in London can be taken.

The Mayor, along with boroughs and other partners, supports an air quality monitoring network for measuring pollution concentrations at a range of sites across London. Air quality information is available in a number of formats, including real-time information on the Internet. The Mayor will consider ways to use the GLA website to make this information even easier for people to use and interpret. This will allow people in London to track London's progress towards meeting the air quality limit values.

The Mayor will also continue to fund the London Atmospheric Emissions Inventory, which will allow the actual impact of the policies in this Strategy to be quantified, alongside changes to wider factors influencing air quality in London (see Policy 11). The emissions inventory will also provide for future strategic and local air quality studies on behalf of the GLA and boroughs.

It will be important to monitor and report on the effectiveness of measures included in this Strategy. The GLA Act 1999 requires the Mayor to prepare a State of the Environment Report at least every four years, which must include information on air quality and emissions, particularly from road traffic. The GLA will also publish annually a more detailed Air Quality Strategy Progress Report from 2011 which will set out how measures have been implemented and show progress towards meeting limit values. The Strategy will be kept under continuous review and if it becomes clear that changes to the approach proposed are required, the Strategy will be revised at this time.

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Chinese

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Hindi

यदि आप इस दस्तावेज की प्रति अपनी भाषा में चाहते हैं, तो कृपया निम्नलिखित नंबर पर फोन करें अथवा नीचे दिये गये पते पर संपर्क करें

Vietnamese

Nếu bạn muốn có văn bản tài liệu này bằng ngôn ngữ của mình, hãy liên hệ theo số điện thoại hoặc địa chỉ dưới đây.

Bengali

আপনি যদি আপনার ভাষায় এই দলিলের প্রতিলিপি (কপি) চান, তা হলে নীচের ফোন্ নম্বরে বা ঠিকানায় অনুগ্রহ করে যোগাযোগ করুন।

Greek

Αν θέλετε να αποκτήσετε αντίγραφο του παρόντος εγγράφου στη δική σας γλώσσα, παρακαλείστε να επικοινωνήσετε τηλεφωνικά στον αριθμό αυτό ή ταχυδρομικά στην παρακάτω διεύθυνση.

Urdu

اگر آپ اِس دستاویز کی نقل اپنی زبان میں چاھتے ھیں، تو براہ کرم نیچے دئے گئے نمبر پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Turkish

Bu belgenin kendi dilinizde hazırlanmış bir nüshasını edinmek için, lütfen aşağıdaki telefon numarasını arayınız veya adrese başvurunuz.

Arabic

إذا أردت نسخة من هذه الوثيقة بلغتك، يرجى الاتصال برقم الهاتف أو مراسلة العنوان أدناه

Punjabi

ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Gujarati

જો તમને આ દસ્તાવેજની નકલ તમારી ભાષામાં જોઈતી હોય તો, કૃપા કરી આપેલ નંબર ઉપર ફોન કરો અથવા નીચેના સરનામે સંપર્ક સાધો.

GREATER**LONDON**AUTHORITY