Air quality action plan report 2009-2012

Camden

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CONTENTS

1 INTRODUCTION

1.1 National and Regional Air Quality Regulations

Protecting local air quality has a vital role to play in safeguarding public health and the environment, as well as enhancing quality of life for society. Medical evidence has demonstrated that exposure to air pollution is associated with a number of adverse health impacts and can reduce life expectancy by an average of 7 - 8 months. Poor air quality particularly affects the most vulnerable in society, the very young and older people and those with heart a lung conditions.

The latest Air Quality Strategy (AQS), released in July 2007, provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the Government to protect human health. The AQS objectives take into account EU Directives that set limit values which member states are legally required to achieve by their target dates. The objectives for ten pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide, particulates - PM_{10} and $PM_{2.5}$, and ozone) have been prescribed within the Air Quality Strategy based on the Air Quality Standards (England) Regulations 2007. The Objectives set out in the AQS for the protection of human health are presented in Table 1 on the following page.

The AQS introduces two new objectives to control very small sized particles - $PM_{2.5}$, which make up a proportion of PM_{10}. These fine particles have been recognised as posing the most harmful risk to human health. A new approach has been adopted in the AQS to tackle $PM_{2.5}$, known as 'exposure reduction'. The aim of this approach is to achieve more widespread reduction in particulate matter concentrations over a larger area of the population, rather than focusing on pollution hotspots. The Government has established a number of $PM_{2.5}$ monitoring sites in urban areas across the UK to determine compliance with the new objectives.

The AQS acknowledges the links between air quality and climate change, recommending a joined up approach for dealing with both issues. Carbon dioxide, the main green house gas responsible for climate change, shares common emission sources with air pollution, notably the combustion of fossil fuels for transportation, heat and power. Climate change is predicted to have direct and indirect impacts on human health, including potential negative effects on air quality.

The Mayor of London has a statutory duty to reduce the levels of the seven locally managed pollutants to achieve the Government's air quality targets. The Mayor of London's Air Quality Strategy, 'Cleaning London's Air', was published in September 2002 and outlines a number of measures focused on reducing NOx and PM10 emissions from road transport and buildings. A revised Air Quality Strategy for London should be published by the end of 2009. The Mayor has also set measures to improve London's air quality in the Transport Strategy, Taxi Emissions Strategy, Energy Strategy and the London Plan.

Table 1: Air Quality Objectives set out in the Air Quality Strategy

Pollutant	Air Quality Objectives		Date To Be Achieved By
	Concentration	Measured as	
Particles (PM_{10})	50 µg/m3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 µg/m3	Annual mean	31.12.2004
Particles [1]($PM_{2.5}$)	25 µg/m^3	Annual mean	2020
	15% reduction in concentrations at urban background	Annual mean	Between 2010 and 2020
Nitrogen dioxide	200 µg/m3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 µg/m3	Annual mean	31.12.2005
Carbon monoxide	10 mg/m3	Running 8-hour mean	31.12.2003
Sulphur dioxide	350 µg/m3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 µg/m3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 µg/m3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005
Benzene	5 µg/m3	Annual mean	31.12.2010
1,3-Butadiene	2.25 µg/m3	Running annual mean	31.12.2003
Lead	0.5 µg/m3	Running annual mean	31.12.2004
	0.025 µg/m3	Running annual mean	31.12.2008

[1] Local authorities are not required to include PM2.5 in their duties under Local Air Quality Management

1.2 Local Air Quality Management in Camden

The Environment Act 1995 gave local authorities duties and responsibilities that are designed to secure improvements in air quality, particularly at the local level. Part IV of the Act requires each local authority within the UK to periodically review and assess air quality in its area, and to determine whether the air quality objectives are likely to be achieved by the relevant target year. This approach is known as Local Air Quality Management.

Camden's last review and assessment of local air quality, carried out in 1999, determined that two of the Government's air quality objectives would fail to be achieved on time. These were the annual mean air quality objective for nitrogen dioxide (NO_2) and the daily mean air quality objective for particulate matter (PM_{10}). Road transport was identified as the main source of NOx and PM_{10} emissions. The Council subsequently declared the whole borough an Air Quality Management Area in 2000 and produced an Air Quality Action Plan in 2002.

Since 2002, the Council has continued to monitor and assess air pollution levels against the air quality objectives, and undertake the measures outlined in the first Air Quality Action Plan. Effective partnership work between internal departments and external organisations has been a central aspect of Camden's successful delivery of the Action Plan. Tackling poor air quality remains a challenging task given that Camden, like many other local authorities in London[2], continues to breach the air quality objectives for NO_2 and PM_{10}. The dominant source of NOx and PM10 emissions in Camden is road transport with a variety of other sources contributing emissions.

1.3 Local Government Performance Framework

From April 2009, the Council has to report against a number of 'environmental sustainability' national indicators (NIs) as part of the new local government performance framework, the Comprehensive Area Assessment. Of relevance to this report, these include:

NI 185	CO_2 reduction from Local Authority operations
NI 186	Per capita CO_2 emissions in the LA area
NI 187	Tackling fuel poverty – people receiving income based benefits living in homes with a low and high energy efficiency rating
NI 188	Planning to adapt to climate change
NI 194	Level of air quality – reduction in NOx and primary PM_{10} emissions through local authority's estate and operations
NI 197	Improved local biodiversity – proportion of Local Sites where positive conservation management has been or is being implemented
NI 198	Children travelling to school – mode of travel usually used

In respect of NI 194, Camden has to report on its NOx and PM_{10} emissions from its own transport services and buildings; as well as minimising these emissions from the services provided by our contractors. Camden is collating and reviewing emissions data associated with the Council's estate and operations to determine where to target the greatest emissions reduction.

[2] Traffic related Air Quality Management Areas have been declared by 30 of the 33 local authorities, all of which cover nitrogen dioxide, with 26 also covering PM10.

This work will be complemented by measures to reduce carbon dioxide emissions required by national indicators related to tackling climate change - NI 185 'CO_2 reduction from Local Authority operations' and NI 186 - 'Per capita CO_2 emissions in the LA area. On a more long term scale NI 188 - 'Planning to adapt to climate change', will involve an exploration of measures to address the impacts of changes in weather patterns on local air quality and how to safeguard public health.

1.4 About this Plan

This document presents a revised and updated Air Quality Action Plan for Camden. The plan brings together a variety of measures to help reduce particulate matter and nitrogen oxides emissions from various emission sources in the borough. In accordance with the Government's AQS, consideration has also been given to explaining how these actions will contribute to lowering carbon dioxide emissions, necessary for averting climate change.

2 SOURCES OF PM_{10} AND NO_x EMISSIONS

PM_{10} and NO_2 concentrations across the borough are affected by emissions from different sources produced within Camden and from sources outside of the borough. Understanding the sources of PM_{10} and NOx emissions plays an important role in determining what measures should be introduced to improve air quality. At a local level, Camden's primary role is to implement measures to minimise NOx and PM_{10}emissions produced within the borough.

2.1 Particulate Matter

Particles vary in size, with those measuring 10 micrometers (µm) or less referred to as PM_{10}. PM_{10} concentrations comprise particles from a variety of sources at a given location. Primary particles arise directly from natural and man-made sources. Natural sources include pollen, sea salt and sand particles. Man-made sources are predominantly produced from combustion sources such as motor vehicles, diesel trains, gas and wood fired boilers and bonfires. These particles are released in the fine size fraction – $PM_{2.5}$ (<2.5µm). Coarse sized particles (2.5-10 µm) arise from industrial processes, such as cement batching plants and construction and demolition work. These particles tend to have an impact close to the emission source. The wearing of vehicle tyres and brakes, plus the re-suspension of deposited particles on road surfaces have been the focus of increased attention as important sources of fine and coarse particle emissions in urban areas.

Secondary particles are produced from the chemical reactions in the atmosphere involving gases such as nitrogen oxides and volatile organic compounds. These exist as $PM_{2.5}$ and have a regional rather than local influence, dispersing over a wide area. Consequently, a large proportion of the particulate matter emissions in the UK arrive from Europe and on occasions more distant locations such as Africa and the United States.

Camden has carried out an analysis of the contribution of different emission sources to PM_{10} and NOx concentrations. PM10 concentrations in Camden comprise approximately 10-15% of emissions produced from different sources within the borough (direct emissions). The remaining 85-90% arise from regional background pollution sources originating from more distant locations across London and as far afield as Europe. 21% of PM10 emissions arise from vehicle brake and tyre wear.

The London Atmospheric Emission Inventory (2004) has been used to derive direct PM_{10} emissions from different sources in Camden, see Figure 1. Road transport is the largest source of particulate matter emissions (58%), followed by gas boilers used in homes and commercial buildings (24%). Road transport can be further divided into vehicle PM10 emission sources, with taxis and heavy goods vehicles contributing the greatest emissions.

Figure 1: PM_{10} Emission Sources in Camden

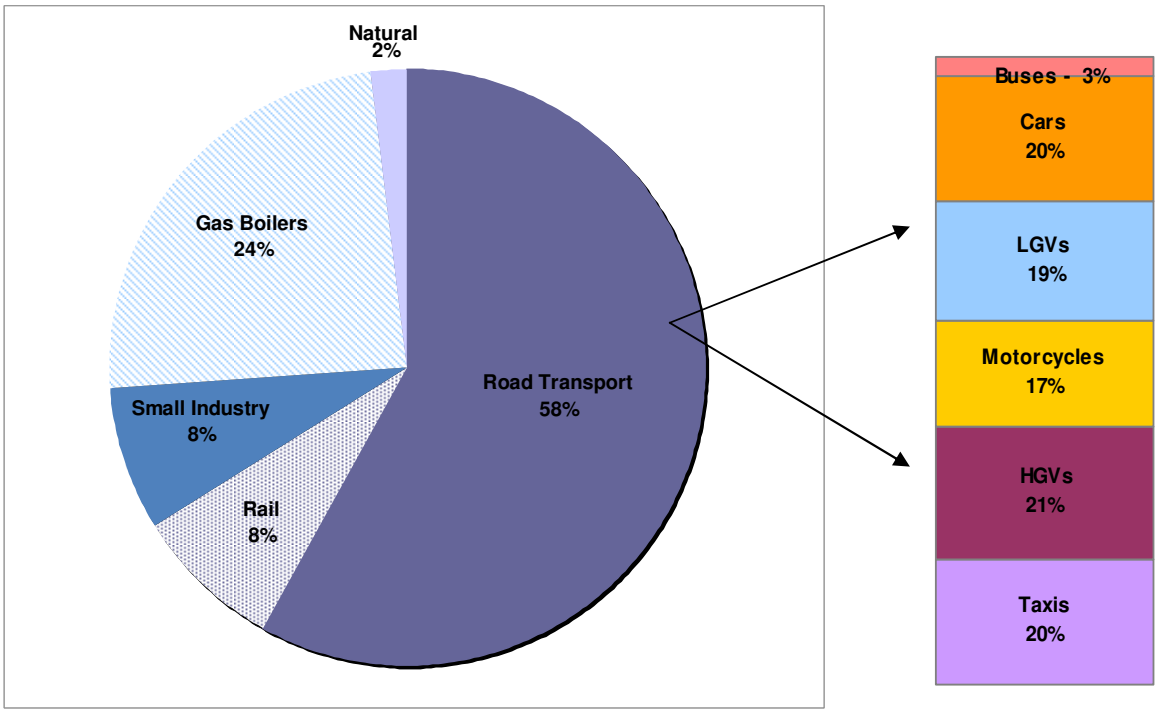
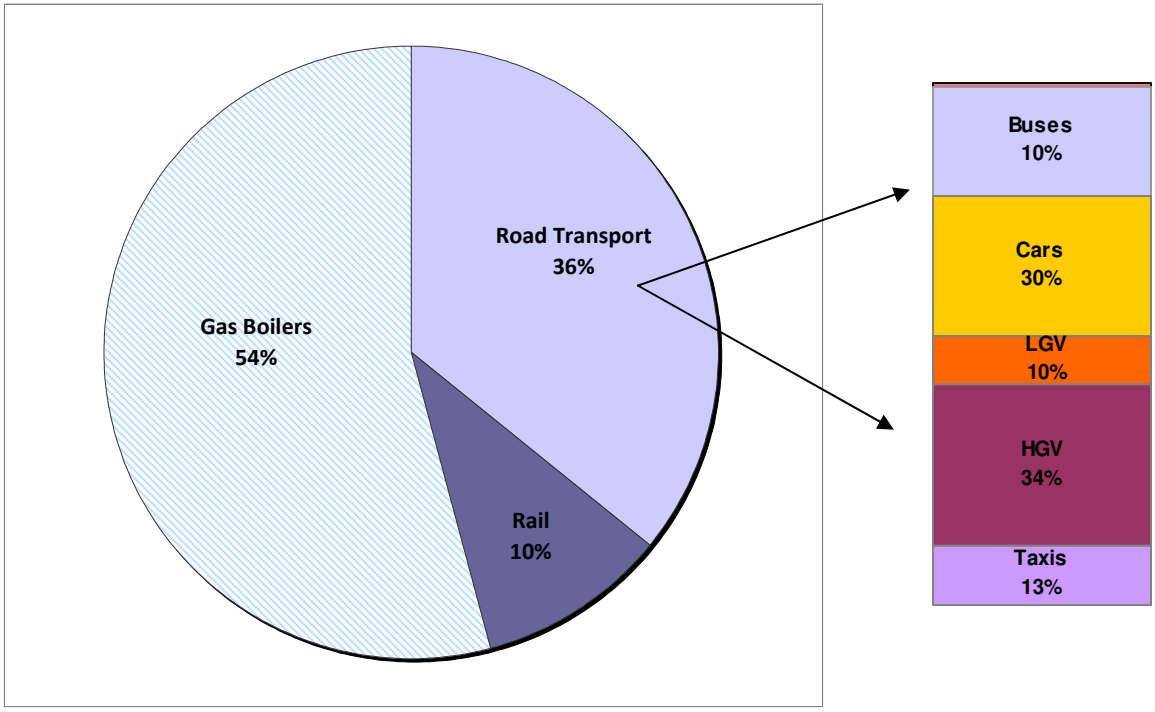


Figure 2: NOx Emission Sources in Camden



2.2 Nitrogen Oxides

Nitrogen oxides (NOx - including nitrogen dioxide and nitric oxide) are released directly from combustion sources such as vehicle engines and gas boilers. A larger proportion of nitrogen dioxide is formed in the atmosphere through chemical oxidation of nitric oxide.

During hot and sunny weather, NOx and volatile organic compound (VOCs) emissions (primarily produced by vehicles and industrial processes using solvents), react in the atmosphere to form ground level ozone. Ozone is one of the main constituents of photochemical smog, with higher concentrations in summer when sunlight and temperatures are higher.

Source apportionment work has identified that 60-70% of NOx emissions arise from direct sources produced within Camden, with the remaining 30-40% originating from the rest of London.

Figure 2 shows the proportion of NOx emissions from different sources in London using data from the London Atmospheric Emission Inventory (2004). The main direct sources of NOx emissions in Camden are gas boilers (54%), road transport (36%) and diesel trains (10%). The vehicle types responsible for the largest contribution of NOx emissions from road transport are cars and heavy goods vehicles.

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3 HEALTH AND AIR QUALITY

Medical studies have identified the impacts of air pollutants on public health, with the World Health Organisation providing the best information. In the UK the Expert Panel on Air Quality Standards (EPAQS) provides independent advice on air quality issues, in particular the levels of pollution at which no or minimal health effects are likely to occur. They have carried out a number of research studies with the Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP) to investigate the short and long term health effects of air pollution.

Poor air quality has serious implications for public health resulting in around 3,000 premature deaths in London each year. Between 157,000 and 319,000 people in London are exposed to PM_{10} and NO_2 levels above the air quality standards.

PM_{10} is of most concern to health as these particles are inhaled deeply into the lungs leading to heart and lung illnesses in sensitive individuals, including chronic bronchitis, and may cause premature deaths among those with pre-existing lung and heart illnesses. Respiratory conditions such as asthma can worsen when particle levels are elevated. Fine particles have been suggested to cause lung cancer, since cancer-causing chemical compounds in vehicle emissions can attach themselves to particles. These chemicals include poly-aromatic hydrocarbons (PAH) and certain metals. Particle emissions from diesel engines, released as $PM_{2.5}$, are linked with particularly harmful effects on health. $PM_{2.5}$ has been recognised as causing long term effects on the cardio-vascular and respiratory systems leading to reduced life expectancy. Health studies have been unable to identify a threshold concentration below which ambient particulate matter has no effect on health.

Nitrogen dioxide is most associated with harmful health effects on the respiratory system. At high concentrations, NO_2 can irritate airways and impair lung function, particularly for sensitive people such as asthma sufferers as their response to allergens can worsen.

3.1 Air Quality Bulletins

For most people, pollution levels in the UK are unlikely to cause any serious health effect. However, during particularly severe pollution episodes, eye irritation or coughing may be triggered. Certain sensitive individuals who are more susceptible to respiratory pollution may feel the effects at lower levels. These individuals include those who suffer from heart and lung disease, including asthma and bronchitis, especially young children and the elderly.

The Government has devised an Air Pollution Banding system. These bands have been set using the latest research on the medical effects of air pollution on health, and are intended to make air quality information more meaningful. Table 2 overleaf shows the four bands and their impact on the health of people who are sensitive to air pollution. These bandings are a useful and simple method to notify the public of air pollution episodes. Figure 3 shows that Camden predominantly measures PM_{10} and NO_2 levels in the Low air pollution bandings.

Air quality bulletins can therefore enable sensitive individuals (people who suffer from heart disease or lung diseases, including asthma) to take preventative measures when air pollutants are elevated, to avoid negative effects on their health.

Table 2: National Air Pollution Bandings System

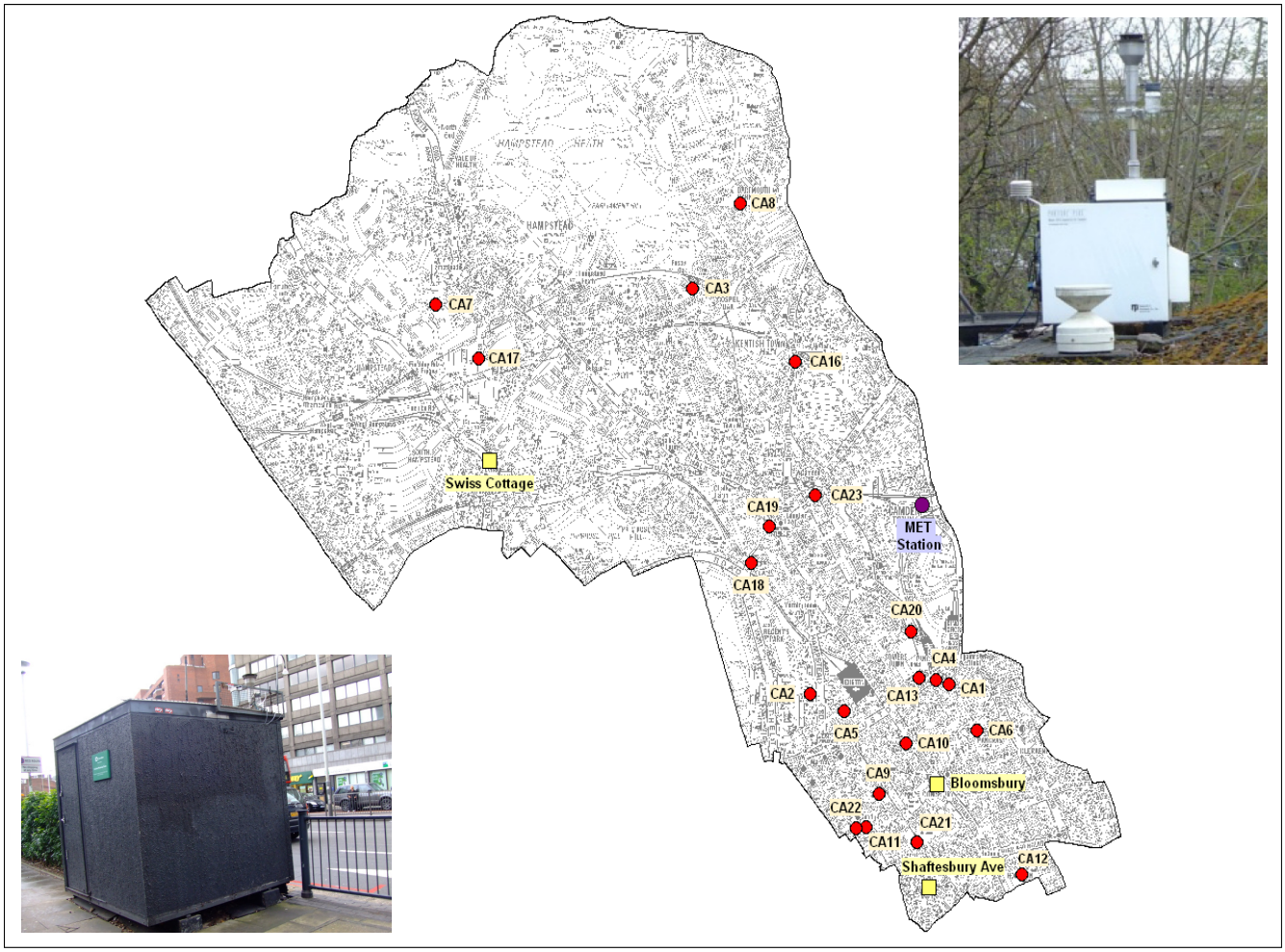
Band	Index	Nitrogen Dioxide (hourly) µg/m^3	Particulate Matter (24 hour) µg/m^3	Health Advice for People Sensitive to Air Pollution
LOW	1	0-95	0-21	Effects are unlikely to be noticed, even by people who know they are sensitive to air pollution.
	2	96-190	22-42	
	3	191-286	43-64	
MODERATE	4	287-381	65-74	Mild effects are unlikely to require action, but may be noticed by sensitive people.
	5	382-477	75-86	
	6	478-572	87-96	
HIGH	7	573-635	97-107	Sensitive people may notice significant effects, and may have to take action to reduce or avoid them (for example, by reducing time spent outdoors). Asthmatics will find that their 'reliever' inhaler is likely to reverse the effects of pollution on their lungs.
	8	636-700	108-118	
	9	701-763	119-129	
VERY HIGH	10	764 or more	130 or more	The effects on sensitive people, described for 'high' levels of pollution, may worsen.

4 AIR QUALITY IN CAMDEN

4.1 Camden's Air Pollution Monitoring Sites

Camden has been monitoring the air pollutants set out in the Government's Air Quality Strategy since 1992. The Council operates three automatic monitoring stations located at Russell Square Gardens (Bloomsbury), Finchley Road (Swiss Cottage) and Shaftesbury Avenue, in addition to twenty-four nitrogen dioxide diffusion tube sites in relation to Local Air Quality Management. Figure 3 shows the locations of these sites. Camden also carries out ad-hoc air quality monitoring related to research projects, assessing the impact of traffic management schemes and investigating dust complaints. Details of Camden's monitoring sites can be found in Appendix 1. In order to assist the interpretation of air pollution measurements, the Council operates a weather station at Camley Street Nature Reserve.

Figure 3: Map showing location of Camden's air quality monitoring sites.

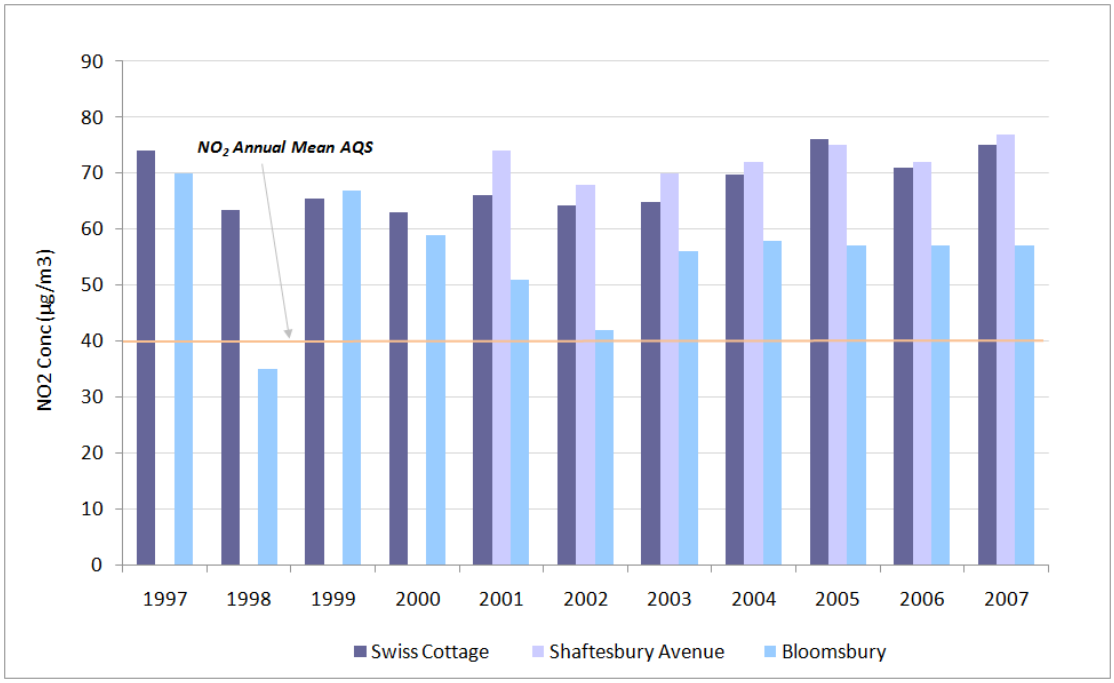


4.2 Trends in Air Pollution Levels

Camden has achieved the air quality objective for sulphur dioxide, carbon monoxide, lead, benzene and 1,3 butadiene. The levels of these pollutants have declined over the past ten years in line with reductions in emissions. This has mainly been attributed to the introduction of regulations stipulating improvements in fuel quality, the reduction of sulphur in diesel and lead in petrol, the fitting of vehicle exhaust emission control equipment, and the control of benzene emissions at petrol stations.

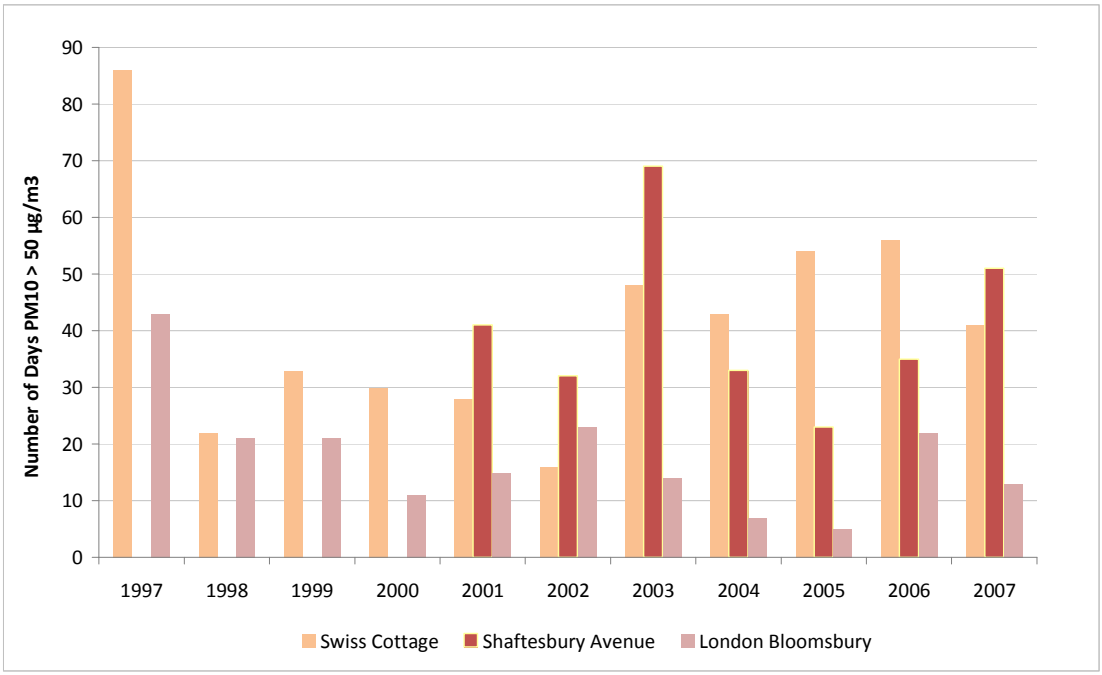
Long term trends reveal that Camden continues to breach the annual mean air quality objective for nitrogen dioxide and the daily mean air quality objective for particulate matter, see Figures 4 and 5. PM_{10} and NO_2 concentrations are highest at Camden's roadside monitoring sites (Swiss Cottage and Shaftesbury Avenue) highlighting the influence of road transport emissions on air quality in Camden.

Figure 4: Long term trends in annual mean NO_2 concentrations



Weather has an important influence on air pollution by affecting how emissions are transported and dispersed in the atmosphere. Under certain weather conditions, emissions are transported to London from Europe causing incidences of high air pollution, known as 'pollution episodes'. On other occasions, cold and stagnant weather prevalent during the winter months inhibits dispersion and leads to elevated air pollution concentrations.

Figure 5: Long term trends in number of days PM10 is greater than 50 µg/m^3



4.3 Future Air Quality

The Atmospheric Dispersion Modelling System (ADMS) has been used to predict air pollution concentrations in Camden for 2010, taking a snap shot of the south of the borough. Traffic emissions data used in the model has been based on the LAEI 2004 augmented with local traffic counts. Figures 6 and 7 overleaf show predicted nitrogen dioxide and particulate matter concentrations at a number of receptors located on some of the busiest roads around Bloomsbury.

The annual mean air quality standard for nitrogen dioxide (40 µg/m^3) is shown to be exceeded at all roadside buildings facades, with the highest concentrations predicted at certain junctions. The daily mean particulate matter air quality standard (50 µg/m^3) is breached at slightly fewer receptor locations. This modelling exercise reveals that improving air quality will continue to be challenging, especially at the most heavily trafficked part of the north and south of the borough.

Figure 6: Predicted Annual Mean NO_2 concentrations 2010

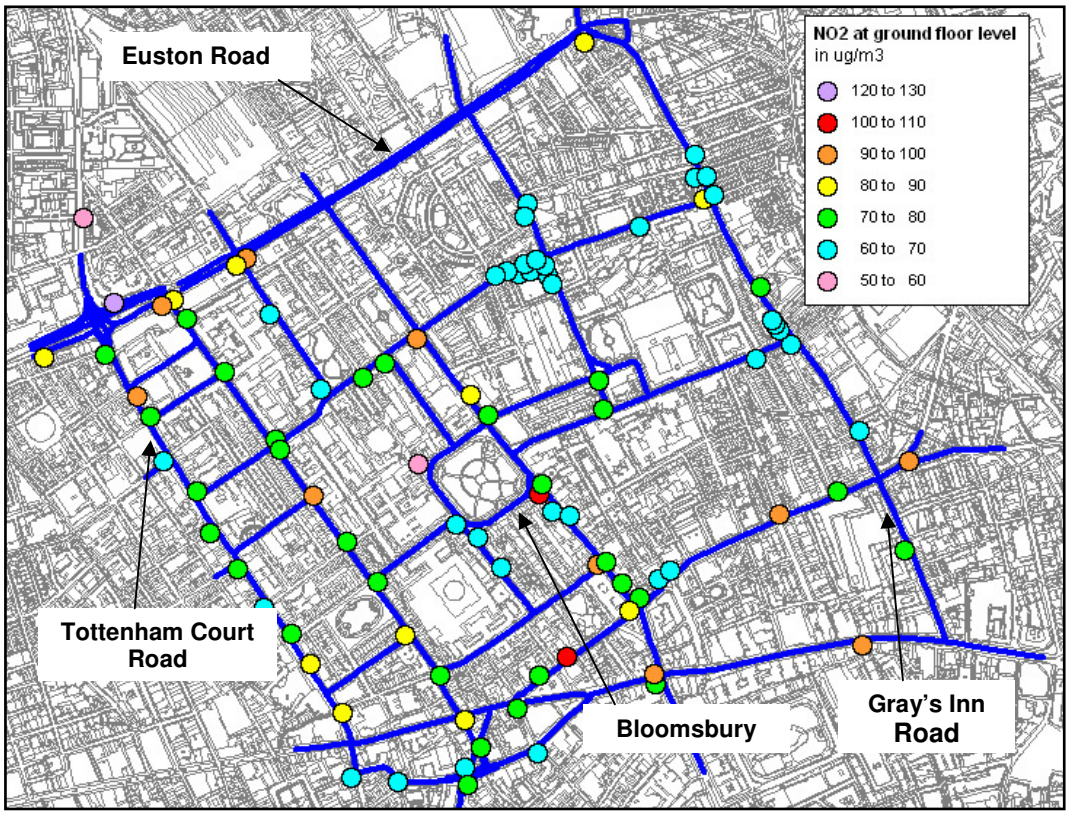
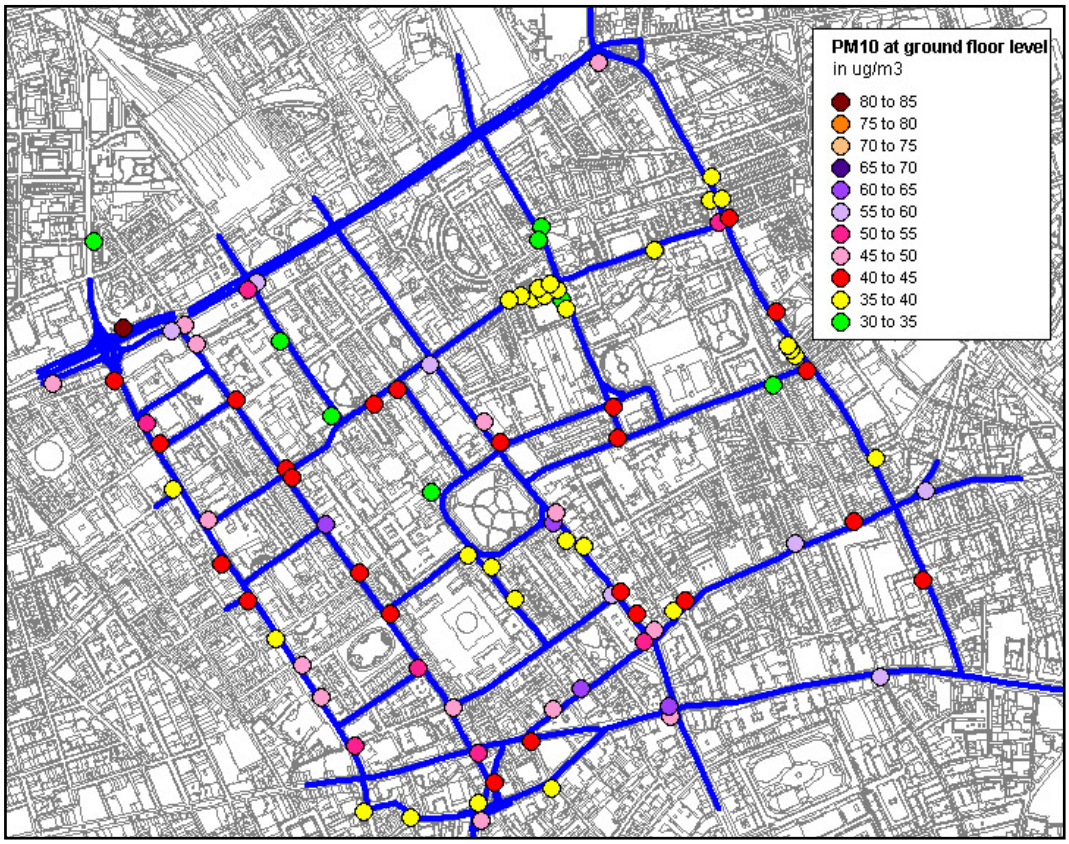


Figure 7: Predicted Daily Mean PM_{10} concentrations 2010



5 AIR QUALITY AND CLIMATE CHANGE

5.1 Links between Air Quality and Climate Change

Over the last century increases in man-made emissions of greenhouse gases[3], in particular carbon dioxide, have been associated with a rise in global temperatures. Scientists have predicted significant changes in the world's weather patterns if temperatures continue to rise over the next century, leading to climate change. For the UK, this could mean more extreme weather events, including hotter and drier summers, flooding and rising sea-levels leading to coastal realignment. This in turn could result in detrimental consequences to our society, economy and natural environmental.

Reducing greenhouse gas emissions is at the forefront of the Government's environmental agenda. The Climate Change Programme, published in 2006, sets out the Government's policies and priorities for action in the UK and internationally. The Climate Change Bill became law on 26th November 2008. This legislation introduces the world's first long term legally binding framework to tackle the dangers of climate change.

Air quality and climate change are intrinsically linked. Greenhouse gas and air pollution emissions (NOx and PM_{10}) share common sources, notably the combustion of fossil fuels for road transport, power and heat generation. Air quality is affected by many weather related factors, for example emissions of air pollution are commonly temperature dependent, transportation and dispersion is influenced by wind, chemical reactions in the atmosphere are effected by temperature and humidity. All these are in turn affected by a changing climate. Conversely air pollution has an impact on the climate directly and indirectly. Examples are provided below;

- Particulate matter is made up of a variety of different chemical components. These include sulphate and nitrate aerosols that reflect sunlight and heat, giving rise to a cooling effect on the planet.

- Increasing attention is being given to soot particles (black carbon) primarily released from diesel engines and wood burning appliances. Soot particles absorb the sun's energy and warm the atmosphere contributing to global warming.

- Ground level ozone is a strong greenhouse gas

Climate change will have an impact on local air quality. These interactions are complex and ingrained with a level of uncertainty, however the majority of expert sources predict the following effects[4]:

- Increased temperatures are likely to encourage the formation of ground-level ozone. This could have implications on human health as ozone is associated with a number of respiratory conditions.

[3] Methane (CH4), nitrous oxide (N20), carbon dioxide (CO_2), ozone, chlorofluorocarbons and water vapour.
[4] Climate Change and Air Quality, Air Quality Expert Group, 2007

- Climate change could impact on the likelihood of air pollution events by increasing the number and strength of summer highs and conversely the number and duration of calm winter days.

- Higher temperatures could make vulnerable people more sensitive to the impacts of poor air quality, exacerbating respiratory and cardiovascular health conditions.

- Warmer temperatures cause an increase in the release of volatile organic compounds from trees, leading to an increase in ozone formation.

A joined-up approach to reducing emissions from transport and energy sources will benefit local air quality and climate change. In some cases measures to mitigate climate change may conflict with local air quality. For example, various national and local fiscal measures aimed at mitigating climate change are incentivising fuel efficient vehicles which produce lower CO_2 emissions. However this presents a trade-off in terms of local air quality. Diesel vehicles are more fuel efficient than petrol, leading to lower CO_2 emissions per mile. However, diesel vehicles emit more particulate matter and nitrogen oxides emissions.

The Government's renewable energy policies support the increased uptake of biomass amongst a range of alternative energy technologies. This is primarily in response to reducing CO_2 emissions from fossil fuel use for stationary power, and transport in the UK. Biomass covers a range of solid, liquid and gaseous fuels that are derived from virgin and waste plant material such as cereal crops, trees, plant and vegetable oils and decomposed organic waste. The generation of renewable heat energy by biomass (solid wood) boilers at new developments is escalating in London due to certain planning policies. Whilst biomass boilers are considered highly attractive in terms of their carbon dioxide savings compared to other renewable energy sources, the burning of solid wood produces fine particle and nitrogen oxide emissions. Given that Camden, and the rest of London, is failing to achieve the Government air quality objectives for PM_{10} and NO_2, the potential impacts of additional pollution emissions from the wide scale use of biomass is concerning, and requires effective control in order to protect air quality.

The air quality impacts of emissions associated with bio-fuels (bio-diesel, bio-ethanol and biomethane) used to substitute diesel and petrol in road transport are also of interest to Camden. Bio-fuels deliver advantages and disadvantages in terms of reducing air pollution emissions from vehicles. For example bio-diesel is associated with lower carbon dioxide and particulate matter emissions but can give rise to an increase in nitrogen oxides emissions when compared to diesel. The Council recognises other concerns about the sustainability of bio-fuels (for example the destruction of tropical forests and impact of food supplies from land use changes associated with growing crops for biofuel production). The Council has gained an understanding of which bio-fuels deliver the greatest CO_2, PM_{10} and NOx reductions making use of life cycle analysis.

These types of conflicts and issues need to be carefully considered when setting policies and measures to address climate change.

5.2 Mitigating Climate Change in Camden

Mitigating climate change is a top priority for Camden and has been integrated into policies and plans across the Council including Camden's Sustainable Community Strategy and forthcoming Local Development Framework. *Delivering a Sustainable Camden*, LB Camden's Environmental Sustainability Delivery Plan 2008-2012, is the delivery plan for the commitments made in the Sustainable Community Strategy and includes an ambitious target of an 80% reduction in CO_2 emission by 2050, based on 1990 levels. In 2007, the Council commissioned SEA-Renue (now Carbon Descent) to produce a study to identify a route map for achieving long term CO_2 emission reductions. The study, "Delivering a Low Carbon Camden", concluded that:

- The greatest CO_2 reductions in the borough can be most cost-effectively achieved through the creation of large-scale gas-powered combined, heat and power (CHP) plants linked to district heating networks, serving large buildings, council estates and other nearby buildings. In time, biomass-powered CHP and building-scale CHP also create significant reductions, and by 2050, photovoltaic (PV) panels would also contribute significantly. Road transport policies can also contribute by reducing motor traffic and by encouraging more low-carbon vehicles.

- Camden's existing target of a 60% reduction in CO_2 emissions can be met through technological means in a financially viable way.

- Higher targets, such as the 80% reduction target by 2050 would rely on both alternative technologies and fuels becoming available or on significant behavioural change to reduce demand.

Camden has included National Indicator 186 'Per capita CO_2 emissions in the LA area' as an indicator in its Local Area Agreement, with a target to achieve an 8.5% reduction on 2005 levels by 2010/11. Our NI 186 delivery plan includes new initiatives such as: an expanded borough-wide insulation programme for domestic buildings; enhanced sustainable travel initiatives such as an expansion of car club spaces in the borough; a communications campaign for residents, known as *Small Steps Big Difference*, involving a "Virtual Eco-centre"; and a sustainability network for private, public and voluntary sector organisations via the Camden Climate Change Alliance, which uses the *Better Climate for Camden* brand. In parallel to the 3 year NI186 delivery plan, the Council is actively exploring opportunities for promoting and implementing decentralised energy projects in order to help us meet our longer term CO_2 reduction targets.

6 AIR QUALITY ACTION PLAN - OBJECTIVES AND MEASURES

6.1 Introduction

This revised action plan identifies the most up to date initiatives being implemented by Camden to reduce NOx and PM_{10} emissions from four main emission sources – road transport, gas boilers, new developments and small industrial processes.

An integrated approach to improving local air quality and mitigating climate change has been adopted in the new Air Quality Action Plan. This will help to ensure that policies and initiatives related to air quality and climate change are balanced and harmonised across the Council. Attention will be given to ensuring that local transport, planning and energy policies related to reducing carbon dioxide emissions do not have a negative impact on air quality and vice-versa. In the long term, tackling these environmental issues together will achieve greater cost savings and health benefits, compared to pursuing both issues separately.

Camden will demonstrate how ongoing progress is being made with delivering the new measures proposed in this action by using performance indicators. Where possible, Camden will quantify reductions in NOx and PM_{10} emissions.

The key aims of the air quality action plan are identified below:

- Lead by example and reduce NOx and PM_{10} emissions associated with our own buildings and transport services.
- Encourage reductions in fossil fuel use, the adoption of clean fuels and technology and promote energy efficiency.
- Raise awareness about air quality in Camden, making links with protecting public health and promoting lifestyle changes which can help reduce air pollution.
- Work in partnership with public and private organisations to foster improvements in air quality.
- Ensure measures which serve to reduce NOx and PM_{10} emissions complement actions to mitigate CO_2 emissions and vice-versa.

The Plan comprises four themes each with its own section:

1 Reducing transport emissions.
2 Reducing emissions associated with new development.
3 Reducing emissions from gas boilers and industrial processes.
4 Air quality awareness raising initiatives.

Each section explains the significance of the issue and outlines what is already being done, what our measures of success will be, the key actions the Council will take and how local people can contribute.

6.2 Supporting Plans and Strategies

A number of Council plans and strategies support the Air Quality Action Plan:

- The Unitary Development Plan 2006 is Camden's statutory development plan setting out the Council's planning strategies and policies. This will be superseded by the Local Development Framework in 2010.

- *Delivering a Sustainable Camden*, the Environmental Sustainability Delivery Plan 2008-2012, specifies the Council's policies and measures with regards to reducing CO_2 emissions, waste and other environmental impacts.

- The Local Implementation Plan is the Council's statutory transport plan, and sets out how Camden intends to deliver the borough's and the Mayor for London's transport objectives over the years to 2011.

- The Green Transport Strategy 2008-2012 outlines how the Council will deliver the borough's transport policies, programmes, and environmental objectives focused around reducing air pollution and carbon dioxide emissions.

- Camden's Walking Plan sets out the broader context for walking including health, community safety, and transport objectives alongside environmental targets.

- Camden's Cycling Plan includes proposals for the development of cycling within Camden.

- Camden's Parking and Enforcement Plan sets out policies designed to reduce inter-borough and intra-borough car journeys.

6.3 Working in Partnership

Partnership work is an essential mechanism to successfully delivering improvements in local air quality. Camden works closely with a variety of public and private organizations summarised below:

- **Clear Zones Partnership**

This is a Central London cross-borough partnership, involving the London Borough of Camden, Westminster City Council and the Corporation of London. The Clear Zones Partnership is one of the most successful sustainable transport initiatives managed by Camden, which is closely linked to reducing air pollution emissions from road transport and enhancing the urban realm.

- **Central London Air Quality Cluster Group**

Camden works in partnership with the Central London Air Quality Cluster Group (Corporation of London, London Borough of Islington, London Borough of Kensington and Chelsea, Westminster City Council, London Borough of Hackney and London Borough of Southwark) to undertake various air quality projects and respond to Government consultations related to technical and policy matters.

- **Central London Freight Quality**

The Central London Freight Quality Partnership (CLFQP) brings together the London Boroughs of Camden, Islington, Southwark and Lambeth; Royal Borough of Kensington and Chelsea; Westminster City Council and City of London Corporation, Transport for London (TfL), Central London Partnership and the freight industry; to address improvements in the reliability and movement of freight in Central London.

- **London Hydrogen Partnership (part of the Greater London Authority)**

Camden has worked in partnership with the London Hydrogen Partnership to carry out projects involving hydrogen fuel cells for transport applications.

- **Businesses**

Camden actively works with local business groups to deliver sustainable transport projects linked with the Clear Zones Partnership, and the *Better Climate for Camden* project. Air quality related initiatives are linked with these projects. *Better Climate for Camden* provides support through one-to-one business visits, workshops and events – to help businesses identify how they can reduce their impact on climate change through measures such as saving energy, green procurement, staff awareness schemes, reducing waste and using greener modes of transport. The project was originally funded by the London Development Agency but has now been mainstreamed into the Camden Climate Change Alliance and is available to all organisations in the borough - public, private and voluntary.

SECTION 1: REDUCING TRANSPORT EMISSIONS

Why this issue is important

Reducing NOx and PM_{10} emissions from road transport is one of the most important routes to improving air quality in Camden. Lowering the number of vehicles on our roads, easing congestion, encouraging residents and businesses to use less polluting forms of transport, and improving driver behaviour are key methods to reaching this goal. The Council is actively addressing these issues through a wide variety of measures focused around implementing a sustainable and efficient transport system. The measures are detailed in the Council's Local Implementation Plan, Green Transport Strategy, Walking Plan, Cycling Plan and Parking and Enforcement Plan. Examples of some of the innovative transport projects the Council is undertaking are shown in Appendix 3. The measures to reduce road transport emissions cover each of the vehicles emission sources identified in Figures 1 and 2 in the 2nd chapter of this report.

A proportion of PM_{10} and NOx emissions in Camden arise from road transport sources which the Council has no control over. These include London buses and black taxis which fall under the responsibility of the Mayor of London, and road transport emissions from major roads outside of borough. The Mayor has introduced a number of measures to improve exhaust emissions from Transport for London's vehicle fleet. In order to help lower PM_{10} and NOx concentrations across London, the Mayor introduced the Low Emission Zone in February 2008.

The rail service contributes approximately 10% of PM10 and NOx emissions in Camden. Although a large fraction of national railway lines currently operate electric trains, a minor proportion continue to use diesel. Investigating how diesel train emissions can be lowered will be addressed in the new action plan.

What is already being done

- Significant reductions in car use and increases in walking and cycling over the last ten years. Camden was awarded the 'Smarter Travel Borough' in 2008.
- Release of Travelfootprint – the first website in the UK showing people the air pollution and CO_2 emission impacts associated with traveling and buying a car.
- Expansion of car club membership reaching 4,050 members in 2008/09, with 92 car club spaces achieved by 2008/09.
- 70% (63 schools) of the borough's 89 schools have an approved School Travel Plan.
- 4,528 Cycle parking spaces required as part of developments
- Installation of five on-street charging points for electric vehicles, and the development of an electric website under the Newride initiative.
- Progressive environmental improvements in Camden's vehicle fleet, with over 70% of our own transport fleet comprising of clean vehicles (including LPG, electric and hybrid vehicles).
- The first local authority in the UK to trial a biomethane vehicle and operate a portable hydrogen fuel cell generator.

What the Council will do

Key Objectives - Reducing Transport Emissions

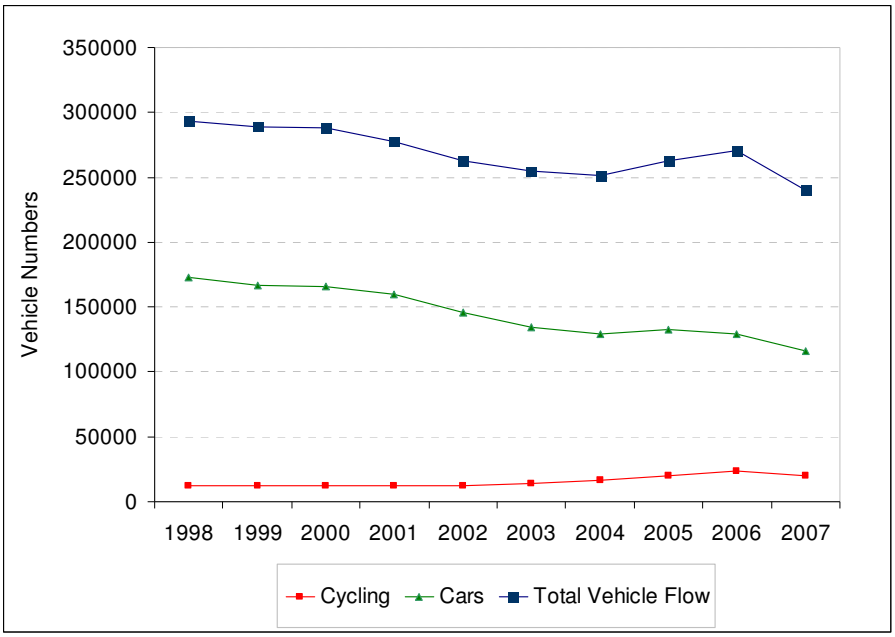
The Council has prioritised the following objectives for reducing NOx and PM_{10} emissions from road transport in Camden:

- Reduce traffic and encourage the use of sustainable transport.
- Encourage the adoption of low emission vehicles.
- Encourage changes in driver behaviour.
- Reduce the impact of freight vehicles.
- Improve understanding of diesel train emissions.
- Support initiatives introduced by the Mayor to reduce transport emissions across London.
- Reduce the Council's own transport emissions.

Objective 1 - Reducing Traffic and Encouraging the Use of Sustainable Transport

Camden has maintained an explicit aim to reduce levels of motor traffic in the borough for some years. The overall traffic and transport investment programme (Local Implementation Plan) in the borough is designed to improve road safety and encourage shifts to more sustainable modes of transport, something that evidence suggests is being achieved. The numbers of new pedestrian crossing facilities, cycle and bus facilities are an indication of this purpose. The Local Implementation Plan has committed to a 15% fall in motor traffic by 2011, from a 2001 baseline. Annual traffic counts show that by 2007, the fall in motor traffic had exceeded this, at 17%. Taken against the 1996 results, total motor vehicle flows have fallen by 25%, with private car numbers falling by over 37%, see Figure 8. Cycling numbers have risen by 64% since 2001. Heavy goods vehicles show an upward trend in line with the rest of London, indicative of increasing economic growth and the movement of freight, but the trends for other goods vehicles is less clear.

Figure 8: Trends in car, cycling and total vehicle flows in Camden



Since 1999, the London Borough of Camden has led the Clear Zones Partnership and delivered a range of sustainable transport projects in the Clear Zone, a specific area of Central London south of Euston Road to the Strand. The aim of the partnership is to reduce congestion, air and noise pollution and improve the urban realm. They achieve this by installing innovative technology such as of electric vehicle recharging points, developing useful tools to improve public understanding of less polluting forms of travel and implementing sustainable transport measures which encourage cycling and walking.

A number of main roads in Camden[5] are managed by Transport for London (TfL). These are classified as Red Routes and are characterised by the highest volumes of traffic. The Council has no direct powers over traffic management or road improvements on these road networks.

In order to help alleviate traffic in Central London TfL introduced the Congestion Charging Scheme in February 2003. In February 2007 the original Central London congestion charging zone was extended westwards, creating a single enlarged congestion charging zone. Traffic entering the charging zone was 21% lower in 2006 compared to 2002. By reducing the volume of traffic circulating within the charging zone and improving the efficiency with which it circulates, it has been estimated that between 2003-2006, NOx emissions have reduced by 17 % and PM10 emissions by 24%.[6]

Outlined below is a summary of the key initiatives Camden is undertaking to reduce traffic and promote sustainable transport within the borough.

- **Reducing Car Journeys through parking enforcement and transport planning policies**

Reducing car use, in particular short journeys, is an effective mechanism to ease congestion and improve air quality. Camden promotes a travel hierarchy of walking, cycling and use of public transport in preference to journeys made by car. The Council's parking enforcement policies have resulted in the whole of the borough being designated into controlled parking zones. This has been highly influential in reducing the number of cars in Camden.

The Council has been limiting private car use through the planning system. The integrating of land use and transport planning policies, delivered through the Council's Unitary Development Plan and forthcoming Local Development Framework, limits private car use through requiring car free and car capped developments. Supporting measures to reduce the need to travel include the requirement for new development to facilitate sustainable forms of transport such as cycling.

Measure - Camden will continue to require car free and car capped housing in new developments to limit journeys made by car.

[5] Euston Road, Finchley Road, Camden High Street, Camden Road, Hampstead Road
[6] Central London Congestion Charging, Impact Monitoring, 5th Annual Report, July 2007, TfL

- **Promoting Walking and Cycling**

The promotion of walking principally includes providing well-maintained, improved urban realm and cleaner footways, more space for walking and better crossing facilities, particularly at traffic signal junctions. Camden is working with other boroughs and TfL to improve signage through the Legible London project. Camden and the Clear Zone Partnership are implementing one of the first Legible London pilots in Bloomsbury and Covent Garden between 2008 and 2009. The Clear Zones Partnership is also undertaking a number of walking programmes focused on reducing traffic dominance and creating more pedestrian friendly environments.

Camden has made excellent progress with increasing cycling numbers whilst reducing the number of cyclists killed or seriously injured through road safety measures. The Council seeks to achieve 10% of journeys made by cycle by 2012. This will be achieved by implementing additional sections of the London Cycle Network and other cycling projects such as provision of secure cycling parking at transport interchanges, shops and other key locations. The Council also provides cycle training for school children.

Cycle facilities are an essential part of creating a culture of cycling in London similar to other European countries. The Clear Zones Partnership has just completed a study into the feasibility of implementing a cycle hire scheme in Central London, similar to the Velib scheme that has been implemented in Paris. Following the study, the cycle hire scheme is now being implemented in Camden and will be in place by May 2010.

Measure - Camden will continue to undertake measures to increase walking and cycling in the borough.

- **Camden's Travel Awareness Programme**

Camden's Travel Awareness Programme is aimed at providing information to the public to increase the use of sustainable forms of travel, in order to divert people away from using a car. This is primarily carried out under the DIY Planet Repairs initiative. The Better Climate for Camden project and the Clear Zone Partnership deliver seminars on travel awareness promoting the benefits of sustainable travel to local air quality and public health and reducing CO_2 emission.

Air quality officers participate in travel awareness events such as European Car Free Day and Walking Week. These events help promote various air quality initiatives such as AirText, Walkit, and the Travelfootprint website, as well as raise awareness about the links between sustainable travel and the benefits to air quality and health.

Measure - Camden will continue to undertake travel awareness initiatives and making links with improving air quality.

- **Encouraging the Adoption of Travel Plans**

Travel plans provide people with a range of useful actions to help reduce the need to travel by car and instead use more sustainable forms of transport. Camden is the lead borough for the North and Central Travel Plan Network (NCTN) which is a partnership of boroughs working together to develop travel plans with organisations in the private and public sector. To date NCTN has worked with over 100 businesses across the six boroughs, resulting in fifty approved travel plans in operation. Additionally, over 800 cycle parking spaces have been provided at workplaces as a result of travel plan development. Camden also manages a Transport Management Association in conjunction with the Holborn Partnership Business Improvement District, which delivers travel plans and transport solutions to businesses in Holborn.

Camden provides assistance to schools to produce a school travel plan with a strong focus on reducing motor traffic, encouraging walking and cycling, delivering travel awareness, parking enforcement and the engineering of safer routes to schools. Thirty-one out of ninety-one schools in Camden have now developed an active travel plan approved by the Department for Children Schools and Families (DCSF). Camden is working towards all schools in boroughs having an operational DSCF approved travel plan in place by 2009.

Measure - Camden will continue to work in partnership with schools and businesses to encourage the adoption of travel plans.

- **Increasing the Use of Car Clubs**

Car clubs have a number of beneficial features that help to reduce emissions associated with road transport. Primarily, car clubs reduce the number of cars on the road by reducing car ownership. UK studies suggest that each car club car typically replaces at least six private cars. Car club cars are usually recently registered vehicles and subsequently have among the lowest emissions of on-road vehicles in their class. Car club users typically give up owning a first or second car on joining, others defer purchasing one, preferring to use the car club vehicle instead.

Camden has been operating car clubs for over five years and since 2003 has permitted multiple car club operators to provide services in Camden. To date, Camden has 92 car club bays at over 50 on-street locations across the borough. Camden is piloting a multi vehicle car club scheme. The advantage of this scheme is that by offering a range of vehicles more people will become members.

There has been a great increase in the use of car clubs throughout Camden with car club members rising to 4,050 in 2008/09. The Council is seeking to increase the number of car club bays in the borough and carry out ongoing promotional work.

Measures - Camden will increase the number of car club bays across the borough and encourage more people to join car clubs.

Objective 2 - Encouraging the Use of Low Emission Vehicles

In conjunction with reducing levels of traffic, improvements in vehicle exhaust emissions are necessary to lower PM_{10} and NOx emissions from road vehicles. Benefits will also be gained in terms of lower carbon dioxide emissions. Low emission vehicles are those which emit the lowest amounts of NOx, PM_{10} and CO_2 emissions and are sometimes referred to as 'Green Vehicles'. This can be achieved using a number of different methods including lowering vehicle size, improving engine design and fuel efficiency, driving vehicles which meet the latest European Emission Standards and fitting pollution control equipment such as diesel particle traps. Certain vehicle technology can help reduce PM10 emissions arising from break and tyre wear such as hybrid vehicle which use regenerative breaking systems.

Low emission vehicles also include those which use clean fuels and alternative technology. Clean fuels include liquid petroleum gas (LPG), compressed natural gas (CNG) and certain biofuels including biomethane. Alternative technology covers electric, hybrid and hydrogen fuel cell vehicles. Camden is keen to adopt and promote low emission vehicles that co-benefit local air quality and mitigating climate change, as well as having the lowest environmental impacts in terms of their manufacture. This however is a complex issue, as different vehicle fuels and technology offer different benefits in terms of reducing air pollution emissions (PM10 and NOx) and greenhouse gas emissions.

In order to inform the Council's sustainable transport and vehicle fleet procurement policies Camden, through the Clear Zones Partnership, commissioned two research studies which compared the environmental impacts of clean vehicle fuels and technology using life cycle analysis. Life cycle analysis takes into account the manufacture, use and disposal of a product. The emissions included in the assessment were greenhouse gases and regulated air pollutants in particular carbon dioxide, nitrogen oxides and particulates.

Life Cycle Analysis of Vehicle Fuels and Technology Study, 2006 (Ecolane Transport Consultancy)

This study covered petrol, diesel, biodiesel, natural gas, liquefied petroleum gas, battery electric, hybrid electric and hydrogen fuel cell vehicles. The key findings were:

- Battery electric vehicles, recharged using renewably sourced electricity, have the least overall environmental impact, reduced by 70% - compared to a petrol baseline, with 100% reduction in NOx, PM_{10} and CO_2 emissions.

- Petrol hybrids perform second best with overall impact reduced by around 26%, air pollution emission reduced by 90%.

- Vehicle size is strongly correlated to overall environmental impact. Smaller vehicles have the least impact due to lower fuel use, and less materials and embodied energy during manufacture.

Informed by the results of this study, Camden and the Clear Zones Partnership are promoting the uptake of electric and hybrid vehicles as well encouraging the downsizing of vehicles.

Life Cycle Analysis of Transport Biofuels, 2008 (Sustainable Transport Solutions)

Increasing attention has been given to the role of biofuels in address rising carbon dioxide emissions from the road transport sector. The carbon benefits of different biofuels are commonly assessed using life cycle analysis. However, limited information is available relating to the life cycle air quality impacts of different biofuels; both during their production and from tail-pipe emissions.

A transport biofuels study was commissioned to compare the life cycle emissions impacts of three biofuels: biodiesel - produced from rape seed oil, palm oil and from used cooking oil (UCO); bioethanol - produced from wheat, sugar beet, and Brazilian sugar cane and biomethane - produced from organic waste, sewage waste and landfill gas. The main findings of the study where:

- Biomethane was the cleanest burning fuel, with reduced particulate matter (90%) and nitrogen oxide emissions (60%) compared to diesel.
- Biomethane, derived from organic waste on a site using combined heat and power plant, and biodiesel produced from used cooking oil, gave the greatest CO_2 savings of up to 85%.
- Biomethane had the lowest overall environmental impact. The production of biomethane from organic waste reduces the volume of waste sent to landfill, making this a sustainable biofuel with no damaging land use changes affecting bio-diversity or competing with the production of food crops like other biofuels.
- Bio-ethanol was shown to give marked increases in aldehyde emissions (precursors of ground level ozone), and bio-diesel a small rise NOx emissions.

The findings of Camden's transport biofuels study have shown that biomethane delivers lower PM_{10}, NOx and CO_2 emissions than other transport fuels, in addition to wider environmental benefits. The Council is including biomethane as a clean fuel in its vehicle fleet procurement policy. Camden is also keen to promote the use of biomethane by local businesses in their vehicle fleets.

- **Supporting the Use of Electric Vehicles**

Electric vehicles are particularly suitable for driving in urban areas like Camden where short distances are covered. These vehicles produce no air pollution emissions, extremely beneficial in terms of improving air quality. The distance that electric vehicles can travel is gradually increasing due to improvements in battery technology. Electric vehicles are exempt from the congestion charging scheme, pay no road tax (Vehicle Exercise Duty) and much reduced company car tax, receive free parking in many parts of Camden and the rest of London and free electricity for recharging the vehicle. This makes electric vehicles cheaper to run than diesel or petrol vehicles.

Recent research by the Government[7] has identified electric and plug-in hybrids vehicles as the most promising technologies that can help achieve significant reduction in CO_2 emissions from road transport in the UK, and deliver benefits to

[7] The King Review of Low Carbon Cars, Part I: The potential for CO_2 reduction, 2007

local air quality. The Mayor is supporting the expansion of electric vehicles in London and has provided funding for the establishment of a hundred electric vehicle charging points across the capital. An Electric Vehicle Working Group has been established by Transport for London to stimulate the advancement of electric vehicles in London. The members involve electric vehicle manufacturers, the GLA and local authorities including Camden.

Camden is taking a proactive role in supporting the uptake of vehicles through the Newride scheme, co-ordinated by the Clear Zones Partnership. Newride provides a network of electric recharging points to support a range of electric vehicles covering cars, scooters and bicycles. The core aim of Newride is to encourage people who need to use vehicles for essential journeys who live and work in the borough to use electric rather than petrol and diesel vehicles.

Camden currently operates twelve off-street recharging stations distributed between the NCP car parks at Drury Lane and Saffron Hill, Royal College Street and Bloomsbury Square. In July 2008, Camden introduced five on-street charging points through the Newride scheme. These are located in the south of the borough, occupying the Clear Zones area, at Red Lion Square, 8-14 Store Street, Malet Street - outside the University of London Union, Sardinia Street and 40 Charlotte Street.

Camden has produced an informative electric vehicle website, under Newride which identifies all the electric vehicle recharging points in London; see page 28. This website will be used with other communication initiatives to raise awareness about the benefits of electric vehicles, both in terms of their zero exhaust emissions and reduced operating costs.

In collaboration with the Clear Zone Partnership, Camden intends to introduce recharging infrastructure for large electric vans, such as the Modec and Smiths electric vans,[8] and plug-in hybrid vans. This type of electric recharging infrastructure could be an important step to incentivising the use of electric vehicles by local businesses that deliver goods around Camden, and the rest of London. More advanced hybrid passenger cars and light vans, known as plug-in hybrids, will soon be available,. A plug-in hybrid electric vehicle is a hybrid vehicle with batteries that can be recharged by connecting a plug to an electric power source. The infrastructure will be suitable for these types of vehicles as well.

Measure - Camden will increase the number charging points for electric vehicles across the borough and promote electric vehicles as part of the Newride scheme.

[8] Large electric vans operate using a large battery which requires 3 phase electricity, subsequently they cannot be recharged with the same infrastructure as electric cars based on single phase electricity

- **Supporting the Use of Bio-methane**

The use of biomethane as a vehicle fuel is a relatively new concept in the UK, even though a number of countries such as Sweden, Italy and Germany have been using biomethane in compressed natural gas (CNG) vehicles for a number of years as a substitute for natural gas (methane). Increasing the uptake of CNG vehicles powered by biomethane, especially in lorries, vans and private taxis, could help bring positive reductions in NOx, PM_{10} and reduce carbon dioxide emissions as these vehicles contribute a significant proportion of road transport emissions.

Raising awareness about the environmental benefits of biomethane as a road transport fuel, and providing refuelling infrastructure are essential routes to increasing the adoption of biomethane vehicles. Camden has installed a biomethane refuelling station at its transport depot in Kings Cross as part of a biomethane vehicle trial.

The Council will encourage local businesses which operate large vehicle fleets to adopt biomethane vehicles and install refuelling infrastructure; whilst making them aware of Government grant funding programmes. Camden will promote the benefits of biomethane vehicles to local businesses linked with the delivery of freight in the borough. The aim will be to encourage businesses to replace diesel with biomethane vehicles at the time of fleet replacement. This will be carried out through projects related to reducing the impact of freight.

Camden is keen to work in partnership with our contractors and local businesses to carry out biomethane vehicle demonstration projects. This will assist in gaining public confidence in the reliability and environmental benefits of biomethane as a transport fuel.

Measure - Camden will support the uptake of biomethane vehicles, and participate in a demonstration project with a local business.

- **Undertaking Hydrogen Fuel Cell Transport Projects**

Hydrogen fuel cells are emerging as an innovative alternative technology to replace polluting internal combustion engines in vehicles. A fuel cell is a device akin to a recharging battery which generates electricity by the electrochemical reaction of hydrogen and oxygen from the air. Hydrogen-powered fuel cells emit no air pollution exhaust emissions, only water, extremely beneficial for local air quality and addressing reductions in carbon dioxide emissions from motor vehicles. The use of hydrogen reduces society's reliance on fossil fuels and when used in a fuel cell produces electricity extremely efficiently. Hydrogen fuel cell cars are commercially available in Japan and the US, but not yet in the UK. The main challenges regarding the development of hydrogen fuel cell vehicles in the UK relate to practical issues surrounding the storage and transportation of hydrogen gas.

Camden, in partnership with the London Borough of Croydon, has procured a portable hydrogen fuel cell generator. This is a demonstration project to raise awareness about the application of hydrogen fuel cells for stationary power and transportation. The project is funded by Transport for London and supported by the London Hydrogen Partnership. The hydrogen fuel cell is based on 'Proton Exchange Membrane' (PEM) fuel cell technology and can delivery 5 kilowatts of electrical power. The fuel cell generator is housed in a trailer which is towed by

the Council's electric van to the location where power is required, making this power supply portable.

The fuel cell generator is being used to power roadside vehicle emission testing equipment, in addition to sound and lighting equipment at Camden's environmental events, including the Camden Green Fair and Car Free Day, as well as events organised with the London Hydrogen Partnership. This is a pioneering project as Camden is the first local authority in the UK to establish a hydrogen storage facility and deploy a portable hydrogen fuel cell generator.

Camden is keen to undertake further transport projects to raise awareness about the benefits of using zero emission hydrogen fuel cell vehicles. One of the projects Camden intends to carry out is to integrate hydrogen fuel cell bicycles into a local courier company's vehicle fleet and the Council's transport fleet. If the project proves successful in Camden, it will be expanded and deployed in neighboring boroughs.

Measure - Camden will work in partnership with private and public organisations to carry out hydrogen fuel cell transport projects.

- **CO_2 Emission Based Parking Charges**

Following the Life Cycle Analysis of Vehicle Fuels and Technology Study, Camden introduced a CO_2 emission based parking charging policy for residents in order to encourage the uptake of more efficient and smaller vehicles. Camden's differential parking permit scheme charges uses the DVLA's car tax classification bands. Cars registered before March 2001 will be charged based on engine size. The changes mean cheaper residents' parking permits for cars that emit lower CO_2 levels. If the electric vehicle uses renewably sourced electricity to re-charge their vehicles the permit is free.

Camden intends to regularly monitor this scheme to determine if there has been a shift in the types of vehicles residents are using. Care will be taken to ensure that the scheme does not encourage a marked increase in diesel vehicles, which are associated with lower CO_2 emissions. This would be counter-productive and conflict with local air quality policies which aim to reduce emissions from diesel vehicles.

- **Increasing Awareness about Low Emission Vehicles**

University College London carried out a research project in partnership with the London Borough of Camden in 2008, to investigate public perceptions of traffic emissions, low emission vehicles and air quality. The study revealed lead, carbon dioxide and carbon monoxide as the most cited air pollutants by respondents. Other traffic related pollutants such as particulate matter, nitrogen oxides and benzene where not mentioned. The public were aware of the phrase 'alternative vehicles' but had very limited knowledge of the different types of low emission vehicles.

This research project highlighted the importance of providing the public with simple information explaining the impacts of traffic emissions on air quality, health and the links with climate change. In addition, people need clear information explaining the environmental benefits of low emission vehicles to help encourage behaviour changes. Camden will use this research to formulate education and media

campaigns linked to promoting low emission vehicles, air quality and climate change.

Travelfootprint Website

Camden, through the Clear Zones Partnership, has created a unique website named Travelfootprint[9]. The website is designed to inform people about the air quality and climate change impacts of travelling and encourage the use of the least polluting forms of transport. The website features three emission tools which calculate the life cycle emission impacts of different methods of travelling. The methodology behind this website is based on Camden's life cycle analysis of vehicle fuels and technology.

The *'journey emissions tool'* allows the public to calculate the air pollution (NOx and PM10) and carbon dioxide emissions of a journey. The tool takes into account the main travel modes – driving, cycling, walking, rail, London underground trains, London taxis and flying, and identifies on a chart the emissions associated with each form of transport. This tool has proved useful for travel planners when demonstrating the benefits of sustainable travel and travel plans.

The *'vehicle emissions tool'* aims to encourage the public to buy the cleanest car models. This tool allows people to compare the PM_{10}, NOx and CO_2 emissions of up to five car models of their choice. An overall environmental score is also provided for each vehicle which combines air quality and climate change impacts. This presents a simple method to help people understand which of the car models are associated with the lowest environmental impact.

The '*fleet emission audit tool'* is aimed at businesses, assisting them to calculate the CO_2 emissions associated with their vehicle fleet. This webpage has a wealth of information about the environmental and financial benefits of 'green fleet management' practices.

Newride Website and Electric Vehicles

The Newride website[10]managed by Camden, through the Clear Zone Partnership, is the leading on-line information source for users and buyers of electric vehicles in London. The site includes an electric vehicle guide, details of electric cars, scooter, bicycle and light van models and UK dealers, and an interactive map showing all the electric vehicle recharge points in the capital. The provision of this information will help stimulate interest in procuring electric vehicles. The Newride website serves as a portal for electric vehicle users in Camden, Westminster and Islington who join the Newride scheme. Camden hopes the scheme will be rolled out across London and that other authorities will adopt the Newride branding in order to assist promoting the use of electric vehicles.

[9] http://www.travelfootprint.org
[10] http://www.newride.org

- **Encouraging Businesses to Adopt Low Emission Vehicles**

The integration of low emission vehicles in local business fleets can help lower PM10, NOx and CO_2 emissions from cars, taxis, vans and lorries. Camden's Clear Zone Partnership and the Better Climate for Camden team have organised a number of seminars for local businesses to encourage the uptake of clean fuels and alternative technology, the use of smaller vehicles and to raise awareness about the Low Emission Zone. This has involved Council staff and expert speakers from the Energy Saving Trust, Transport for London and the Low Carbon Vehicle Programme.

Camden will continue to raise awareness about the environmental and financial benefits of adopting low emission vehicles. Local businesses need to be confident that new vehicle fuels and technology are reliable and can perform to the same standard as diesel and petrol vehicles. Camden will ensure information is available to demonstrate the reliability of electric, hybrid and low carbon fuels, using data obtained from Camden's own vehicle trials.

Measure - Camden will provide guidance and information about low emission vehicles to residents and local businesses.

Objective 3 - Encouraging Changes in Driver Behaviour

Some vehicles create considerably more pollution than others depending on how the vehicle is operated and maintained. New vehicles are much cleaner than a decade ago; however, the benefits of improvements in vehicle technology can be offset by poor driver behaviour. This is characterised by aggressive and fast driving, leaving engines idling and poor vehicle maintenance. This behaviour increases fuel consumption in parallel with NOx and PM_{10} emissions, as well as CO_2 emissions.

- **Reducing Idling Vehicles**

Motorists who leave their engines running when parked cause unnecessary air pollution emissions. It is currently an offence to leave a vehicle engine idling for more than two minutes whilst parked under the Road Vehicle (Construction and Use) Regulations. From July 2002, local authorities were given powers to enforce these regulations. Authorised officers can ask drivers to switch their engine off if they are deemed to be letting them idle unnecessarily. If the motorist refuses to turn the engine off, a fixed penalty notice of £20 will be issued.

A number of hotspots have been identified in the borough where idling vehicles are an issue including outside schools, taxi ranks at St Pancras station and tourist locations where coaches are parked around Bloomsbury. Camden intends to undertake an awareness raising campaign at these locations to encourage drivers to switch of their engines.

Measure - Camden will undertake an awareness raising campaign to encourage drivers to switch off their engines.

- **Encouraging Smarter Driving**

Encouraging people to drive and operate their vehicle more efficiently benefits reductions in exhaust emissions. This is achieved by improving their driving skills (smoother driving, less harsh braking and smoother acceleration) and undertaking regular vehicle servicing (checking tyres, fuel filters and engine tuning) and carrying out journey planning. These measures are referred to as 'Smarter Driving'. Smarter driving has the potential to reduce fuel use by up to 15%, reduce air pollution and CO_2 emissions, and save money on fuel costs. Other measures which smarter driving measures include: allowing engines to warm up before driving, using air conditioning sparingly and reducing the weight of a vehicle (e.g. roof rack, unnecessary items in the car boot).

Camden will organise awareness raising initiatives encouraging residents and businesses to adopt smarter driving methods. Camden will explore working in partnership with a local driving school or private taxi company to promote smarter driving training. This will instruct drivers on low fuel consumption and low emission driving techniques.

Although vehicle emissions are checked by the MOT test, they often exceed acceptable levels due to low levels of service and maintenance by owners, as well as a degree of wear and tear between MOT tests. Camden has carried out voluntary vehicle emission testing in car parks and at roadside locations for some years with the assistance of the Vehicle Operating and Standards Agency (VOSA). The aim of this exercise is to increase the public's awareness of vehicle pollution, and to give advice on vehicle servicing and driving styles. Camden will continue to organise roadside vehicle emission testing, using their portable hydrogen fuel cell generator to power emissions monitoring equipment.

Measure - Camden will promote smarter driving to residents and businesses, and carry out regular vehicle emissions testing.

Objective 4 - Reducing the Impact of Freight Vehicles

London serves as one of the main corridors for the movement of goods (freight) across England, with central London being the Capital's commercial and retail hub. Consequently large volumes of traffic are concentrated on the Capital's strategic road networks. In Camden these roads experience the highest NO_2 and PM10 levels in the borough. Diesel lorries associated with the delivery of goods and services, typically contribute the highest emissions. London's planned increase in population and employment will result in an approximately 15% increase in demand for the movement of freight, placing further strain on Central London's overcrowded road network. Reducing emissions from freight traffic is vital both in terms of protecting air quality, and curtailing carbon dioxide emissions.

Camden is exploring freight projects with TfL, the Central London Freight Quality Partnership and the Clear Zones Partnership to minimise the emissions from lorries, vans and motorbikes:

- **Introducing a Freight Consolidation Centre**

Freight consolidation centers are advantageous as they minimise trips to deliver goods and fuel used thereby benefiting emission reductions. The Clear Zone Partnership intends to undertake a series of feasibility studies relating to the development of a freight consolidation centre within Camden.

Measure - Camden will investigate how a freight consolidation centre can be introduced in the borough.

- **Encouraging the Use of Bicycles**

Encouraging couriers to change mode from using motorised transport to walking and cycling has the potential to reduce delivery and collection trips. Initial estimates show that 75,000 van km could be saved per year. Camden is trialling one of the first bicycle freight projects in London. Camden's Clear Zone Partnership plans to undertake an investigation into establishing a cycle freight service in Central London. Research will also be carried to look at developing other kinds of green freight deliveries through partnership with local businesses including the use of electric tricycles and hydrogen fuel cell bicycles.

Measure - Camden will work in partnership with local delivery companies to encourage the use of bicycles instead of motorised forms of transport for delivery of light goods around central London.

- **Promoting Clean Vehicles and Smarter Driving**

Green fleet management is aimed at improving the environmental credentials of vehicle fleets operated by businesses. This covers the adoption of low emission vehicles, smarter driving and improving fleet operating efficiencies. Green fleet management can bring about cost savings, as well environmental benefits to businesses by lowering fuel usage.

Improvements in emissions associated with freight vehicles can be achieved by encouraging the uptake of clean fuels and technology in particular hybrid, electric and bio-methane in place of diesel vehicles, encouraging the adoption of smaller vehicles, encouraging the use of new vehicles which meet the latest Euro Standards and fitting pollution control equipment such as diesel particle traps.

In terms of promoting smarter driving there are two initiatives currently available for operator of light and heavy duty vehicles. The Freight Operators Recognition Scheme (FORS)[11], run by Transport for London, requires operators to adopt more efficient driving and operating practises. Camden intends to notify local freight operators about this scheme and encouraged them to become accredited. The second initiative, the Freight Best Practise Programme offers advice regarding saving fuel, fuel efficient driver training and improving operation efficiency which contributes to reduced exhaust emissions. This will also be promoted.

Camden intends to work with the Central London Freight Partnership to raise the profile of improving air quality through green fleet management to the freight industry in Camden and central London. This will be undertaken through various

[11] FORS is a free membership scheme for freight operators that provide a quality and performance benchmark for the freight industry by encouraging companies to prioritise safety and reduce their impact on the environment.

communication exercises. Links will additionally be made with FORS and the Freight Best Practise Programme.

Measure - Camden will work in partnership with the Central London Freight Best Partnership to promote cleaner vehicles and smarter driving to local freight companies.

Objective 5 - Supporting Initiatives Introduced by the Mayor of London

- **London Low Emission Zone**

In order to achieve reductions in PM_{10} and NOx emissions released from the most polluting vehicles, the Mayor of London introduced the Low Emission Zone (LEZ). The LEZ applies to all roads and some motorways across most of Greater London, and operates twenty-four hours a day 365 days a year. In order to drive within London the LEZ requires the heaviest diesel-engine vehicles (lorries >3.5 tonnes, minibuses, buses, coaches and vans) to meet strict European emissions standards for PM_{10}[12] or pay a daily charge. Operators achieve compliance with the PM_{10} emission standards by either procuring new vehicles or fitting exhaust emission control technology, such as a diesel particle traps. Operators who enter the LEZ with vehicles that fail to meet the relevant Euro Standards, and have not paid the daily charge are fined.

The LEZ is being implemented in four phases between 2008 and 2012. The first two phases focusing on large lorries, buses and coaches has been successfully implemented. A detailed analysis of the impact of the LEZ on air quality in London will be published by TfL during 2009/10. The Mayor has proposed to suspend the introduction of phase three which applied to vans and minibuses from October 2010. This has been decided in light of the current economic downturn and to alleviate the financial costs that would be incurred on van and minibus drivers to comply with the LEZ. (Phase 4 of the scheme will still go ahead).

- **Other Initiatives to Improve Air Quality in London**

The Mayor is undertaking a package of measures to compliment the LEZ and reduce NOx and PM10 emissions from road transport in London:

- Introducing 56 hybrid buses to the London fleet by the end of February 2009, and a further 300 by March 2011.
- Delivering 8 hydrogen hybrid fuel cell buses.
- £1million funding to trial low carbon technology in London's taxi fleet in March 2010 including micro-hybrid taxis.
- Supporting a fuel efficient driving campaign aimed at taxi and private hire drivers.
- Smoothing traffic flow to increase the reliability and predictability of journeys.
- Establishing an Electric Vehicle Partnership to support greater uptake of electric vehicles.

Camden intends to liaise with the Public Carriage Office (PCO) to encourage the adoption of measures which will reduce the impact of black taxis emissions at St Pancras Station. The Council would like to ensure that taxis which operate from

[12] Euro III for PM10 in 2008 and Euro IV for PM10 in 2012

the station meet the latest Euro Emission Standards and operate using clean fuels and technology for example biomethane or micro-hybrids. In addition the Council will request that driver training is improved to reduce the practise of leaving engines idling.

Measure - Camden will continue to support the full implementation of the Low Emission Zone and other measures introduced by the Mayor to improve air quality.

Objective 6 - Reducing Diesel Train Emissions

Within Camden are three of London's major railways stations, St Pancras Station, Kings Cross and Euston. Domestic high-speed journeys from London to regional cities are predominately undertaken by electric trains. However, a number of high-speed journeys from Kings Cross to Edinburgh and Newcastle are carried out using diesel trains which contribute both NOx and PM_{10} emissions. The rail industry has been required to meet strict emission standards for new diesel engines as part of EU regulations, and switch to sulphur free diesel by 2012. The Council is keen to understand what further measures train operating companies using St Pancras Station intend to put in place over the next five years to reduce emission from diesel trains.

Measure - Camden will request train operating companies using St Pancras Station to provide an action plan outlining measures to reduce diesel train emissions.

Objective 7 - Reducing the Council's Own Transport Emissions

Camden's transport fleet operates within a green fleet management framework which covers a range of initiatives aimed at reducing PM10 and NOx, and more recently CO_2 emissions. The Council's key objective is to keep the number of diesel vehicles in their fleet to a minimum and use a range of low emission vehicles, with efforts made to use the smallest vehicles capable of doing a particular service.

The Council has outlined specific timeframes for Camden's vehicle fleet to meet new Euro Emission Standards. In 2008, 82% of Camden's fleet met the Euro 4 emission standard, with 18% achieving Euro 3. Camden's larger vehicles are fully compliant with the requirement of the LEZ. The emission standards of Camden's fleet will progressively improve with the procurement of new vehicles. The Council regularly tests and services all its vehicles to ensure they continue to meet the correct emission standards.

In accordance with the national sustainability indicators for air quality (NI 194) and climate change (NI 185), Camden's transport services are monitoring fuel use, vehicle mileage and NOx, PM_{10} and CO_2 emissions associated with their vehicle fleet. Information on staff travel will also be gathered in addition to vehicle type, mileage and fuel use from Camden's major contractors. Performance targets will be set in order to make further emission reductions.

Camden's fleet transport service is working towards accreditation with the ISO14001 environmental management scheme, and adopts wider sustainability practises such as generating a proportion of electricity on site from photovoltaic panels.

- **Adopting Clean Vehicle Fuels and Alternative Technology**

Camden operates a fleet of approximately 300 vehicles, comprising a high proportion of low emission vehicles including 200 LPG, four petrol hybrid, six light duty electric vans and a heavy duty electric van.

Camden has introduced a fuel additive to their diesel fleet that improves fuel efficiency. Results from fleet trials carried out by the manufacturer indicate that the additive reduces particulate matter emissions, ultra fine particles, poly-aromatic hydrocarbon and NOx levels. The use of this additive will also assist Camden to lower CO_2 emissions due to savings in fuel economy.

Camden's fleet transport service is keen to trial and adopt emerging clean fuels and vehicle technology, particularly hybrid assist technology and biomethane vehicles.

Camden has been involved in a biomethane vehicle trial with a biomethane manufacturing company and Camden's waste contractor which uses CNG vehicles. The trial ended in April 2009 and provided some very positive results in terms of the performance and emissions benefits of biomethane. When compared to fuel consumption figures for a diesel vehicle, savings of between 53% and 59% CO_2 where achieved from the biomethane vehicle, and a 20% improvement in fuel consumption. A biomethane refuelling station has been installed at Camden's transport depot. The biomethane is produced from landfill gas derived from the decomposition of organic waste at a landfill site in Surrey. The landfill gas is cleaned and used as biomethane to fuel CNG vehicles.

Camden is participating in the Department of Transport's Low Carbon Vehicle Procurement Programme in partnership. This is a Government funded initiative aimed at stimulating the procurement of low-carbon vehicles in public sector fleets, including electric and low carbon vans. The will use the funding to expand the number of electric and hybrid vans in their vehicle fleet.

- **Undertaking Smarter Driver Training**

Encouraging smarter driving practises will bring improvements in fuel economy, and thereby aid emission reductions. Camden staff take part in the Safe and Fuel Efficient Driving (SAFED) driver training programme, and our corporate transport service is aiming to achieve Bronze accreditation under the Freight Operators Recognition Scheme (FORS).

Camden is using a CO_2 emissions monitoring system for smarter driver training. A display monitor has been fitted to the dashboard of one of the Council's vans which shows fuel consumption and CO_2 emissions to the driver as a vehicle is operated. The monitor will assist staff to understand how different driving practices affect CO_2 emissions and raise awareness about fuel efficient driving techniques.

- **Corporate Travel Plan**

Camden discourages staff from using cars for work related travel, and actively promotes walking, cycling and public transport. Staff have the opportunity to buy bicycles at reduced prices through Council's salary sacrifice scheme. The Council is also interested in procuring two hydrogen fuel cell bicycles. Camden offers other financial incentives to staff such as season ticket loans. The Council has reduced the number of pool cars in their fleet, and instead chosen to use local car clubs. The Council plans to investigate tele-working as a means of further reducing the need for staff travel. The development of joint work centres with other boroughs,

which allows employees to access computer facilities at remote sites from Camden offices, is another being considered. Camden intends to review its Corporate Travel Plan and introduce new measures to reduce staff travel by car.

- **Reducing Emission Associated with Contractors' Vehicles**

Camden is developing a vehicle fuel and technology hierarchy as part of the Council's tendering process, with zero emission electric vehicles on the top tier and diesel at the lowest level. Contractors' vehicles must also comply with the most recent Euro Standards. More emphasis will be placed on requiring contractors to use low emission vehicles which deliver reductions in NOx, PM_{10} and CO_2 emissions. Camden will also include requirements relating to smarter driver training. Camden will consider requiring contractors to achieve, or working towards achieving, Bronze accreditation under Freight Operators Recognition Scheme as additional operational and vehicle efficiency measures.

Measures - Camden will increase the proportion of low emission vehicles in their fleet, reduce fuel usage and carry out smarter driver training.

Camden will review their Corporate Travel Plan and introduce new measures to reduce staff travel by car.

Camden will create a green vehicle policy which sets vehicle size, fuel, technology and efficiency standards.

Table 3: Summary of objectives and action plan measures to reduce transport emissions

Objectives	Action Plan Measures Reducing Transport Emissions	Timeframe	Lead Department
Reduce traffic and improve opportunities to encourage sustainable transport	Require car free and car capped housing in new developments to limit journeys by car.	2012	SM/TP
	Undertake measures to increase walking and cycling in the borough		
	Undertake travel awareness initiatives and making links with improving air quality		
	Work in partnership with schools and businesses providing advice to encourage the adoption of travel plans		
	Increase the number of car club bays across the borough and encourage more people to join car clubs.		
Encourage the Use of Low Emission Vehicles	Increase the number charging points in the borough for electric vehicles and promote electric vehicles as part of the Newride scheme	2013	CZ
	Support the uptake of biomethane vehicles, and participate in a demonstration project with a local business.	2011	ST
	Work in partnership with private and public organizations to carry out hydrogen fuel cell transport projects	2013	ST
	Provide guidance and information about low emission vehicles to residents and local businesses	On-going	ST/CZ/TP
Encourage Changes to Driver Behaviour	Undertake an awareness raising campaign to encourage drivers to switch off their engines	On-going	ST/TP
	Promote smarter driving to residents and businesses, and carry out regular vehicle emissions testing.	On-going	ST/TP
Reduce the Impact of Freight Vehicles	Investigate how a freight consolidation centre can be introduced in the borough	2010	CZ
	Work in partnership with local delivery companies to encourage the use of bicycles instead of motorised forms of transport	On-going	CZ
	Work in partnership with the Central London Freight Best Partnership to promote cleaner vehicles and smarter driving to local freight companies	On-going	CZ/ST

Objectives	Action Plan Measures - Reducing Transport Emissions	Timeframe	Lead Department
Support Initiatives Introduced by the Mayor of London	Continue to support the full implementation of the Low Emission Zone and other measures introduced by the Mayor to improve air quality	On-going	ST
Reduce Diesel Train Emissions	Request train operating companies using Kings Cross Mainline Station to provide an action plan outlining measures to reduce diesel train emissions	2010	ST
Reduce the Council's Transport Emissions	Increase the proportion of low emission vehicles in our fleet, reduce fuel usage and organise smarter driving training.	On-going	CT
	Review Camden's Corporate Travel Plan and introduce new measures to reduce staff travel by car.	2009	TP
	Create a green vehicle policy which sets vehicle size, fuel, technology and efficiency standard and integrate this into the Council's strategic procurement system.	2010	CT/ST

How the Council will measure success

Key Performance Indicators	
% change in traffic counts and vehicle modes/yr	% change in emissions (kg) from Council vehicle fleet/annum
Length of new cycle routes installed	Fuel consumption per year
Number of school travel plans produced/yr	Number of visitors to Travelfootprint & Newride website/yr
Number of car free housing/yr	Number of awareness raising events
Number of car club members and bays	Number of electric vehicle charging points installed

Abbreviations:
SM: Street Management, TP: Transport Planning, CZ: Clear Zones, PE: Planning Enforcement CT: Corporate Transport, EMT: Energy Management Team, ST: Sustainability Team

SECTION 2: REDUCING EMISSIONS ASSOCIATED WITH NEW DEVELOPMENT

Why this issue is important

PM10 and NOx emissions can arise during the construction and operational phases of new development, with the impacts influenced by the size and location of the development. The land-use planning system plays a central role in managing the environmental impacts of new development and contributes to the protection and long-term improvement of air quality. This is achieved by ensuring that new developments do not have a negative impact on local air quality, and that public exposure to air pollutants is reduced in areas which breach the Government's air quality standards. The Council has accordingly produced a Supplementary Planning Guidance on air quality and has been successfully using a combination of planning conditions and legal obligations to help mitigate impacts on air quality associated with transport, energy use and construction practices at new developments.

New spatial planning documents will form the Local Development Framework and replace the Unitary Development Plan from 2010. Camden is currently developing the policies, and the evidence to support these policies, which will continue to require that air pollution emissions associated with new developments are minimised, both during construction and operation phases.

Planning policies that deliver reductions in carbon dioxide emissions will be a central theme in the LDF. Attention will be given to balancing measures to reduce carbon dioxide emissions from new developments whilst protecting air quality, especially with regards to the generation of renewable heat energy using biomass.

What is already being done

- Requiring air quality impact assessment for planning applications associated with increased transport and boiler emissions.
- Requiring developers to control and monitor dust emissions at large construction site in accordance with best practise measures.
- Requiring of car free and car capped housing developments. 245 planning applications have been required to be car-free, including 1,742 new residential units.
- Requirement of major developments to meet a 20% renewable energy target.

What the Council will do

Key Objectives – Reducing emissions associated with new development

The Council has prioritised the following objectives for reducing NOx and PM_{10} emissions from new developments in Camden:

- Determining the impact of new developments on air quality.
- Controlling emissions from construction sites.
- Measures to reduce transport emissions.
- Measures to reduce gas boiler emissions.
- Controlling emissions from biomass heating appliances.

Objective 1 - Determining the Impact of New Developments on Air Quality

Camden requires an air quality impact assessment to be included with planning applications which have the potential to cause a negative impact on air quality, particularly in cases where an increase in stationary and/or transport emissions may arise, or where new residents could be exposed to poor air quality. Historically air quality impact assessments have been carried out to determine the influence of additional traffic generation on air quality. With the increasing requirement for major development sites to adopt low carbon and decentralised energy sources, air quality assessment will be required for combined heat and power plants (CHP) and biomass boilers. Applicants will additionally be required to take into account the cumulative impacts of emissions on local air quality.

Where an air quality assessment shows that a new development is likely to have a negative impact on air quality, or expose new residents to poor air quality, the applicant will be required to submit an air pollution mitigation plan.

Measure - Camden will require developers to undertake an air quality impact assessment in circumstances where a new development could have a negative impact on air quality, and provide an emission mitigation plan when necessary.

Objective 2 - Reducing Emissions at Construction Sites

During the construction phase of a new development, controlling dust emissions will reduce the impact of dust emissions on local PM_{10} concentrations and prevent nuisance complaints by local residents. Sources of dust include demolition activities, grinding and cutting of materials, stockpiles of dusty materials and re-suspended particles that are deposited on roads carried on the wheels construction vehicles. Construction vehicles and machinery give rise to exhaust emissions of nitrogen oxides and fine particulate matter, which can also impact on local air quality. An EU study has identified that road machinery contributed approximately 60% of particle emissions from mobile sources in 2000, and is projected to increase to 40% by 2020.

Camden requires developers to comply with the 'London Best Practice Guidance to Control Dust and Emissions from Construction and Demolition', 2006. In 2008, the Council revised its 'Guide for Construction Workers in Camden', which outlines advice for mitigating dust emissions from construction and demolition work carried out in the borough. The Council is particularly keen on reducing the PM10 emissions from construction machinery by requiring the fitting of emissions control equipment.

The Energy Saving Trust has introduced a non-road mobile machinery accreditation scheme linked to the London Best Practice Guidance. The Council will require construction machinery operated at major developments to be accredited with this scheme.

The Council is increasingly requiring Construction Management Plans to be included in planning applications. This is particularly important as construction work for a number of large developments will take place in Camden over the next few years, especially in the south of the borough. Construction Management Plans should outline best practice measures for controlling dust and air pollution emissions. Large development sites are required to carry out PM_{10} monitoring around the site boundary and comply with a 'dust trigger action level' set by the Council. This alert system aims to quickly identify ineffective dust control measures to construction staff. Camden is encouraging developers to adopt web-based air quality monitoring data reporting, to facilitate readily available access to PM10 measurements associated with construction sites. This will enable Camden to have a better understanding of the impact of construction activities on local PM_{10} levels.

Measure - Camden will require developers to submit Construction Management Plans in accordance with the London Best Practice Guidance 'Control of Dust and Emissions from Construction and Demolition'.

Objective 3 - Reducing Transport Emissions at New Developments

Emphasis will continue to be given to ensuring new developments in the borough are located and designed in such a way as to reduce reliance on private car journeys, and increase the opportunity for people to use more sustainable modes to access developments and services.

Measure - Camden will continue to use planning conditions and obligations which require developers to adopt measures which will reduce transport emissions to include requesting travel and business plans, the installation of electric vehicle recharging infrastructure, the provision car club bays and bicycle stands.

Objective 4 - Reducing Gas Boilers Emissions at New Developments

Commercial gas boilers, used for hot water and space heating, are one of the largest sources of NOx emissions in Camden, and contribute a minor proportion of particulate matter emissions. Reducing emissions from heating systems in new commercial developments will help protect air quality, in conjunction with lowering carbon dioxide emissions.

- **Promotion of the London Plan Energy Hierarchy**

Camden's UDP requires the use of on-site renewable energy to reduce annual CO_2 emissions by 10% for major new build developments. The 10% CO_2 reduction target has been increased to 20% in the latest alterations to London Plan and reframed in the context of the Mayor's *energy hierarchy*, which promotes the following approach in order: use less energy, supply energy efficiently, use renewable energy.

Camden's planning policies therefore advocate that major development sites are designed and constructed to use less energy, meet high standards of energy efficiency and consider combined heat and power (CHP - an efficient form of de-

centralised energy supply providing heating and electricity at the same time) with greater priority than renewables.

The Council requires major development sites to meet a high standard of building design and construction, requiring a minimum BREEAM[13] score of 'very good', with a score of 60% in energy, and demands Level 3 for the Code for Sustainable Homes. The Council also requires that low NOx gas boilers are installed in new developments. Large scale gas CHP may require air pollution control equipment such as selective catalytic reduction (SCR) in order to minimise NOx emissions; this will become evident following an air quality assessment.

The Council will encourage developers to adopt hydrogen fuel cell CHP as this technology delivers significant improvements in energy efficiency and gives rise to exceptionally low NOx, PM_{10} and CO_2 emissions compared to gas-fired CHP. As part of the Section 106 agreement for Kings Cross Central development, Camden has requested the installation of a 200kw hydrogen fuel cell generator.

The adoption of certain renewable heat technologies can contribute to reducing NOx emissions from commercial gas boilers. These include solar water heaters, ground source heat pumps, air-source and heat pumps. Camden is discouraging the use of biomass boilers.

Measure - Camden will require major development sites to meet the Mayor of London's energy hierarchy, with high standards of sustainable building design and construction, and consideration of combined heat and power and renewables.

Objective 5 - Controlling Emissions from Biomass Heating Appliances

Biomass boilers deliver the largest CO_2 savings, at lowest costs, compared to other renewable energy sources and are often the preferred option for meeting the renewable energy target. However, the combustion of wood produces higher particulate matter and nitrogen oxides emissions than the burning of gas. The particles released from biomass boilers are predominantly in the $PM_{2.5}$ size fraction, which are associated with the most dangerous impacts to human health. The origin and characteristics of wood fuel, the design of the boiler, and how the appliance is operated greatly influence the air pollution emissions released from a biomass boiler. The combustion of contaminated wood can result in emissions of dioxins and heavy metals which are especially harmful to human health if not adequately controlled.

The impacts of biomass combustion on air quality have been recognised in a report commissioned by the London Councils' 'Air Quality Impacts of Wood Fuelled Biomass' in 2007, and the Draft UK Renewable Energy Strategy, 2008. There is some concern regarding the potential cumulative impacts on air quality of the large-scale deployment of biomass appliances in urban areas where Air Quality Management Areas are in force. This could present further challenges in meeting the PM_{10} and NO_2 air quality objectives particularly in London.

Camden is requiring an air quality impact assessment to be carried for all developments which include biomass boilers and CHP. Camden is maintaining an inventory of biomass heating appliances installed in the borough which includes

[13] BRE Environmental Assessment Method - the most widely used environmental assessment method for buildings.

emissions data, and is assessing technical information submitted in planning applications. If necessary the Council will refuse the installation of biomass boilers, if the cumulative impacts of emissions are determined to have a negative impact on air quality. In locations of the borough where PM10 and NO_2 concentrations are particularly elevated, Camden is discouraging the installation of biomass boilers and encouraging other types of renewable energy technology.

The Council will ensure that best practice methods to control and minimise particulate matter and nitrogen oxides emissions from biomass boilers and CHP are adopted by developers. Camden is making use of Section 106 agreements to set requirements to minimise and control emissions from biomass boilers. These requirements include use of high quality wood pellets, specific biomass boiler design features, boiler maintenance, and particulate matter emission control technology. Once national best practice guidance[14] for biomass heating appliances is published, Camden will require developers to adopt the recommended measures to reduce emissions from biomass heating appliances.

Camden has been designated a Smoke Control Area in accordance with the Clean Air Act 1993. As a result of this legislation, only certain fuels can be used in heating appliances which do not produce smoke. Heating appliances such as boilers and small stoves which are fueled using wood must be certified as exempt appliances by the Government in order to operate in the borough. The Clean Air Act unfortunately is not suitable for controlling fine particle emissions from wood fired heating appliances, as this legislation is designed to deal with smoke. Camden is making developers aware of this legislation and only allowing exempt appliances to be operated in the borough.

In some incidences the use of bio-diesel *(a liquid bio-fuel*), is being proposed in planning applications as a renewable fuel in boilers and CHP. Limited research has been carried out on the impacts of bio-diesel boilers on air quality, however available literature suggests that the NOx emissions are higher than gas. Camden will require an air quality assessment and set emission control requirements for heating appliances using bio-diesel.

Measure - Camden will use planning conditions and obligations to set best practice requirements for controlling NOx and PM_{10} emissions from biomass boilers and CHP

[14] Environmental Protection UK has set up a biomass working group, which includes the London Borough of Camden and the City of London, which is developing national guidance for controlling air pollution emissions from biomass heating appliances.

Table 4 – Summary of objectives and measures to reduce emissions associated with new developments

Objectives	Action Plan Measures Reducing Emissions Associated With New Developments	Timeframe	Lead Department
Determine The Impact of New Developments on Air Quality	Require developers to undertake an air quality assessment in circumstances where a new development could have a negative impact on air quality, and provide an air pollution mitigation plan where necessary.	On-going	ST/P
Reduce Emissions at Construction Sites	Require developers to submit Construction Management Plans in accordance with the London Best Practise Guidance to Control Dust and Emissions from Construction and Demolition'	On-going	ST/P
Reduce Transport Emissions At New Developments	Continue to use planning conditions and obligations to require developers to adopt measures which will reduce transport emissions –request travel and business plans, installation of electric vehicle recharging infrastructure, car club bays to reduce private car use.	On-going	TP
Reduce Gas Boiler Emissions At New Developments	Camden will require major development sites to meet the Mayor of London's energy hierarchy, with high standards of sustainable building design and construction, and consideration of combined heat and power and renewables.	On-going	P
Control Emissions From Biomass Boilers	Use planning conditions and obligations to set best practice requirements for controlling NOx and PM_{10} emissions from biomass boilers and CHP	On-going	ST/P

How the Council will monitor success

Key Performance Indicators	
Number of planning application set condition s106 related to air quality/yr	Number of development meeting the BREEAM rating of 'very good' and above/yr
Number of sites which submitted CMP/yr	Number of developments meeting the 20% renewable energy target
Number of car free developments/yr	Number of biomass boilers installed/yr
Number of developments required to install electric vehicle recharging points/yr	Number of developments required to produce travel plans

SECTION 3: REDUCING EMISSIONS FROM GAS BOILERS AND INDUSTRIAL PROCESSES

Why this issue is important

Domestic and commercial gas boilers are the dominant sources of NOx emissions, and the second largest source of PM_{10} emissions in Camden. Reducing gas consumption and improving energy efficiency in buildings is a key route to minimising emissions from gas boilers. Camden has been actively promoting the benefits of energy efficiency measures for a number of years. This has primarily focused on saving heat in homes in response to statutory requirements to improve energy efficiency and reduce fuel poverty. More recently this has been linked to requirements to reduce the borough's CO_2 emissions.

Small industrial processes contribute a minor proportion of particulate matter emissions in Camden. The Council has a statutory duty to regulate emissions to air from industrial processes in accordance with the Environmental Permitting Regulations. This legislation requires site operators to adopt the best emission control practices in order to protect local air quality.

What is already being done

- Free energy efficiency advice is provided to householders through the Camden Energy Advice Helpline.
- Camden's *Warmth for All* partnership has provided over 1,000 grants for energy efficiency measures, totalling over £1.2 million, to vulnerable residents in the privately owned, private rented and council tenanted sectors.
- The Energy Rating of Camden's own housing stock is above the national average, demonstrating high standards of energy efficiency.
- The Council has reduced overall energy use in its buildings by 12% in 2007/8 from its 2005/6 baseline.
- Successful implementation of the Better Climate for Camden project which has so far provided energy saving and efficiency advice to over 150 businesses in Camden.

What the Council will do

Key Objectives – Reducing emissions from gas boilers and industrial processes

The Council has prioritised the following objectives for reducing NOx and PM_{10} emissions from domestic, commercial and industrial processes in Camden:

- Providing advice regarding energy efficiency and promoting fuel saving measures.
- Reducing the Council's gas boiler emissions.
- Controlling air pollution from small industrial processes.

Objective 1 – Providing advice regarding energy efficiency and promoting fuel saving measures

A range of initiatives are carried out by Camden to support saving heat in homes, schools and businesses. These measures are primarily aimed at reducing carbon dioxide emissions and tackling fuel poverty, however co-benefits will be gained as reducing gas consumption will assist lower NOx and PM_{10} emissions. Initiatives the Council is co-ordinating include:

- **Home Energy Conservation Act 1995 and *Warmth for All* scheme**

In response to statutory duties under the Home Energy Conservation Act 1995, Camden has developed a range of partnerships and initiatives to improve energy efficiency and promote affordable warmth in all housing in the borough. Since 2000, Camden's award-winning *Warmth for All* scheme has provided over 1,000 grants for energy efficient measures in homes. The *Camden Energy Advice H*elpline is central to the scheme and provides householders with advice on saving energy in the home, such as increasing insulation and installing new energy efficient boilers. The *Warmth for All* brand has now been superseded by the *Small Steps Big Difference* brand, with energy efficiency grants now promoted under the *warmer, cheaper greener* programme.

- **Energy Saving Improvements in Private Sector Homes**

£1.15M of new funding was allocated in July 2008 to be spent on installing insulation measures in private sector housing. The Council will look for ways to top-up this funding through CERT (Carbon Emissions Reduction Target) which is provided by energy utility companies and through funding from the North London Sub Regional Housing Partnership.

- **Eco-Grant Schemes**

An 'Eco-grant' is available for owners and landlords of private residential property for the installation of renewable heating technology such as solar thermal.

- **Camden Climate Change Alliance - *Better Climate for Camden***

Better Climate for Camden organises energy saving seminars to help local businesses and other institutions measure and reduce their carbon footprint. The seminars include practical advice on reducing heating and hot water use in offices, and adopting energy efficient appliances.

- **Working with Schools**

The Council works with schools to help reduce gas usage. This includes proving information materials and undertaking energy audits. More work will be carried out on assisting schools access funding for renewable heat technology and energy efficiency measures.

- **Awareness Raising Initiatives**

The Council undertakes a number of awareness raising initiatives throughout the year to encourage the local community to adopt energy efficiency measures. These include attending community events such as the Camden Green Fair, encouraging residents to complete energy pledges, advertising the Camden Energy Advice Helpline, and carrying out bus stop campaigns promoting energy efficiency.

Measures - Camden will promote the adoption of fuel saving measures to residents, businesses and schools through the Small Steps Big Difference campaign and Camden Climate Change Alliance.

Objective 2 - Reducing the Council's Gas Boiler Emissions

Energy efficiency improvements linked to gas heating in the Council's housing and building stock are integral to helping Camden reduce energy consumption. These are necessary to meet internal energy efficiency targets and national performance targets relating to both air quality and climate change.

- **Improving Energy Efficiency in the Council's homes**

The Council has been improving the energy efficiency of its own homes for many years as part of both maintenance and dedicated insulation programmes. Between 2000 and 2007, we installed over 14,000 energy efficiency measures in council housing. The average energy rating for the council stock now stands at over 70 (the scale runs from 0-100, with 100 being best). This is considerably higher than the regional average of 59, and is also above the new Government target of SAP 65 for homes improved through Government grants (this represents a low risk of fuel poverty).

- **Improving Energy Efficiency in the Council's Buildings**

In order to stimulate reductions in energy consumption, Camden has an annual energy efficiency improvement target of 1.5% for Council accommodation buildings. The Council has reduced overall energy use by 12% for 2007/8 based on their 2005/6 baseline. The Council has been accepted onto the Carbon Trust's Local Authority Carbon Management Programme which will commence in May 2009. The programme will see the completion of our baselining exercises for NI 185 and the Carbon Reduction Commitment and the development of a funded carbon management plan from 2010/11 onwards.

A range of improvements have already been delivered in recent years, including cavity wall insulation, double glazing with solar coating, and ground source heat pumps at Bidborough House, and improvements to reduce energy consumption at the Kentish Town Sports Centre. We are also implementing a £500K Revolving Energy Fund (REF) designed to deliver cost effective energy, CO_2 and fuel cost savings which can be re-invested into further energy saving measures. Over the past year, four REF schemes worth £169k have been completed across such diverse areas as Bloomsbury Square Car Park, Holborn Library, 10 elderly homes/day care centres, Swiss Cottage Library and Talacre Leisure Centre. This will result in an estimated saving of £46k per year and 258 tCO_2 per annum.

The Council also engages its staff to help promote sustainability and reduce the impact of their activities on the environment through our *Small Steps, Big Difference* campaign. We have recruited 140 voluntary Environment Champions in 24 locations across our own estate and operations, with regular email and intranet updates available to all staff on council-wide initiatives and guidance on how to be more environmentally friendly on a day to day basis.

- **Increasing the Supply of Efficient and Renewable Heat Energy**

In 2007/08, 30.5% of Camden's electricity came from certified renewable sources including wind and solar power via green tariffs. However, the Council is keen to expand efficient and renewable heat and power generation within its own estates.

In the medium term, the Council plans to move away from a reliance on the national grid and adopt gas-fired CHP linked to district heating networks serving large buildings and Council estates. CHP greatly increases the fuel efficiency of a power

plant, resulting in fewer PM10, NOx and CO_2 emissions. A large-scale CHP site identification study has identified the sites in the borough with the greatest potential for CHP.

It is important that the potential impacts of NOx and PM10 emissions released from CHP are taken into consideration, especially if biomass will be used as fuel in the future. In order to prevent any future degradation of air quality, emission control technology may need to be installed on CHP.

Measure - Camden will investigate the long term use of CHP ensuring that air quality impacts are considered in the design phase.

- **Reducing Emissions Associated with the Council's Contractors' Buildings**

As part of Camden's requirements to meet NI 194 and NI 185, the Council is required to account for PM_{10}, NOx and CO_2 emissions produced from the operations associated with our major contractors. This includes gas boiler emissions. Camden is introducing an Emissions Measurement and Reduction Requirement which includes in scope minimising NOx, PM_{10} and CO_2 emissions associated with Council's contractors' buildings.

Measure - Camden will continue to undertake energy efficiency improvement work in its own buildings.

Camden will introduce an emissions measurement and reduction requirement for its main contractors and investigate options for encouraging contractors to reduce fuel usage in their buildings.

Objective 3 - Controlling Industrial Air Pollution Emissions

The Council has a duty under the Environmental Permitting (England and Wales) Regulations 2007 to control air pollution emissions from small industrial processes referred to as Part B Installations. This is referred to as the Local Authority Pollution Prevention and Control Regime (LAPPC). Camden regulates seventy-nine Part B Installations covering five different types of industrial activities, see Table 5.

Camden's regulatory duties include carrying out compliance inspections, determining new Part B applications, issuing environmental permits and undertaking enforcement action where operators fail to meet compliance. Camden has reviewed the Environmental Permits of all our Part B Installations to include the Best Available Techniques for controlling emissions to air in accordance with the latest guidance published by the Government.

Camden is ensuring that petrol stations in the borough comply with the new requirements to fit Stage II Vapour Recovery. This will help to reduce benzene emissions from petrol dispensing pumps. As benzene is a volatile organic compound, this measure will reduce the formation of ground level ozone, benefiting air quality and climate change mitigation.

Table 5: Part B Installations in the London Borough of Camden

Industry Type	Emissions to Air	Number of Installations
Vehicle body shops	Volatile organic compounds, particulate matter	8
Precious metal recovery	Particulate matter, carbon monoxide	1
Concrete batching	Particulate matter	3
Petrol stations	Benzene	10
Dry cleaning	Volatile organic compounds	57

Measure – Camden will ensure that all Part B Installations in the borough maintain the highest standards of air pollution emission control.

Table 6: Summary of objective and action plan measures to reduce emissions from gas *boilers and industrial processes*

Objectives	Action Plan Measures Reducing Emissions From Gas Boilers and Industrial Processes	Timeframe	Lead Department
Support Fuel Saving and Energy Efficiency Measures	Camden will promote the adoption of fuel saving measures to residents and businesses through the Small Steps Big Difference campaign and Camden Climate Change Alliance.	On-going	ST, EH and HASC
Reduce the Council's Gas Boiler Emissions	Continue to undertake energy efficiency improvement work in the Council's own buildings	On-going	EM
	Camden will introduce an emissions measurement and reduction requirement for its main contractors and investigate options for encouraging contractors to reduce fuel usage in their buildings.	2009/10	EH and ST
	Investigate the long term use of CHP ensuring that air quality impacts are considered in the design phase.	On-going	ST
Control Industrial Air Pollution Emissions	Ensure that all Part B Installations in the borough maintain the highest standards of air pollution emission control.	On-going	EH

How the Council will measure success

Key Performance Indicators	
Number of new business subscribed to Climate Change Alliance/yr	Number of Part B Installations meeting compliance
% change in PM10 and NOx emissions from Council buildings	Energy rating of Council housing
Reduction Council's gas consumption/yr	Number of private houses installed with insulation/yr

SECTION 4: AIR QUALITY AWARENESS RAISING INITIATIVES

Why this issue is important

Informing people about local air quality can help to protect those members of the community who are most sensitive to the health impacts associated with air pollution. Increasing public understanding of the sources and effects of air pollution can also motivate lifestyle changes which can help improve air quality, for example promoting sustainable travel as method of reducing air pollution.

Camden has been monitoring air pollution levels across the borough for the last ten years and reporting this data on our website. Camden has undertaken a variety of air quality monitoring research work which has assisted raising awareness about the sources and impacts of air pollution, as well as testing new technology. This work complements other research studies undertaken with the Clear Zone Partnership to investigate life cycle analysis of vehicle fuels and technology. Research work will assist Camden develop effective measures to improve air quality.

Camden undertakes a variety of initiatives to inform the public about air quality using a variety of communication channels. These are carried out in partnership with different departments within Camden and other local authorities in London.

What is already being done

- Introduction of AirText - air pollution alert system, in association with twenty London boroughs.
- Introduction of Walk-it - a web based air pollution walking route planner; in association with seven Central London boroughs.
- Launch of the Small Steps, Big Difference campaign to raise awareness about sustainability across the borough.
- Up to date air quality data and information on Camden's website.
- Camden has undertaken a variety of air quality research work, including investigating the impact of dust emissions from construction work and innovative air pollution reducing materials.

What the Council will do

Key Objectives – Air quality awareness raising initiatives

The Council has prioritised the following objectives in relation to reducing NOx and PM_{10} through awareness raising initiatives:

- Provision of air quality information through monitoring air pollution, disseminating information on air quality and carrying out research.
- Strengthen promotional work relating to air pollution and health.
- Raise awareness about air quality across the borough making links other Council communication campaigns linked to sustainable transport and climate change.

Objective 1 - Provision of Air Quality Information

- **Disseminating Information to the Public**

Camden's website[15] has a number of pages dedicated to air quality covering the sources and health effects of air pollution, air quality monitoring sites, LAPPC, planning, information regarding Camden's vehicle fleet, low emission vehicles, LAQM reports, fact sheets for schools and information about bespoke air quality projects carried out by the Council.

The air quality monitoring pages allow the public to easily view and download air pollution data from Camden's automatic monitoring stations and diffusion tube sites. The data can be displayed as weekly, monthly and annual trends on a graph, shown directly on the webpage. The webpage indentifies the air pollution banding for each day (e.g. low, medium or high) and has maps showing Camden's air quality monitoring sites, and the air pollution concentrations at each site. Camden will continue to make air pollution data and other air quality information available to the public. New methods of informing the public about air pollution levels will be explored.

Measure - Camden will continue to disseminate up to date information about air quality, and investigate new methods of informing the public about air pollution levels.

[15] http://www.camden.gov.uk

- **Maintaining Camden's Air Quality Monitoring Network**

Over the next few years Camden will review and update its routine air quality monitoring network. Subject to undertaking a feasibility study and final costs being fundable from existing internal or external funding streams, the Council intends to carry out the following work to improve our understanding of air quality across the borough:

- Introduce a further $PM_{2.5}$ monitor in the north of Camden at a background location, in addition to the two sophisticated $PM_{2.5}$ monitors in the south of borough at our Bloomsbury and Swiss Cottage monitoring sites.

- Investigate the impact of large construction sites on PM10 and coarse particle levels.

- Review our NO_2 diffusion tube network and install a continuous NO_2 monitor in the north of the borough.

Measure - Camden will continue to monitor air pollution levels across the borough and review our air quality monitoring network every year.

- **Air Quality Research**

Camden is currently undertaking several research projects and new technology trials which will improve our understanding of the sources and levels of fine particles, which could help reduce nitrogen dioxide levels in heavily trafficked locations. These studies will help the Council and local authorities across London determine what specific actions can be taken to reduce NOx and PM_{10} emissions.

A particulate matter source apportionment study is being carried out at our Swiss Cottage monitoring site during 2009/10. This entails monitoring black carbon particles and the chemical analysis of PM_{10}. This work will assist Camden understand trends in PM_{10} levels and the influence of particulate matter from road transport, and more distant sources as far as Europe associated with secondary particulate matter.

In collaboration with the Clear Zone Partnership, Camden will undertake $PM_{2.5}$ monitoring in central London to improve understanding of the influence of traffic emissions on $PM_{2.5}$ levels in central London.

Camden, in association with the Clear Zones Partnership, is undertaking an air quality investigation at St Martin's College of Art in Holborn involving a photocatalytic paint which manufacturers' propose reduces NOx emissions from road traffic. 'Photocatalytic materials', which come in the form of paint, cement and concrete, contain a chemical called titanium dioxide, which in sunlight has been suggested to reduce NOx emissions from traffic and subsequently lower NO_2 levels in urban areas. This technology has been used in Italy, Japan and France to keep the surface or buildings clean in polluted urban areas. Continuous monitoring of NOx/NO_2 concentrations at St Martin's College will be carried until December 2009. NOx/NO_2 concentrations will be analysed before and after paint application and diurnal trends interpreted to determine any change in NOx/NO_2 levels, augmented by various meteorological measurements. Camden will publicise the results of the trial and consider participating in further studies.

Measure – Camden will carry out air quality research and disseminate the results in order to influence effective actions to improve air quality across London.

Objective 2 - Strengthen Promotional Work Relating to Air Pollution and Health

- **Improve understanding of the sources and health impacts of air pollution**

The Council will increase awareness raising work to improve the public's understanding of the main sources and heath effects of air pollution emissions in Camden. Simple information will be given on the health impacts of air pollution emissions, emphasising negative impacts of PM_{10} emissions from vehicle emissions. Links will be made with initiatives which promote sustainable travel, energy saving and healthier lifestyles co-ordinated by the Council and NHS Camden. The Council hopes that by engaging with the public and increasing their understanding of the health impacts associated with PM_{10} and NO_2, this will stimulate lifestyle change which reduce traffic and gas boiler emissions.

- **Continue Promoting the Air Pollution Alert System - AirText**

Raising awareness about incidences of poor air quality can assist the public to take precautions to bring about health benefits. AirTexT[16] is a unique air quality information service for people who live or work in London and who suffer from asthma, emphysema, bronchitis, heart disease or angina. People who experience these conditions may be affected by higher than normal levels of air pollution. AirText is designed to alert people when air pollution levels are elevated so that they can take simple measures to help reduce the likelihood of any impacts. Subscribers to the scheme are alerted either by text message, voice message or email when air pollution levels are predicted to be Moderate, High or Very High. AirText has been being adopted by Camden and twenty-two local authorities across London, in partnership with the Greater London Authority.

- **Walkit.com – Air Pollution Aware Walking Routes**

Walkit [17] is a website which provides walking routes around different parts of the UK. In order to assist the public avoid exposure to poor air quality when walking in central London, the Central London Air Quality Cluster Group has worked in partnership with Walkit.com to develop 'air pollution aware walking routes'. A new feature on this website enables the public to select the least polluting walking routes to reduce people's exposure to traffic emissions. Camden is actively promoting Walkit.com on their website, and at travel awareness events.

Measure – Camden will undertake air pollution and health awareness initiatives, and explore how these can be linked with NHS Camden.

[16] http://www.airtext.info
[17] http://www.walkit.com

Objective 3 - Working with the Community

- **Small Steps, Big Difference Campaign**

In order to engage with the wider community in Camden, initiatives relating to the Air Quality Action Plan will be promoted through the Council's sustainability communications campaign 'Small Steps, Big Difference'. This will involve awareness raising initiatives linking to air quality and climate change, with measures to promote better health, sustainable transport, use of clean vehicles and energy efficiency.

- **Virtual Eco-centre Exhibition**

Camden intends to raise awareness about the sources and impacts of air pollution and climate change issues using a mobile environmental exhibition as part of the Council's Virtual Eco-centre. The Council's electric vehicle will perform as a mobile 'Eco-Exhibition' comprising leaflets, activities and demonstration kits about air pollution, energy efficiency, renewable energy, sustainable travel and low emission vehicles. The Eco-Exhibition will be taken to Council events. Camden's hydrogen fuel cell generator will be operated alongside the mobile Eco-Exhibition as a hydrogen fuel cell demonstration project.

- **Working with Schools**

Camden intends to explore how further educational work can be carried out with schools in relation air quality. Making links between air quality and other environmental issues could help engage children and increase their interest and understanding about air quality such as - climate change, sustainable travel, energy efficiency and waste reduction. Stronger links will be made with school travel plan officers and greater integration with other Council projects associated with schools. Camden will also work in partnership with London Hydrogen Partnerships and introduce the Hydrogen Schools Challenge to local schools. This initiative provides educational tools to increase understanding of hydrogen fuel technology to children.

Measure - Camden will carry out awareness raising activities across the borough linking measures that reduce air pollution and CO_2 emissions.

Table 7: Summary of objective and action plan measure relating to air quality awareness raising initiatives

Objectives	Action Plan Measures - Air Quality Awareness Raising Initiatives	Timeframe	Lead Department
Provision of Air Quality Information	Continue to dissemination up to date information about air quality and investigate new methods of informing the public about air pollution levels.	On-going	CS
	Continue to monitor air pollution levels across the borough and review our air quality monitoring network every year.	On-going	CS
	Carry out air quality research and disseminate the results in order to influence effective actions to improve air quality across central London.	On-going	CS
Strengthen Promotional Work Relating To Air Pollution and Health	Undertake air pollution and health awareness initiatives, and explore how these can be linked with NHS Camden.	On-going	CS
Working With The Wider Community	Camden will carry out awareness raising activities across the borough linking measures that reduce air pollution and CO_2 emissions.	On-going	ST, EM, TP,CS

How the Council will measure success

Key Performance Indicators	
Number of residents subscribed to AirText/yr	Number of people visiting Camden's Virtual Eco Exhibition
Number of new air pollution monitoring sites operating/yr	

GLOSSARY

ADMS	Atmospheric Dispersion Modelling System – computer software used by Camden Council to predict future concentrations of air pollutants
AQMA	Air Quality Management Area – area where it is predicted that the air quality objective are unlikely to be met by specified deadlines
Biomass	Solid, liquid or gaseous fuel derived from virgin or recycle plant material for example wood logs or pellets, straw or used cooking oil, bio-methane
BRE	Building Research Establishment
CHP	Combined Heat and Power Plant – Decentralised energy system which generates electricity and heat
CNG	Compressed Natural Gas – road fuel derived from methane.
CO	Carbon Monoxide – gas formed from the incomplete combustion of fossil fuels such as oil and gas
CO_2	Carbon Dioxide – gas formed from the complete combustion of fossil fuels, main green house gas responsible for climate change
COMEAP	Committee on the Medical Effects of Air Pollution
CPZ	Controlled Parking Zone
CRT	Continuously Regenerating Trap – fitted to diesel engines to reduce production of particles and gases
DEFRA	Department of Food and Rural Affairs
EPUK	Environmental Protection UK
GLA	Greater London Authority
HGV	Heavy Goods Vehicles - lorries
LAQM	Local Air Quality Management
LAPPC	Local Authority Air Pollution Prevention and Control
LGV	Light Goods Vehicle - vans
LEAI	London Atmospheric Emission Inventory – an inventory produced by the Greater London Authority which quantifies emissions from different sources for each local authority in London
LCA	Life Cycle Analysis – method of quantifying the emissions associated with the manufacture, use and end of life of a product
LDF	Local Development Framework -
LEZ	London Low Emission Zone – zone created around the boundary of London which only allows entry to heavy goods vehicles, buses and coaches which meet certain exhaust emission standards for PM10.

LPG	Liquid Petroleum Gas – gas comprising if propane derived as a by-product of oil-refining
µg/m^3	Micrograms per metre cubed – measurement terms used to describe concentration of pollutants
MOT	Annual test legally required for vehicles older than 3 years old
NAQS	National Air Quality Standards
NO_2	Nitrogen Dioxide – pollutant created high temperature combustion as a result of the oxidation of nitric oxide (NO)
NOx	Nitrogen Oxides – term used to describe moth nitrogen oxide and nitric oxide
NRMM	Non-road mobile machinery – terms used to describe plant and equipment used at construction site e.g. power generators
PAH	Poly aromatic hydrogen carbons – groups of organic compounds with complex structures producing from burning oil and wood
PM10, PM2.5	Airborne particles (PM10 less than 10 µm, PM2.5 less than 2.5 µm)
SO2	Sulphur Dioxide – gas produced from burning of coal and oil
TfL	Transport for London – section of the GLA concerned with delivering the Mayor of London's transport strategy
UDP	Unitary Development Plan – sets out Camden Council's policies for use and development of land and buildings
ULSD	Ultra low sulphur diesel – diesel fuel containing lower concentration of sulphur (less 50 ppm)
VED	Vehicle Exercise Duty - Government's vehicle tax for which there are reductions for cleaner vehicles

APPENDICES

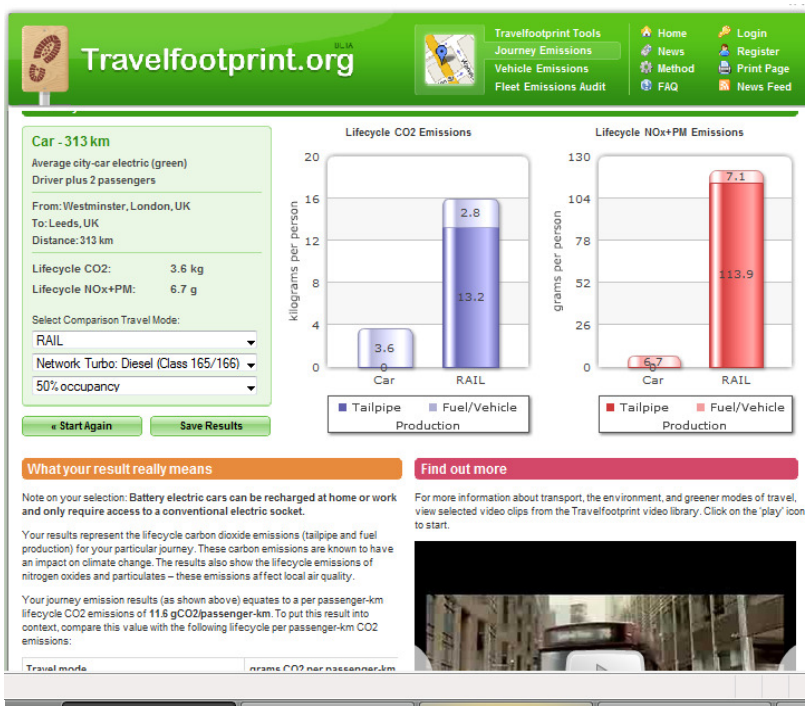
Appendix 1 – Air Quality Monitoring Sites in Camden

Site Code	Site Type	Location	Air Pollutant(s)	Purpose of monitoring
Automatic Monitoring Sites				
CAM1	K	Swiss Cottage – Finchley Road	NO_2, PM10/2.5	LAQM/Source Apportionment
CAM2	UB	Bloomsbury – Russell Square Gardens	NO_2, PM10/2.5 SO_2, CO, O3	LAQM
CAM3	R	Shaftesbury Avenue	NO_2, PM10	LAQM
CAM4	UB	St Martin's Art College	NO_2	Photocatalytic Paint Trial
CAM5	K	Tottenham Court Road	NO_2	Traffic Management
Diffusion Tube Monitoring Sites				
CA1	R	Argyle School, Tonbridge Street	NO_2	LAQM
CA2	R	Robert Street	NO_2	LAQM
CA3	R	Gospel Oak School, Mansfield Road	NO_2	LAQM
CA4	R	Camden Town Hall, Euston Road	NO_2	LAQM
CA5	R	Drummond St/Cobourg Street	NO_2	LAQM
CA6	B	Wakefield Gardens	NO_2	LAQM
CA7	B	Frognal Way	NO_2	LAQM
CA8	B	La Sainte Union School, Croftdown Road	NO_2	LAQM
CA9	R	Gower Street	NO_2	LAQM
CA10	R	Tavistock Gardens	NO_2	LAQM
CA11	K	Tottenham Court Road	NO_2	LAQM
CA12	R	Lincoln's Inn Field	NO_2	LAQM
CA13	B	British Library, Euston Road	NO_2	LAQM
CA14	B	Russell Square Gardens (Bloomsbury)	NO_2	LAQM
CA15	K	Finchley Road (Swiss Cottage)	NO_2	LAQM
CA16	R	Kentish Town Road	NO_2	LAQM
CA17	R	St Mary's School, Fitzjohn's Ave	NO_2	LAQM
CA18	R	Gloucester Avenue/Parkway	NO_2	LAQM
CA19	R	Inverness Street	NO_2	LAQM
CA20	B	Brill Place	NO_2	LAQM
CA21	R	Camden Road	NO_2	LAQM
CA22	R	Goodge Street	NO_2	LAQM
CA23	R	Camden Road	NO_2	LAQM
CA24	R	Chetwyn Road	NO_2	LAQM
Osiris Monitoring Sites				
CAP1/2		Swiss Cottage – Finchley Road	PM10/2.5	Co-location Study
CAP4		Bloomsbury – Russell Square Gardens	PM10/2.5	Co-location Study
CAP3/5		Kings Cross	PM10/2.5	Construction Dust

Appendix 2 – Examples of Camden's air quality action plan projects

Newride Website

Portable Hydrogen Fuel Cell Generator and Council's Electric Van



Travelfootprint Website

Electric Vehicle Recharging Point

Biomethane Fuelling Infrastructure and Biomethane Refuse Collection Van