City of Bradford MDC
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Bradford MDC
Low Emission Strategy

reducing road transport emissions - improving air quality and health

August 2013

Foreword

"The existence of a black pall of smoke over the town is quite unnecessary to the trade of Bradford…the existence of the unnatural and unhealthy condition of the atmosphere is highly prejudicial....." said Dr. Thomas W Hime, Medical Officer of Health for Bradford, in his annual report to the Council in 1884.

At Bradford Council we have long recognised that clean air is fundamental for the district to prosper, and be an attractive place to live, work and invest. The adoption of our Air Quality Strategy in April 2011 continued the council's commitment to protect the health of its residents.

Transport is now the major contributor to our air quality problems. This Low Emission Strategy outlines how the council will work with the public and the private sector, and with other stakeholders, to implement measures which reduce the impact of emissions from traffic on public health and air quality, whilst simultaneously contributing to the regeneration of our economy.

Cllr Andrew Thornton: Portfolio holder for Environment, Sport & Sustainability

Acknowledgements;

The LES project has been funded via DEFRA air quality capital grant funding.

The Low Emission Strategy has been developed with technical support from Andrew Whittles of Low Emission Strategies Ltd.

The LEZ feasibility study involves joint working with Leeds CC to achieve maximum benefits for both Councils.

Contents

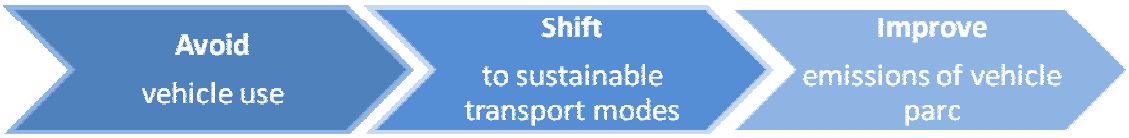
Tables

Figures

Executive Summary

This Low Emission Strategy seeks to improve air quality in the urban areas of Bradford through vehicle emission reduction activity, while simultaneously securing CO_2 benefits where possible. The LES acknowledges that reducing vehicle emissions should follow the progression outlined below.

Emission Reduction Progression



It is important to understand the role that the LES has to play as part of the wider strategy to reduce emissions in Bradford and West Yorkshire. There are strategies and associated work areas which the LES will exist to support, work alongside and complement.

While supporting and building on measures outlined in 'My Journey' the third West Yorkshire Local Transport Plan (LTP), the LES focuses on activity to cost effectively improve the emissions of the residual vehicles on the road. The LTP seeks to make progress towards a low carbon transport system and enhance people's quality of life through enhancements to the sustainable transport network, improved connectivity and promoting choice in travel modes, resulting in a shift to alternative modes of travel including, walking, cycling and public transport, whilst implementing complementary demand management measures to encourage less car use.

The LES identifies key areas of Council activity that are capable of influencing vehicle emission improvements and the implementation of measures in line with the following objectives:

- Review current air quality in the urban area and establish a robust emission profile of the Bradford road transport system.
- Evaluation of cost effective local transport measures that encourage the uptake of cleaner vehicle technologies such as Low Emission Zones (LEZ), bus and freight partnerships, and exploration of infrastructure for alternative fuels.
- Introduction of planning and development control measures that are capable of mitigating and improving vehicle emissions and exposure to emissions, and enabling residents to make green vehicle choices.

- Enhancement of travel planning to include vehicle emission improvement considerations in addition to promotion of modal shift measures to increase cycling and walking, public transport and traffic reduction.
- Support the uptake of alternative models of vehicle ownership and use in the district, for example through car clubs and car sharing initiatives
- Promotion and adoption of green procurement policies.
- Undertake further research and raise awareness of the health impacts of vehicle emissions in Bradford.
- Identification of opportunities for economic development through the transition to a low emission economy.

This strategy will also support external agencies to embrace activities that will lead to lower emissions throughout the district, for example the freight industry and bus operators.

Large areas of the Bradford District enjoy some of the best air quality in the UK. However, in line with other major conurbations around the world, the urban areas of Bradford experience significant air quality problems, largely due to road transport emissions. Levels of Nitrogen Dioxide (NO_2) recorded in the vicinity of the urban road network are in breach of the EU Limit Value that should have been met in 2010. Indeed, the Government has classified the exceedence of the NO_2 Limit Value in the West Yorkshire area as the 4th most extensive in the UK and is now awaiting infraction proceedings by the EU for failure to comply with the Air Quality Directive[1]

Under the reserve powers of the Localism Act[2], any fines imposed on the Government can be passed onto public authorities that are deemed to have not fulfilled their responsibilities for improving air quality.

While recorded levels of fine particulates in Bradford are marginally below the EU Limit Value, it is estimated that 5.3%[3] of all mortality in the District is attributable to fine particulates. This figure is likely to be considerably higher in the urban areas. The World Health Organisation (WHO/IARC) recently classified diesel particulates as carcinogenic, increasing the risk of lung cancer by 40% in at risk groups such as truck drivers[4]. Further

[1] http://ec.europa.eu/environment/air/quality/legislation/directive.htm
[2] http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted
[3] http://www.phoutcomes.info/public-health-outcomes-framework/domain/4
[4] http://www.bmj.com/content/344/bmj.e4174.full

reductions in particulate emissions, particularly from road transport, will bring significant health benefits to the Bradford population.

In addition to being a significant source of regulated air pollutants, road transport accounts for around 20% of all Carbon Dioxide (CO_2) emissions in the District[3] and is a major source of environmental noise.

Further to the Bradford Air Quality Action Plan 2009, the Council approved the Air Quality Strategy (AQS) in 2011, including measures to look at the following areas of Council activity:

- Produce guidance on how land-use planning and development control policies could further assist in tackling road transport emissions
- Look at ways in which Council procurement could be used to influence emissions
- Review opportunities for low emission vehicle uptake within the Bradford Council Fleet

The AQS also included the requirement to develop a Low Emission Strategy (LES) as an overarching mechanism to co-ordinate key aspects of Council activity capable of influencing the reduction of road transport emissions, complementing measures within the West Yorkshire Local Transport Plan (2011-2026), that are being implemented across Bradford through the Local Implementation Plan.

In 2011/12, Bradford Council was awarded £102,000 by Defra, the largest single authority award in England, to develop a Low Emission Strategy (LES) for the District and the project was launched at City Hall in March 2012, involving neighbouring authorities, health professionals, Metro, Bradford University, logistics companies and other key stakeholders.

This document outlines the keys aims, objectives and underlying principles of the LES and details the work to date in implementing LES measures within Bradford.

The LES is keen to promote key principles that will underpin the ability to recognise and take action to reduce road transport emissions, including:

- Monetisation (assignment of a monetary value) of pollution impacts using robust damage costs
- Incorporating Whole Life Cost considerations into procurement decisions

[3] West Yorkshire Local Transport Plan (2011-2026) - Bradford Local Implementation Plan

- Promotion of partnerships to achieve mutual goals
- Building on regional strengths in low emission vehicle research, manufacture, demonstration and deployment

This LES details the significant progress that the Council has made over the last 12 months in achieving its objectives. Bradford Council recognises that road transport emissions arising from the regional, strategic road system cannot be tackled in isolation. Working with the other West Yorkshire authorities, Bradford applied for further Government funding and on behalf of the five West Yorkshire councils, has been awarded £150,000, through Defra Air Quality Grant 2012/13, to develop a West Yorkshire Low Emission Strategy.

Summary of Low Emission Strategy Objectives, Actions/Measures

Objective	Actions/Measures	Project Lead/Partners	Key Stakeholders	Timescales	Report Section
1)	**Review air quality in the urban area and establish an emission profile of the road transport system**				
	Review AQ monitoring and modelling data	Bradford Council	Council, DEFRA and general public	Ongoing, complete Summer 2013	2
	Review ANPR camera data to establish fleet profile	Bradford & Leeds Councils	Bradford and Leeds Councils	Completed	7
2)	**Evaluate cost effective transport measures that encourage the uptake of cleaner vehicle technologies such as Low Emission Zones, bus and freight partnerships**				
	Modelling of LEZ scenarios	Bradford & Leeds Councils	Bradford and Leeds Councils	Complete September 2013	7
	Cost Benefit Analysis of selected LEZ scenarios	Bradford & Leeds Councils/Ricardo-AEA	Transport Officers, Economic Development Units & Metro	Ongoing – targeted for completion end 2013	7
	Health Impact Assessment of LEZ scenarios	Bradford & Leeds Councils, Bradford NHS, PHE West Yorkshire HPU	Public Health Dept, Leeds NHS, PHE West Yorkshire HPU	Scoping Report completed. Final Report targeted for completion end 2013	2
	Promote and further develop cycling and infrastructure and other initiatives in line with the Bradford District Cycling Strategy.	Bradford Council	Bradford MDC, Public Health Dept, NHS, Cycling public	Cycling Strategy approved by Council	3
	Review data on emissions from standard and low emission buses.	Bradford Council	Bradford MDC, METRO, Bus Operators	Completed review of midi buses	5

Objective	Actions/Measures	Project Lead/Partners	Key Stakeholders	Timescales	Report Section
	Bus Emission Strategy	Bradford, West Yorkshire Authorities, Metro/LTP Board	Bus operators WY Authorities, METRO, Public.	Ongoing – to be completed as part of West Yorks. LES	5
	Freight Emission Strategy/ Quality Partnership development	Bradford, West Yorkshire Authorities, Metro/LTP Board	Freight operators & trade bodies	Ongoing – to be completed as part of West Yorks. LES	6
3)	**Introduce planning and development control measures capable of mitigating and improving vehicle emissions**				
	Produce low emission strategy guidance for planners and development control	Bradford Council	Developers & Residents	Completed – currently implementing new procedure	8
4)	**Enhance travel planning to include vehicle emission improvement considerations in addition to promotion of modal shift measures, public transport patronage and traffic reduction**				
	Revise Council Travel Planning Guidance	Bradford Council	Developers & Residents	Ongoing	3
	Develop Bradford Council Travel Plan	Bradford Council	Council staff	Ongoing	3
	Continue support for voluntary travel plans and schools based initiatives	Bradford Council (& Metro)		Ongoing	3
5)	**Promote and adopt Green procurement policies**				
	Produce green fleet guidance for Council suppliers	Bradford Council	Bradford SMEs	Ongoing – complete Summer 2013	10
	Promote Local Sourcing initiatives	Bradford Council	Bradford SMEs	Bradford Food Strategy adopted. Further work to increase scope ongoing	10
	Incorporate Whole Life Cost considerations into fleet procurement	Bradford Council	Fleet Management, Vehicle Manufacturers	Whole Life Cost model developed and initial vehicles purchased using model outputs	10

Objective	Actions/Measures	Project Lead/Partners	Key Stakeholders	Timescales	Report Section
	Promote grant funding for low emission vehicles & infrastructure.	Bradford Council	Public and private sector stakeholders	Ongoing	10
6)	**Reduce Emissions of the Council Fleet and those associated with Bradford Council Staff Travel**				
	Regularly review low emission vehicle technologies for suitability for fleet integration.	Bradford Council	Low emission vehicle OEMs and infrastructure providers	Ongoing	4
	Appraise fuel and emission saving technology retro-fits to existing fleet vehicles.	Bradford Council	Technology providers, Bradford MDC	Ongoing	4
	Examine business case for development of natural gas/biomethane vehicle take-up and infrastructure provision.	Bradford Council	Technology providers Bradford MDC	Vehicle trials of biomethane vehicles undertaken Autumn 2012 and reported. Business case completed and referred to Regeneration for action.	4
	Produce guidance on how Council staff should reduce their vehicle emissions when travelling in the course of their duties and review for effectiveness.	Bradford Council	All departments	Guidance published. Effectiveness review ongoing	4
7)	**Undertake further research and raise awareness of the health impacts of vehicle emissions**				
	Establish an Air Quality and Health Steering Group	Bradford Council, Bradford NHS, Public Health Department, Bradford Observatory, PHE West Yorkshire HPU	Bradford Council, Bradford NHS, Public Health Department, Bradford Observatory, PHE West Yorkshire HPU	Established April 2012	2

Objective	Actions/Measures	Project Lead/Partners	Key Stakeholders	Timescales	Report Section
	Establish percentage of mortality in urban area attributable to particulates	Bradford Council Air Quality/HIA Steering Group, PHE West Yorkshire HPU	Public, NHS, Public Health Dept, PHE West Yorkshire HPU	Ongoing, complete Summer 2013	2
	Undertake health awareness campaign	Bradford Council Air Quality/HIA Steering Group	Public, NHS, Public Health Dept	To be incorporated in the WYLES project	2
8)	**Identify opportunities for economic development through the transition to a low emission economy**				
	Explore opportunities for development of Low Emission Enterprise Zones (as part of LEZ Study progression)	Bradford Council, Bradford University, Economic Development Unit,	Private Sector Bradford MDC	Ongoing	11
	Appraise funding opportunities arising from Low Emission Policy development e.g. Life Bid.	Bradford Council, West Yorks. Authorities, LTP Board	Bradford University, Metro, Private Sector , Bradford MDC	Ongoing	11
9)	**Development of West Yorkshire Low Emission Strategy**				
	Development of LES for all 5 WY Authorities	West Yorkshire Low Emission Strategy Project Board	DEFRA, Metro, LTP Board, WYTEG, 5 WY LAs, Private Businesses, Bus Operators, Developers and Public.	Start May 2013 to be completed by Jan 2015	11

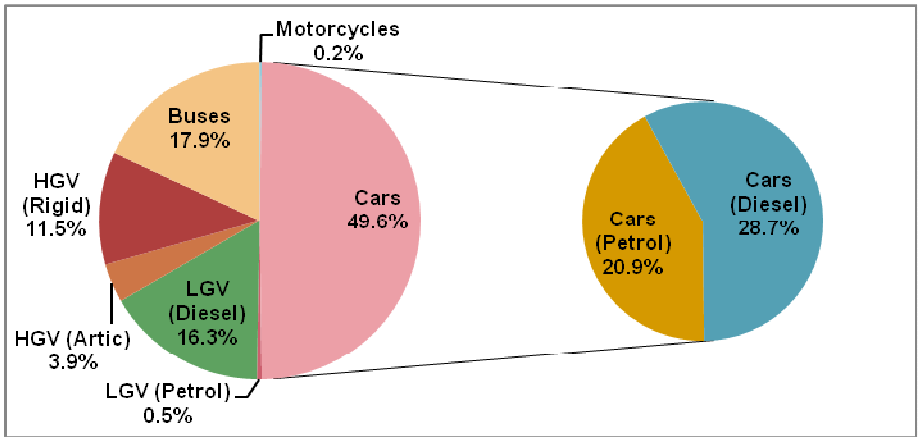
1. Introduction

This strategy describes the impact of poor air quality on health and the environment and outlines the progress that the Council has made in modifying its own policies and practices to encourage and facilitate vehicle emission reductions. It also looks at ways in which partnership working with other public authorities and the private sector can be improved and strengthened to achieve shared goals.

2. The Need for a Low Emission Strategy

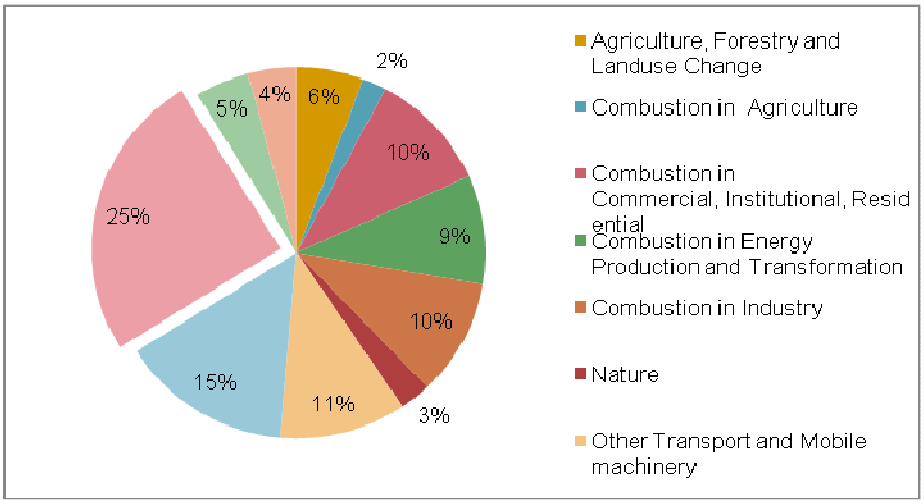
Road transport is responsible for approximately 40% of all NO_x (Oxides of Nitrogen – precursor for Nitrogen Dioxide) emissions and 25% of particulate emissions[4] in urban areas and is the major contributing factor to poor air quality. Figure 1 shows the relative contributions that road transport vehicle types have on urban NO_x emissions in the UK. Figure 2 shows the relative contribution that road transport makes to PM_{10} (particulate matter) emissions in urban areas in the UK.

Figure 1 Relative Contribution to Urban UK NO_x Emissions by Vehicle Type in 2010 (Defra, 2012)



[4] Defra 2012

Figure 2 PM_{10} Emission Sources in Urban Areas (Defra, 2012)



Air Quality in Bradford

Research by the Council's Environmental Health Service identified four areas in the district that are not achieving the UK air quality objective for Nitrogen Dioxide (NO_2 annual mean concentration of 40µg/m3 in relevant locations). Exhaust emissions from traffic on the roads within these areas is largely responsible. Heavy-duty vehicles (freight and buses) in particular contribute significantly to the emissions. However, emerging evidence also suggests that passenger vehicles, particularly diesel cars, are also significant contributors.

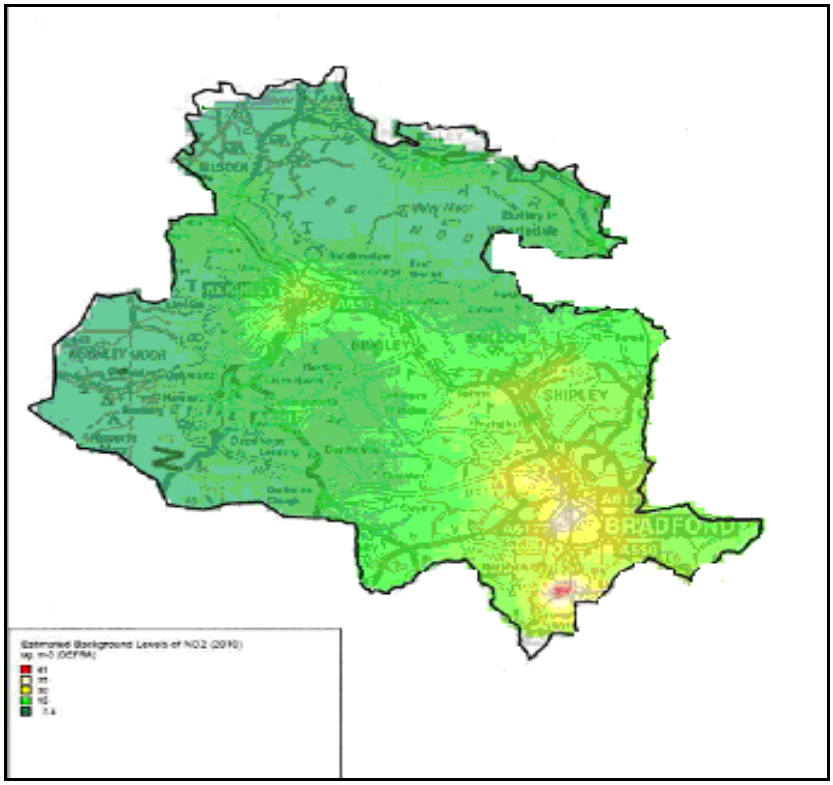
The four Air Quality Management Areas are located on relatively small areas of the following roads;

- Mayo Avenue, Bradford
- Thornton Road, Bradford
- Manningham Lane, Bradford
- Shipley Airedale Road, Bradford

The Council has a statutory duty to designate these locations as Air Quality Management Areas (AQMAs), which it did in September 2006, and to develop an action plan setting out the measures that it will adopt to make progress towards the achievement of the air quality objectives. The Air Quality Action Plan (AQAP) takes account of the contributory factors leading to the exceedance of the air quality objective and any limitations in Bradford Council's ability to act on this issue. The AQAP recognises that District wide policies are required to secure improvements in air quality in the identified AQMAs.

Recent modelling and monitoring studies have shown that NO_2 concentrations may be higher than previously thought and in addition that the projections for decrease in NO_2 predicted by the UK government have not been realised. This is common with many other Local Authorities in the UK. A significant contributing factor to this apparent underestimation is a failure to predict the impact of fleet dieselisation on air quality and the subsequent underestimation of the emissions from many vehicle types which have become a much larger proportion of the vehicle fleet.

Figure 3 Estimated concentrations of NO2 in Bradford.



It can be considered that all areas highlighted in yellow may be at risk of exceeding the objective. This has been highlighted in the Updating and Screening Assessment for Bradford and the Authority will continue to meet its statutory requirement to Local Air Quality Management.

Air Quality and Health in Bradford

Poor outdoor air quality is a contributing factor to health problems as well as damaging ecosystems, biodiversity and valued habitats. The adverse health effects from short and long-term exposure to air pollution range from premature deaths caused by heart and lung disease to worsening of asthmatic conditions, which often leads to a reduced quality of life and increased costs of hospital admissions. Despite improvements over recent decades, air pollution is still expected to reduce life expectancy of every person in the UK by an average

of six months with an estimated annual cost to society of up to £19 billion[5]. In Bradford 5.3%[6] of all deaths are attributable to particulate pollution ($PM_{2.5}$).

Figure 4 Potential pollutant health effects

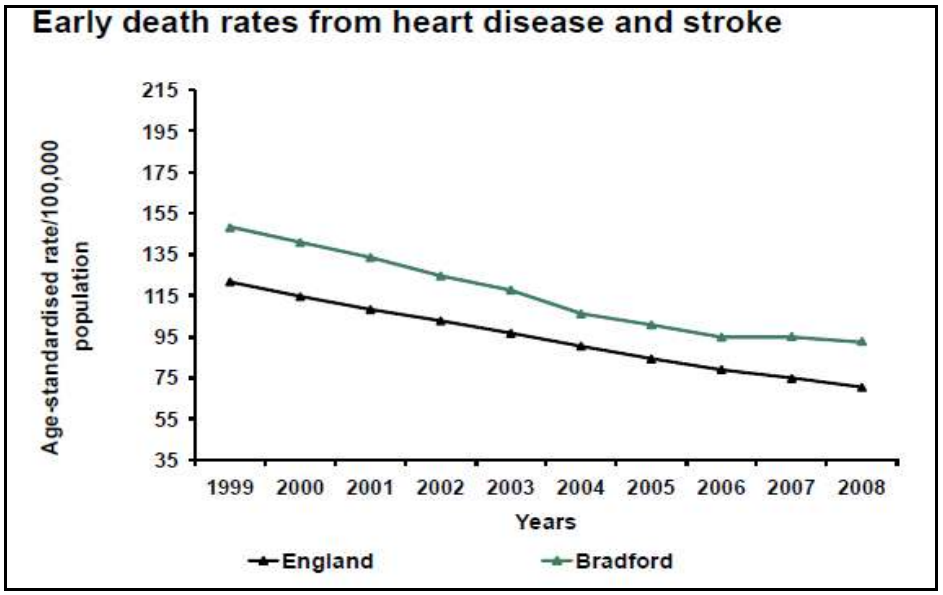
Pollutant	Potential Health Effects
Nitrogen Dioxide	Inhalation irritates the airways of the lungs, causing inflammation and increasing the symptoms of those suffering from pre-existing lung diseases
Particles	Fine particles can be carried deep into the lungs where they can cause inflammation and a worsening of heart and lung diseases

In June 2012 the World Health Organisation released a report which stated that diesel exhaust emissions cause cancer[7].

Air pollution is associated with increased mortality (and therefore reduced life expectancy), particularly in people with certain underlying health conditions. Bradford has substantially higher rates of death from COPD and acute myocardial infarction (heart attacks) compared to regional and national rates. This indicates a high number of people in Bradford are at risk from the effects of the high pollutant concentrations in the City. The graph below shows how Bradford death rates from heart disease are consistently higher than the national average.

[5] Environmental Audit Commission, 2011
[6] http://www.phoutcomes.info/public-health-outcomes-framework/domain/4
[7] http://www.bmj.com/content/344/bmj.e4174.full

Figure 5 Death rates from heart disease and strokes



Emergency admissions for respiratory conditions

The rate of admissions for asthma in Bradford is particularly high at 1.6 per 1,000 compared with 1.1 per 1,000 for England. Similarly the rate of COPD admissions is far higher than the national average of 2 at 2.6 per 1,000. There were over 800 emergency admissions for asthma and over 1,400 for COPD in Bradford in the last year. These figures give an indication of the scale of the 'at-risk' population that have potential to be more adversely affected by poor air quality and positively affected by improved air quality than the general population.

Table 1 Emergency admissions for asthma.

ASTHMA	Number of admissions(2010/11)	Rate per 1,000 population
Bradford	**853**	**1.6**
Yorkshire and the Humber	**6,517**	**1.2**
England	**60,913**	**1.1**

Table 2 Emergency admissions for COPD.

COPD	Number of admissions(2010/11)	Rate per 1,000 population
Bradford	1403	2.6
Yorkshire and the Humber	14,351	2.6
England	111,173	2

Public Health and Air Quality

In April 2013 Public Health became a local authority function. The work of the Public Health Department is set out and prioritised within the 'Public Health Outcomes Framework' (PHOF). The PHOF document recognises the scale of the health impact of air pollution and as such there is an indicator specifically aimed at improving air quality;

> ***3.1 Air pollution*** *(defined as "the mortality effect of anthropogenic* $PM_{2.5}$ *per 100,000 population)*
>
> *Additional indicators that the LES will or may contribute to within the PHOF are:*
>
> ***1.14 The percentage of the population affected by noise*** *(specifically refers to road transport noise)*
>
> ***4.3 Mortality from causes considered preventable*** *(this will depend on the final definition)*
>
> ***4.4 Mortality from cardiovascular disease***
>
> ***4.7 Mortality from respiratory disease***

The PHOF has 2 overarching 'Outcome measures':

Outcome 1: Increased healthy life expectancy. *Taking account of the health quality as well as the length of life*

Outcome 2: Reduced differences in life expectancy and healthy life expectancy between communities. *Through greater improvements in more disadvantaged communities*

Given the strength of the evidence that emissions from road vehicles adversely affect both health quality and length of life the LES will contribute directly to Outcome 1. There is also great potential for air quality improvement measures to aid in reducing the health inequalities and as such contribute towards work by the Public Health Department on outcome 2.

Bradford is within the 10% most deprived local authorities in the country and is the most deprived local authority in West Yorkshire. A key characteristic of Bradford District is the significant variation in the levels of deprivation between different neighbourhoods and communities. *Figure 6* and *Figure 7* show the socio economic status and the background concentrations of NO_2 in Bradford.

Figure 6 Deprivation
most deprived (red) to least deprived (dark blue)

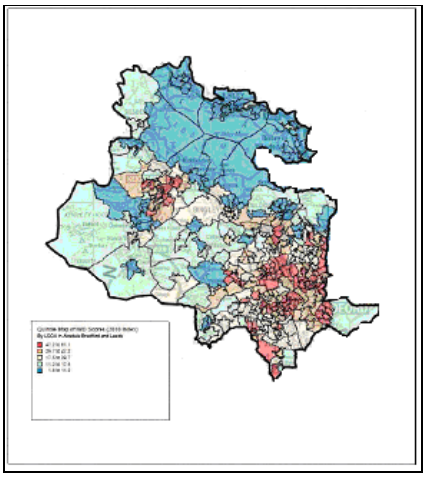
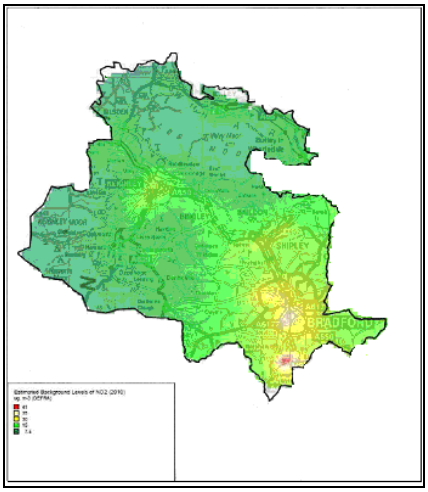


Figure 7 NO_2 concentrations
high (red) to low (dark green)



These maps illustrate the links the between deprivation and poor air quality. The links between social deprivation and poor air quality are well documented in the UK[8].

Health Impact Assessment Steering Group

Bradford Council has established a Health Impact Assessment (HIA) Steering Group in conjunction with The Public Health Department of the Council, Bradford NHS, HPA (Health Protection Agency) and other health bodies to evaluate the impact of low emission strategy policies on the health of the Bradford population. The HIA Steering Group, led by Bradford NHS, is currently undertaking the assessment of health impacts as part of the Low Emission Zone Feasibility Study (see Section 7). The Phase 1 Report of this assessment can be found on the following link; http://www.apho.org.uk/resource/item.aspx?RID=121448

The Council will continue to assess air quality in Bradford to clearly define air quality problems in terms of exceedance and potential exposure and fulfil statutory obligations within Local Air Quality Management.

The Council will investigate the % mortality attributable to air pollution in the urban areas of Bradford, and to compare this with the rural areas of Bradford thus demonstrating the impact in terms of health inequality in Bradford attributable to air pollution.

The Public Health Department of the Council will commit to continuing to work with the Environmental Health Service to decrease the mortality effect of anthropogenic $PM_{2.5}$ per 100,000 population in line with the Public Health Outcomes Framework.

The Council, in conjunction with the National Health Service, Public Health Department and other health bodies has established a Health Impact Assessment Steering Group to evaluate the impact of low emission strategy policies and measures.

The Council will continue to seek partnerships with public authorities, research and academic institutions and the private sector to achieve shared goals, within the LES.

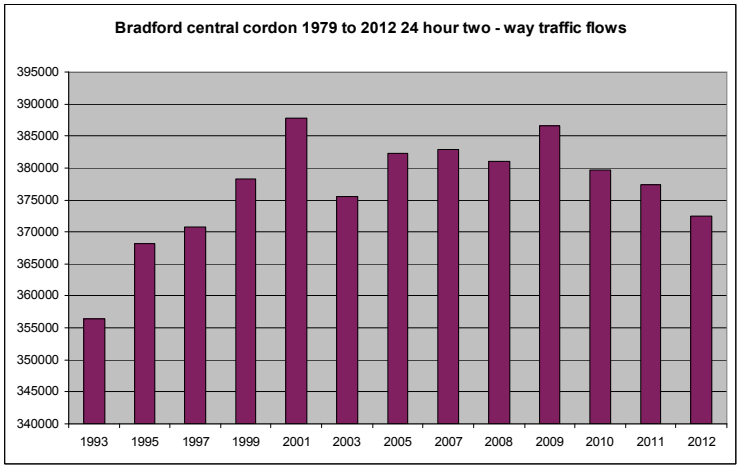
[8] http://uk-air.defra.gov.uk/reports/cat09/0701110944_AQinequalitiesFNL_AEAT_0506.pdf

3. Transport Planning

To many people, road transport is an essential part of everyday life; however, this comes at a cost. The emissions from vehicles include pollutants that are harmful to health and ecosystems and also contribute to climate change. Noise from vehicles can be a significant source of disturbance, particularly in urban areas.

In Bradford, successive increases in traffic flows in the central cordon during the 1990s have seen a levelling off and subsequent decreases in flows since 2009. There are several factors for this, including a large increase in the numbers of people working from home, modest modal shift to public transport and an increase in walking to work. Cycling levels are showing a steady increase across Bradford. These statistics are set against a background of a rise in the number of people in work in Bradford over this period.

Figure 8 Traffic Flows in Central Bradford



However, air quality in Bradford over the last 10 years has not improved and there is clearly a need to both understand how road transport contributes to poor air quality in the City and develop innovative approaches to reducing emissions.

The Low Emission Strategy seeks to compliment and support measures in the LTP and LIP by creating an overarching mechanism for reviewing Council policies and implementing cost-effective measures that reduce the emissions of the residual vehicles on the road by helping to accelerate the uptake of cleaner fuels and technologies.

Bradford has a track record for developing innovative solutions to transport problems - Bradford saw the first car share lane on a motorway in the UK at the junction between the M606 and the

M62 and we will work with partners in continuing to look at innovative solutions to reduce road transport emissions.

One such area of work where partners are already working together and will seek to further improve practice is travel planning and travel choices initiatives. Travel plans set out the sustainable transport options for development sites as well as existing employers and as such have a positive impact in reducing both carbon and hazardous pollutant emissions. Travel planning staff from Bradford Council and Metro work in partnership with developers, employers and residents and schools to allow individuals to make more informed and sustainable travel choices. This work is supported by a range of initiatives such as the WY car sharing database, discounted public transport tickets, journey planning tools along with discrete campaigns around key issues such as walking to school.

Bradford has also developed and begun implementation of a cycling strategy, the strategy and action plans are structured around four key Strategic Objectives:

- Communication and Promotion of Cycling in Bradford
- Bradford's Cycling Infrastructure
- Cycling Economics and Funding
- Cycle Training, Education, Enterprise and Community Support

For further details on this important area of work and how it has influenced modal shift please see Appendix 1.

There is significant action underway to promote a modal shift to walking, cycling and public transport, along with alternative models of vehicle use and ownership through car sharing and car clubs, with signs that the message is starting to get through. The West Yorkshire Local Transport Plan (2011-2026) acknowledges the impact that road transport emissions have and details measures to support a reduction in vehicle use. In addition, the LTP seeks to reduce congestion and improve public transport journey times and reliability. In order to compliment and support these measures, this Low Emission Strategy (LES) which targets a reduction in the emissions of the residual vehicles on the road by using available mechanisms to accelerate the uptake of cleaner fuels and technologies, has been developed. While the primary goal of the LES is to improve air quality in the urban areas, the strategy will also have co-benefits in reducing emissions of greenhouse gases (GHG). The LTP also contains complementary programmes aimed at making the shift to sustainable

modes a natural choice and positive experience. Integrated transport hubs are being developed that provide a seamless interchange between all modes, new rail stations are being built and bus priority is being introduced across the district along with improvements to walking and cycling routes.

West Yorkshire Local Transport Plan (2011 – 2026)

My Journey, the third West Yorkshire Local Transport Plan sets out a 15 year strategy for transport, it is supported by Local Implementation Plans and is the main mechanism for directing funding towards transport improvements in the district, as well as providing the basis for seeking additional funding for key schemes and initiatives. The aims and objectives set out in the LTP inherently seek to improve air quality through measures to manage demand for car travel and shift trips to more sustainable modes of travel including, walking, cycling and public transport, as well as promoting alternative models of car use and vehicle ownership through car sharing and car clubs. There are a number of supporting strategies including freight, rail, asset management and network management that include complementary policies to this Low Emission Strategy, as detailed below in the following sections.

MyJourney West Yorkshire Vision 2026 – connecting people and places: Working together to ensure that West Yorkshire's transport system gives people access to what they want and need easily, efficiently and in a way that supports the environment, the economy and their quality of life.					
Objectives					
To make substantial progress towards a low carbon transport system for West Yorkshire		To improve connectivity to support economic activity and growth across West Yorkshire and the Leeds City Region		To enhance the quality of life of people in West Yorkshire	
Strategy					
Transport Assets	Travel Choices		Connectivity		Enhancements
"Big ideas"					
Enhanced travel information	Integrated ticketing	Encourage greater use of low-carbon modes	New approach to buses	Stronger measures to manage demand	New approach to network management

(Taken from 'My Journey' WY Local Transport Plan (www.wyltp.com)

As part of the West Yorkshire Local Transport Plan (LTP) 2011 to 2026, Bradford has produced a **Local Implementation Plan (LIP)**[9] outlining policies and measures that not only help stimulate jobs and growth but also seek a transition to a more sustainable transport system and a reduction in transport related emissions. Key environmental objectives of the LIP include:

- reducing congestion and supporting greener fuel technologies.
- serving the transport needs of the most vulnerable members of the community and reducing the harmful effects of road traffic within neighbourhoods.
- to make substantial progress towards a low Carbon, sustainable transport system for West Yorkshire, while recognising transports' contribution to national Carbon reduction plans.
- to seek a reduction in concentrations of NO_2 and particulate matter.

Carbon and Transport

Road transport in Bradford contributes approximately 20% to the total carbon emissions for the district[10].

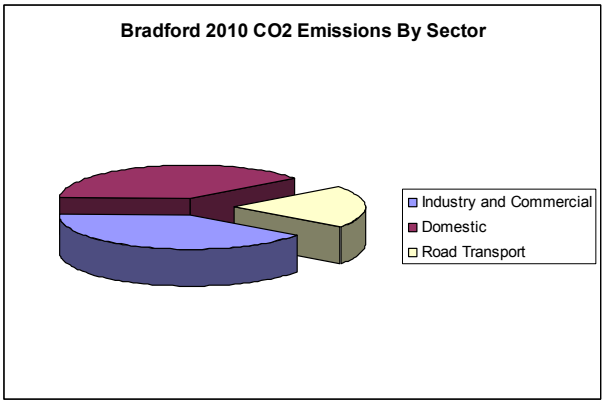


Figure 9 Bradford 2010 CO_2 emissions

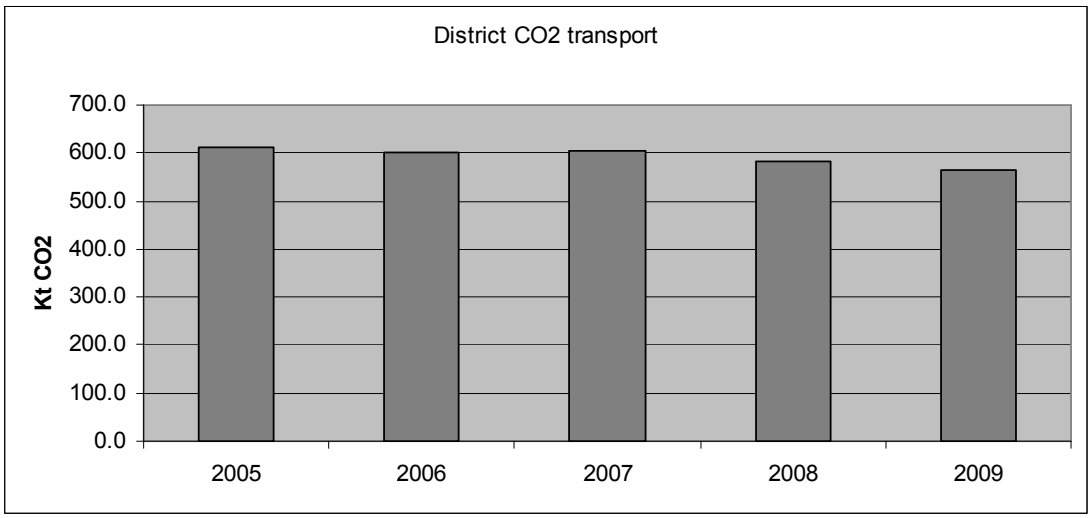
Figure 10 shows that the district carbon footprint has experienced a fall of 47,000 tonnes in CO_2 emissions from road transport compared with 2005 levels. Reasons for carbon emission reduction may be partly explained by improved vehicle efficiency however further research is required to fully understand the overall drivers.

[9] http://www.bradford.gov.uk/bmdc/transport_and_infrastructure/transport_planning/west_yorkshire_local_transport_plan

[10] Bradford Local Transport Plan 2011-2026-p

In order to meet the district 40% CO_2 reduction target by 2020 there will need to be a further 197,000 tonne reduction on 2005 levels.

Figure 10 CO_2 emissions from transport sector 2005 – 2009 [excluding aviation] (source DECC NI186)



There is a commitment to work together to provide simultaneous reductions in both air quality pollutants and climate change gases from transport. This strategy seeks to reduce all emissions from transport including noise.

The Low Emission Strategy recognises that in tackling road transport emissions there is an emission reduction progression. While there is considerable activity in Bradford to promote alternatives to vehicle use and a shift to sustainable transport modes, including walking, cycling and public transport, the LES seeks to build on and compliment these measures by focussing on an improvement in the emissions of the residual vehicles on the road.

Bradford Council has reviewed existing evidence relating to measures that can cost-effectively reduce road transport emissions and is continuing research into the costs and benefits, including economic development, of policies that are capable of improving air quality and greenhouse gas emissions. The following sections outline the progress to date in evaluating and implementing Low Emission Strategy measures in Bradford.

The LES recognises that reducing road transport emissions can be challenging and requires action by all sections of the community. Bradford Council will continue to seek partnerships with public authorities, research and academic institutions and the private sector to achieve shared goals.

4. Bradford Council Fleet Emission Management

The Council has adopted grey and liveried fleet policies and practices to avoid and minimise the emissions from use of these vehicles wherever possible, such as;

- Safe and Fuel Efficient Driver (SAFED) training for drivers
- Eco-Drive Assist (EDA) units have been fitted to 28 refuse collection vehicles (RCV
- An Engine Rev Control System on selected vehicles
- Promotion of video/tele-conferencing to reduce the need to travel
- Use of public transport whenever possible
- Car sharing to meetings where possible
- Recommendation to use 'A' energy-rated options when hiring vehicles
- Provision of pool Metrocards for staff to use when travelling on Council business

Please see Appendix 3 for a more detailed explanation of fuel reduction initiatives currently being employed to reduce the impact of the liveried fleet.

In terms of demonstration and leading by best practice Bradford are amongst the first local authorities in the country to undertake a gas trial of CNG vehicles. CNG vehicles have the potential reduce emissions of regulated air quality pollutants, significantly reduce CO_2 emissions (by using biomethane) and simultaneously reduce fuel costs. Please see Appendix 4 for a summary of the gas trial, the full report can be found on the Council website. Bradford Council has committed to utilise the results of the trial this work in developing a business case which evaluate the feasibility, cost and benefits associated with the use of biomethane for the Council fleet.

Toyota Auris Hybrid

As part of the development of the LES, Bradford has looked at the whole life costs of standard and low emission vehicles as part of a joint initiative with Coventry Council to monetise the operational lifetime energy and environmental impact of vehicles as part of the requirements in the Cleaner Road Transport Vehicle Regulations (2011). This has lead to the purchase of LEVs such as the Toyota Auris Hybrid, in preference to conventional diesel vehicles. Please see Appendix 5 for further details.

The Council will implement best practice with respect to demonstration and evaluation of low emission vehicles

The Council will use whole life costs to evaluate vehicle purchasing decisions, including operational lifetime energy and environmental impacts

The Council will reduce impact of grey fleet and liveried fleet via fuel reduction initiatives and avoiding the need to travel

The Council will evaluate the business case for developing biomethane/ natural gas refuelling infrastructure.

5. Bus Emission Strategy

Buses are a key component of any sustainable transport system in terms of emissions per person. However, we also know that they can contribute significantly to NO_x and PM levels in urban areas. The LEZ Study is currently looking at the impact that bus age and technology has on air quality levels and the outputs will help inform the development of a Bus Emission Strategy for Bradford, incorporating considerations of cost and benefits.

Many bus operators provide services across district boundaries and there is potential that emission standards applied in one area, whether voluntarily or by regulation could see the displacement of older buses to other locations in West Yorkshire, to the detriment of air quality in those locations. It is important that in developing a Bus Emission Strategy consideration is required strategically across West Yorkshire. It is proposed that a Bus Emission Strategy is taken forward as part of the West Yorkshire Low Emission Strategy Project (see Section 10).

Low emission buses often cost more than their traditional diesel counterparts; however, their operational energy costs and environmental impacts are reduced, meaning that whole life costs should be considered as part of any Bus Emission Strategy. Some funding for low emission buses (hybrid, CNG, electric) is provided through the **DfT Green Bus Fund**[11]. Now in its fourth year, the Green Bus Fund has included air quality as a consideration within applications for 2013, required by the end of March.

Despite the impact that buses can have on urban air quality, there is still a lack of understanding of their real-world emissions. Bradford University and Leeds Institute for Transport Studies (ITS) are currently looking at real-world bus emissions. Bradford Council, through the West Yorkshire LES Project, will seek to support such much-needed research which can help to inform the development of a Bus Emission Strategy.

[11] https://www.gov.uk/government/publications/green-bus-fund-round-4

METRO have provided data to characterise the bus fleet in Bradford. Research has been done to calculate the impact of different bus types in terms of price premium, and pollutant contribution. This research can be read in detail in Appendix 6

The Council will build on the outputs from the LEZ Feasibility Study to develop an emission strategy for buses in Bradford, as part of a West Yorkshire Strategy and in conjunction with Metro and the bus operators.

The Council will continue to work with partners to understand real world bus emissions and the costs and benefits of low emission technology.

6. Freight Emission Strategy

Freight is an important sector in the West Yorkshire economy, contributing over 25% in GVA, as well as contributing indirectly in supporting local businesses. However, it is recognised that road freight impacts disproportionately on air quality and carbon emissions, compared to other vehicle sectors.

The West Yorkshire LTP3 Freight Plan 2012 - 2026 sets out the strategic approach for the management of freight within West Yorkshire. It is envisaged that the LEZ Study will help inform and support measures within the Freight Plan to work towards the reduction of vehicle emissions in this sector. One of the objectives of the West Yorkshire LES is to look at the development of a Freight Emission Strategy, possibly achieved through **Freight Quality Partnerships**, in association with freight trade bodies.

Industry partners have a number of current and potential future interests which the air quality agenda should assist in enhancing as priority concerns. Such initiatives include the development of Freight consolidation centres and night time delivery plans.

Bradford Council will continue to engage with freight concerns in the District to support their take-up of low emission vehicle technologies. This strategy has been produced with support from Morrison's and M&S Pro-Logis.

Smiths Newton 7.5t Electric Truck (TNT)

Mercedes 44t Dual Fuel CNG/diesel (Tenens)

One of the key low emission technologies being adopted in the logistics sector is natural gas/biomethane and dual fuel (natural gas/diesel) vehicles. Companies including Eddie Stobart, ASDA, Coca Cola, Tenens, John Lewis, DHL and Wincanton report that operating cost savings can be significant in addition to emission benefits. A

key issue affecting the take-up of gas technology is the availability of refuelling infrastructure. The West Yorkshire LES will seek to support the West Yorkshire Freight Plan through the development of a Low Emission Infrastructure Plan, identifying cost effective mechanisms to accelerate the provision of refuelling infrastructure through partnerships and effective planning and procurement policies, including the protection of those sites deemed suitable for future low emission vehilce refuleing functions.

The Department for Transport (DfT) is currently developing a strategy to switch HGVs to gas which will be published in July 2013 and has just released £9.5m of funding to support gas infrastructure as part of the Technology Strategy Board (TSB) Low Carbon Truck Programme[12].

The Council will build on the outputs of the LEZ Feasibility Study to investigate the development of Freight Quality Partnerships with the aim of agreeing voluntary emission agreements.

The Council will work with the West Yorkshire Authorities, Metro and trade bodies to develop a low emission infrastructure plan for freight, as part of the West Yorkshire Freight Strategy.

The Council will continue to develop public private partnerships in order to achieve shared goals.

[12] https://connect.innovateuk.org/web/low-carbon-truck-demonstrator-trial

7. Low Emission Zones (LEZ) Feasibility Study

Bradford and Leeds Councils are undertaking collaborative studies looking at the feasibility of introducing Low Emission Zones (LEZ) in urban areas. This innovative joint working has shared expertise and resources and reduced costs for both Councils. It also shows acknowledgement of the transboundary nature of air pollution issues.

LEZ are common in many European Cities and the majority focus on reducing fine particulate emissions. More information on these zones can be found on the following website – www.lowemissionzones.eu

There are, however, different models for taking forward LEZ. HGVs, buses and larger vans are required to meet a specified European Emission Standard when entering the Greater London Area and fines are incurred for non-compliant vehicles[13]. In Oxford, buses are required to meet a Euro V standard for NOx and Particulate Matter from 2014 and this is regulated by the Traffic Commissioner[14]. In Birmingham City Centre, buses are required to meet emission standards that tighten over time as part of a Statutory Quality Bus Partnership[15]

In addition to the possibility of restricting access for high emission vehicles through regulation, the Bradford and Leeds Study will also look at the feasibility of developing voluntary agreements i.e. through Bus Emission Agreements and Freight Quality Partnerships, and the potential for accelerating the uptake of cleaner vehicle technologies through incentives, facilities and enhanced green fuel infrastructure.

The first phase of the project has seen the gathering of local vehicle data to establish the emission profile. This data and existing air quality modelling data has been combined to look at possible intervention scenarios and their effect in selected geographic locations across the cities of Bradford and Leeds, including:

- City Centres

[13] http://www.tfl.gov.uk/roadusers/lez/default.aspx
[14] http://www.lowemissionzones.eu/countries-mainmenu-147/united-kingdom-mainmenu-205/oxford
[15] http://www.centro.org.uk/bus/qualitypartnershipscheme.aspx

- Areas cordoned by ring roads
- Strategic corridors

An example of a strategic corridor is Canal Road / A650. Manningham Lane has been designated as an AQMA and the LEZ Study will look at feasible options for directing HGVs that are transiting Bradford away from Manningham Lane and onto Canal Road.

The modelling will look at key vehicle types, according to their pollutant contribution.

Once the intervention scenario modelling has been completed, a full **Cost Benefit Analysis (CBA)** will be undertaken in respect of the most effective options.

The LEZ Study will also incorporate a full **Health Impact Assessment (HIA)**.This work has been carried out through the setting up of a Health Impact Assessment (HIA) steering group. The group has the primary aim of providing a HIA for the Low Emission Zone (LEZ) feasibility study. The steering group is supported by Bradford and Leeds Councils and has representatives from the Bradford Observatory, NHS, Health Protection Agency and Public Health colleagues who can provide understanding of local health data and using it to better inform air quality and subsequent transport policy.

The LEZ Study will report in late 2013. The study includes extensive consultation with key stakeholders, including METRO, freight, and bus operators.

Establishing a robust local emission profile from Bradford ANPR data (automatic number plate recognition cameras)

Modelling possible intervention strategies

Undertaking Cost Benefit Analysis (CBA)

Undertaking a Health Impact Assessment (HIA)

Stakeholder engagement

8. Planning & Development Control

Bradford planning policy can play a significant role in ensuring that development schemes are designed to be sustainable. While planning policy cannot solve immediate air quality issues, it has a role to play so that any likely scheme impacts are reasonably mitigated and future scheme occupants are able to make green vehicle choices.

Courtesy Source London


Courtesy Bradford BMX Bandits

Bradford in association with the West Midlands and Sussex has developed an innovative new approach to development control air quality policy in line with the National Planning Policy Framework (NPPF). The new policy;

- introduces air quality mitigation as a part of good scheme design with a focus on providing cost effective low emission infrastructure and other measures such as travel planning.
- tackles the issue of cumulative impact
- gives clarity and consistency to the process to the benefit of planning colleagues and developers
- can facilitate the 'unlocking' of difficult sites (in air quality terms) making them suitable for development.

Please see Appendix 2 for full details and explanation of the new policy developed and implemented as part of the Low Emission Strategy for Bradford.

Bradford will continue to implement air quality mitigation measures through development control decisions

Bradford will continue to work with developers to cost-effectively provide the infrastructure required for low emission vehicle uptake / enable future residents to make green vehicle choices.

9. Waste Management & Renewable Fuels

Bradford Council policies promote the production of renewable energy, including road transport fuels that can replace fossil fuels. Over recent years it has been recognised that biomethane, produced by the anaerobic digestion (AD) of organic waste, can provide one of the lowest emission vehicle fuels while providing co-benefits, including sustainable fertilizer and economic development in key sectors such as farming and waste management sectors.

Bradford Council will continue to assess the potential for growth of AD plants in the District and promote their development, including the production of vehicle grade biomethane where possible.

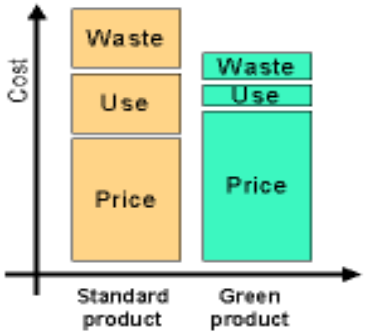
Additionally, the Council will continue to evaluate transport impacts when awarding waste management contracts. A recent waste disposal contract award was influenced by the potential for transport emission benefits

Bradford will continue to review the potential for renewable transport fuel production e.g. biomethane produced through anaerobic digestion

Bradford will continue to consider transport impacts when awarding waste management contracts.

10. Procurement Policies

Combined public sector expenditure represents 17% of GDP across the EU[16]. In 2012-2013, Bradford Council will spend over £1 billion on services[17]. It is recognised that the public sector is able to influence road transport emissions by virtue of its considerable purchasing power.



Local Sourcing

Many councils provide advice to local suppliers to help them compete in winning council contracts. Local sourcing not only helps support the local economy but helps reduce the overall delivery mileage of goods and services, resulting in potential CO_2 savings.

The **Bradford District Food Strategy**[18] promotes the use of local produce, reducing vehicle mileage, while supporting the local economy. The Council will continue to promote and widen local sourcing initiatives, helping to reduce overall vehicle emissions.

Reducing Emissions from Suppliers

In line with Bradford Councils' purchasing practices, there is significant potential to influence the emissions of vehicles used by suppliers. The Council will continue to consider vehicle emissions as part of the evaluation of award criteria in respect of appropriate contracts.

The Council is supporting a survey of SMEs (in conjunction with the University of Leeds) in the district with the aims of;

• Characterising freight emissions and local fleets

[16] http://ec.europa.eu/environment/gpp/index_en.htm
[17] http://www.bradford.gov.uk/bmdc/Consultations/the_councils_budget_explained
[18] http://www.bradford.gov.uk/bmdc/the_environment/climate_change/FoodStrategy.htm

• Understanding the barriers to the uptake of low emission vehicle technologies.

The survey will help inform the development of an awareness campaign to help SME's understand the possibilities for cost effectively improving their fleet emissions and potentially assist them in competing for Council contracts.

Bradford is a founding member of the Yorkshire Purchasing Organisation (YPO) and often procures goods such as vehicle fuel and gas through its framework agreements. The Council will continue to work with YPO and other local authorities to achieve cost reductions related to the procurement of low emission vehicle technologies.

Grants for Low Emission Vehicles

The Government is committed to supporting the uptake of low emission vehicles through the provision of grants for vehicle purchase and infrastructure provision. The Council will continue to look at the benefits of grant funding when making vehicle and infrastructure purchasing decisions and will promote the availability of grants to the wider public. Grant funding that is currently available is listed below:

Plug in car grant[19] - grants of up to 25% of vehicle cost to a maximum of £5,000 are available towards the purchase of an electric or plug-in hybrid electric car

Plug in van grant[20] - grants of up to 20% of vehicle cost to a maximum of £8,000 are available towards the purchase of an electric van

Hybrid van grant[21] - £1.7m of funding under the Low Carbon Vehicle Procurement Programme is available for the public sector to purchase the Ashwoods Hybrid Electric Transit Van at a discount of £3,430 per van

Electric Vehicle Recharging Funding[22] - the following grants are available

- Public sector bodies can receive 75% of the cost of installing work place charging points on their estate for fleets, staff or visitors
- Grants of up to 75% of the cost of installing charging points at railway stations is available

[19] https://www.gov.uk/plug-in-car-van-grants/overview
[20] https://www.gov.uk/plug-in-car-van-grants/overview
[21] https://www.gov.uk/government/publications/the-low-carbon-vehicle-public-procurement-programme-support-for-low-carbon-vans
[22] https://www.gov.uk/government/organisations/office-for-low-emission-vehicles/series/plug-in-vehicle-chargepoint-grants

- Local authorities can apply for funding to increase the availability of on-street charge points in residential streets where off-street parking is not available and also to increase the availability of rapid charge points in locations where those points will help increase the uptake of plug-in vehicles
- Homeowners can receive 75% of the capital cost (capped at £1,000) towards the cost of installing a charge point at home.

The Council will continue to promote and widen local sourcing initiatives, helping to reduce overall vehicle emissions.

The Council will include emission considerations as part of contract award criteria wherever possible.

The Council will continue to consider the benefits of aggregated procurement in reducing the costs of low emission technologies as part of procurement frameworks.

The Council is working with the University of Leeds to survey SMEs to identify barriers to low emission vehicle take-up with a view to providing emission reduction advice and assisting local companies when applying for contracts.

The Council will continue to seek innovative solutions to environmental concerns through procurement mechanisms.

The Council will maximise opportunities to utilise available low emission vehicle grants for its own fleets and support uptake by businesses and individuals.

The Council will work with partners to access available grants to provide a charging infrastructure for electric vehicles throughout the District.

11. The Next Steps – A West Yorkshire Low Emission Strategy

Bradford Council seeks to build on the foundation provided by this Low Emission Strategy and recognises that pollution is a cross boundary issue influenced heavily by the regional strategic transport system. In order to tackle issues at a regional level, the West Yorkshire Authorities, led by Bradford and supported by Metro successfully applied for funding of £150,000, through the Defra Air Quality Grant 2012/13 to develop a West Yorkshire Low Emission Strategy. Defra stated that the funding award was in recognition of the innovation demonstrated in emission reduction activity by Bradford Council and the West Yorkshire Authorities.

A West Yorkshire LES Board has been established involving representatives from all the West Yorkshire Authorities, a representative from the LTP Board, West Yorkshire Transport Emission Group (WYTEG), Metro and a health representative for West Yorkshire from the Health Protection Agency. The project will be co-ordinated by a LES Manager and technical support, appointed by Bradford. The project will run over the next 2 years.

All West Yorkshire Authorities have shown leadership in promoting low emission vehicle technologies and providing infrastructure to enable their use. Building on regional developments in both the public and private sectors, the Low Emission Strategy will incorporate an integrated strategy and implementation plan that and the agreed project plan for the project aims to;

- Identify current low emission vehicle and infrastructure deployment and demonstration and evaluate the potential for a cost effective increase in activity
- In conjunction with METRO and bus operating companies, investigate the development of a regional bus emission strategy.
- Promote joint working with organisations, including West Yorkshire Police, NHS, DSS, Morrison's, M&S, ASDA, TNT, Coca Cola, Eddie Stobart, Sainsbury's etc to establish emission reporting protocol and develop opportunities for shared learning and infrastructure provision.
- Undertake targeted awareness campaign of SMEs to highlight cost effective opportunities for fleet transformation.

- Produce and standardise best practice in public procurement, highlighting approaches in whole life costing, local sourcing, public private partnerships and innovation in procurement.
- Optimise parking and permitting policies to encourage low emission vehicle use and deployment of supporting infrastructure.
- Encourage opportunities for cost savings through economies of scale and innovation of procurement.
- Develop common regional planning policies incorporating air quality mitigation as standard, designed to accelerate the uptake of cleaner fuels and technologies, while encouraging the provision of infrastructure to support take up.
- Evaluate the potential economic benefits to the region arising from policies to support the uptake of cleaner fuels and technologies; this will include the evaluation of opportunities and mechanisms to stimulate low emission enterprise activity.
- Provide a platform for low emission vehicle technology investment for the region
- Prepare an agreed plan for the co-ordinated implementation of policies and measures across West Yorkshire.

The project aims to improve joint working practices to support regional plans and to benchmark and disseminate best practice. Targets and criteria will be established as part of the project to evaluate success.

This work will complement the developing plans within the LTP3, including the freight strategy.

Appendix 1 – Summary of the Bradford District Cycling Strategy

A district wide multi-partner lead cycling strategy, 'Setting the wheels in motion' and associated action plan was endorsed by Bradford Council Executive Committee in January 2012. The strategy and action plans are structured around four key Strategic Objectives:

- Communication and Promotion of Cycling in Bradford
- Bradford's Cycling Infrastructure
- Cycling Economics and Funding
- Cycle Training, Education, Enterprise and Community Support

Since endorsement, interest in cycling at both a national and local level has increased and significant progress has been made on delivery of the strategy in a number of areas. The following paragraphs provide a brief update on activity and initiatives under each of the strategic objectives.

Communication and Promotion of Cycling in Bradford

Cycling activities in Bradford district are being promoted in a more holistic manner; Cyclebradford.org.uk is being used more comprehensively by partners as the primary location for information on cycling. In total 26 press releases have been issued by the council promoting cycling related activity since January 2012. A number of events have taken place over the summer months including Cyclefest in Roberts Park, four cyclist breakfasts and Skyride, Skyride local and Breeze rides which have attracted almost 8,000 participants collectively. These events will run again in 2013 along with a programme of complementary smaller scale activities across the district.

The DfT funded West Yorkshire go:cycling project has been launched, with two dedicated officers providing a co-ordinated approach to cycle promotion (and adult cycle training) activities across West Yorkshire. Within schools, the Sustrans Bike It officer is currently working intensively with 6 schools and a further 14 schools are engaged in the project, with over 3000 children participating in the project throughout the district to date.

Bradford's Cycling Infrastructure

A number of high profile infrastructure projects are being delivered, assisted by the announcement of significant amounts of Government funding for cycling projects. Bradford

Council is working in partnership with Sustrans to make use of best practice in the consultation and design processes and lever in additional funding.

- Connect 2: the bridge across Manchester Rd is now open and the final phase of the project is on track for delivery in early 2013.
- Canal Rd Corridor Cycle Route: £500k scheme funded by DfT LSTF. Project to be completed by 2014.
- Great Northern Railway Trail: The route is being delivered in phases with timescales for completion dependent on negotiations with landowners.
- City Centre: Improvements have been made in the city centre through the City Park works. Further enhancements are being investigated, linking through to Forster Square Station and beyond to Canal Rd.
- 'Cycle Hotspots' Funding: Government has announced £15m for schemes to improve safety for cyclists. Bradford's proposal links into the Airedale Greenway and provides a route to avoid two dangerous roundabouts in Keighley.

DfT have recently announced Cycling City Ambition Grants that City Deal areas can bid into for large scale cycling infrastructure projects. Bradford Council is currently exploring the options for a potential joint bid with Leeds.

Cycling Economics and Funding

Approximately £1.4m in Government funding has been awarded to cycling projects in the district, which will help to deliver the objectives of the cycling strategy. The following projects and initiatives have had funding announced since January 2012:

- Sustrans 'Access to Education': Bradford is a partner in this national project, to deliver access to cycling opportunities at Bradford University and Bradford College including a cycle hub, recycled bike purchase, hire options, improved infrastructure promotional and training activities.
- Bikeability Training: a further £50k has been awarded to Bradford to deliver Bikeability training to school children in the district.

The DfT funded West Yorkshire go:cycling project has announced a 'delegated fund' that local groups will be able to apply for, enabling innovative small scale projects to be progressed in the district.

Cycle Training, Education, Enterprise and Community Support

As mentioned above Bikeability training has continued to be delivered through schools, with participation increasing year on year. To date 1085 children have been through Bikeability training in 2012. In addition 600 children have attended a Road Safety cycle skills training through their school.

The go:cycling project is delivering free adult cycle training through a variety of delivery mechanisms including both group and 1:1 sessions, including assistance with route planning. In addition training and cycle maintenance (Dr Bike) sessions are being held in workplaces.

Through the British Cycling sky ride and Breeze programmes additional ride leader training has been undertaken, with an extra 10 ride leaders trained in 2012. 19 ride leaders have completed off-road leadership training and 8 Sky ride leaders have been trained in 'How to coach disabled people in sport'.

The national Times campaign has highlighted a number of cyclist safety issues including potential conflicts between HGVs and cyclists. Locally, a number of awareness sessions have been held and work is underway with Metro looking at the issues between buses and cyclists. The work of Safer Roads West Yorkshire has been expanded to cover cyclists and the work programme includes a 'someone's son' cyclists and driver's awareness campaign and cyclist specific road safety signage.

Appendix 2 - Development Control Air Quality Policy

National Planning Policy has been revised recently with Planning and Policy Statements concerning Air Quality replaced with the National Planning Policy Framework (NPPF). The NPPF emphasises that air quality is still a material consideration in planning decisions and states that:

Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.

(Paragraph 124)

The NPPF also states that:

Plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people. Therefore, developments should be located and designed where practical to:

- *incorporate facilities for charging plug-in and other ultra-low emission vehicles; and consider the needs of people with disabilities by all modes of transport.*

(Paragraph 35)

and;

If setting local parking standards for residential and non-residential development, local planning authorities should take into account:

- *an overall need to reduce the use of high-emission vehicles*

(Paragraph 39)

Currently, there is no statutory guidance on how to deal with air quality considerations through the planning system. Most guidance concerns itself with technical modelling of impacts with little information provided on how to mitigate against impacts. Bradford, along with other councils in the West Midlands and Sussex have developed a new approach that both simplifies the assessment of air quality for development schemes while placing more emphasis on incorporating road transport emission mitigation as standard, thereby, defining what sustainability means in air quality terms. It is envisaged that by securing reasonable

emission mitigation on each scheme, where appropriate, cumulative impact effects, arising from overall development can be minimised. The new approach provides greater clarity and consistency for developers which should help to speed up the planning process.

The addendum to the Bradford Air Quality Action Plan concerning air quality and planning guidance is provided below;

ADDENDUM TO THE BRADFORD AIR QUALITY ACTION PLAN (MARCH 2013)

LAND-USE PLANNING AND ROAD TRANSPORT EMISSIONS GUIDANCE

The planning system in England has been revised over the past 2 years with the purpose of reducing associated guidance and streamlining procedures through the introduction of the National Planning Policy Framework (NPPF)[23]. The NPPF also introduces the presumption that planning approval will be granted for sustainable development. The Bradford MDC Air Quality Action Plan Addendum seeks to define what is meant by 'sustainable' in air quality terms in order to provide consistency and clarity to both local authority practitioners and developers alike.

The NPPF states that air quality is a material consideration in the planning process and consideration of Air Quality Management Areas (AQMA) and Air Quality Action Plans (AQAP) is needed in the application process. A key consideration in the NPPF is the cumulative impact of development on pollution levels; therefore, this guidance seeks to simplify assessment and mitigation procedures through a standardised development scheme classification, according to potential scheme impact, while recommending the types of appropriate and reasonable mitigation measures that should be designed into each scheme classification. A summary of this approach is shown in the table below:

Table 1

Development Classification	Assessment Required	Mitigation	Compensation
Minor	None (other than for exposure)	Type 1	-
Medium	None (other than for exposure)	Type 1 and 2	-
Major	Full AQ Assessment in line with Council Guidance, including evaluation of emission and concentration changes	Type 1 and 2	Type 3

[23] https://www.gov.uk/government/publications/national-planning-policy-framework--2

Development Classification

Following discussions with local authority Planning and Transport Officers, the Department of Transport (DfT) Threshold Criteria for Transport Assessments and Travel Plans (TA/TP) have been used to produce a development classification table.

Table 2: Development Classification

Scheme Type	Minor	Medium	Major
Threshold	Below DfT threshold criteria for Transport Assessment and Travel Plan (TA/TP)[24]	Meets DfT threshold criteria for Transport Assessment and Travel Plan (TA/TP) Or where the development is for any B2 or B8 use falling below the major classification[25] .	Medium type developments which also trigger any of the following criteria: i) Where development requires an EIA[26] ii) Where development is likely to increase traffic flows by more than 5% on roads with >10,000 AADT[27] or change average vehicle speeds by > 10 kph/likely to cause increased congestion iii) Where a development requires a Transport Assessment and HGV movements are =/> 10% of total trips
Assessment	None (other than for exposure)	None (other than for exposure)	Air Quality Assessment required including an evaluation of changes in vehicle related emissions[28]
Mitigation	Type 1[29]	Types 1 and 2[30] (Mitigation should be included within Travel Plan)	Types 1,2 and 3[31] (Mitigation should be included within Travel Plan)

[24] The DfT Threshold criteria for Transport Assessments and Travel Plans (TA/TP) http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/adobepdf/165237/202657/guidanceontaappendixb

[25] B2 and B8 uses can generate significant HGV movements and would normally require mitigation to a Type 2 standard. Should the development not generate significant HGV movements i.e. where HGV movements are not likely to exceed 10% of trips associated with the development discretion should be used to determine the mitigation required.

[26] Required where development is within or likely to create an area of exceedence of EU Limit Values

[27] Annual Average Daily Traffic flow

[28] Assessment includes monetisation of the impacts arising from emission changes in line with Defra IGCB Damage Costs (see Annex 1)

By incorporating mitigation measures into scheme design as standard, it is envisaged that this approach will help counteract the incremental emission creep, inherent with most development schemes.

It can be seen from the table that no assessment is required for minor and medium impact schemes except for the need to consider whether the development will expose future occupiers to unacceptable levels of NO_2 and Particulate Matter. Whether or not exposure is likely to be an issue can be checked on a case by case basis with the Environmental Health Service at Bradford Council.

A key theme of the NPFF is that developments should enable future occupiers to make green vehicle choices and it explicitly states that low emission vehicle infrastructure, including electric vehicle (EV) re-charging, should be provided. This guidance seeks to develop consistent EV re-charging standards for new developments in Bradford. These standards, known as **Type 1 mitigation**, are shown in the table below:

Table 3

	Residential	**Commercial/Retail**	**Industrial**
Provision Rate	1 charging point per unit (house with dedicated parking) 1 charging point per 10 spaces (unallocated parking)	10% of parking spaces (this may be phased with 5% provision initially and a further 5% trigger)	10% of parking spaces (this may be phased with 5% provision initially and a further 5% trigger)
	To prepare for increased demand in future years, appropriate cable provision should be included in scheme design and development in agreement with the local authority. <u>Demolition/Construction:</u> Adherence to the London Best Practice Guidance[32] for all demolition and construction works.		

The NPPF recommends that where a development scheme requires a **Travel Plan** then all road transport mitigation measures may be included within the Plan. For medium and major development categories, **Type 2 mitigation** should be incorporated into scheme design where appropriate, in addition to Type 1. A list of typical **Type 2 mitigation** measures, in line with existing Council Policy, is provided in the table below:

[29] See Table 3
[30] See Table 4

[31] See Table 5

[32] http://legacy.london.gov.uk/mayor/environment/air_quality/docs/construction-dust-bpg.pdf

Table 4
Type 2 - Mitigation for Scheme Sustainability

Mitigation Options	• Travel Plan (where required), including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies • Designation of parking spaces for low emission vehicles • Differential parking charges depending on vehicle emissions • All commercial vehicles should comply with either current or previous European Emission Standards from store opening, to be progressively maintained for the lifetime of the development • Fleet operations should provide a strategy for considering and reducing emissions, including possibilities for the take up of low emission fuels and technologies • Use of ultra low emission service vehicles

Travel Plan Requirements

With respect to travel planning it is essential that;

• The content of the travel plan is fully assessed prior to its approval in Co-ordination with Bradford MDC travel plan officers. Pre-application advice will be essential.

• The measures and targets included in the travel plan are secured for implementation by mutual agreement of the Council and the developer/applicant (normally by means of a s106 Legal Agreement). Procedure for failure to meet objectives must form part of the agreement.

• The outputs of the travel plan (normally trip levels and mode split) are annually monitored against the agreed targets and objectives

• The travel plan is reviewed annually to assess whether it is delivering its anticipated outputs or whether it has failed to meet its targets and if the latter what mitigation/ alternative measures need to be put in place to address the travel impact/ requirements of the scheme.

•A named co-ordinator will be an essential element of any travel plan. For larger schemes a commitment in terms of staff resource allocation will be expected, this will be determined on a case by case basis in co-ordination with Bradford MDC travel plan officers.

For development schemes that have the potential for major detrimental impact on air quality, the Bradford Guidance specifies an assessment procedure to evaluate the likely change in relevant concentrations and emissions arising from the scheme. As part of the assessment procedure a simple calculation is proposed to allow the quantification of any emission changes – the pollution impact of a scheme can then be monetised using the pollutant damage costs (per tonne) specified by the Defra Inter-Governmental Department on Costs and Benefits (IGCB)[33]. This approach is recommended when undertaking Environmental Impact Assessments.

[33] http://www.defra.gov.uk/environment/quality/air/air-quality/economic/damage/

Air Quality Emissions and Concentration Assessment Protocol

This section provides a method of calculating the pollution damage costs arising from the development. Details of how to undertake an emissions assessment for a development and calculation of damage costs are summarised as follows:

Road Transport Emission Increase =
Estimated trip rate for 5 years x Emission rate per 10 km per vehicle type x Damage costs

Note- For further information on how to undertake the road transport emission increase calculation contact the Environmental Health Service

The road transport emission increase should be annualised and totalled for a period of 5 years. The emission total for the scheme can then be monetised by using the damage costs provided by the Inter Governmental Department on Costs and Benefits (IGCB, Defra)[34].

By establishing the damage costs arising from development scheme emission changes it is possible to assess any additional mitigation or compensation that is required to make the scheme acceptable. A suite of mitigation/compensation measures termed **Type 3 mitigation** is shown in the table below:

Table 5

Type 3 – Additional Mitigation and/or Compensation Required for Scheme Acceptability

Mitigation / Compensation Options	• On-street EV recharging • Contribution to low emission vehicle refuelling infrastructure • Car clubs • Low emission bus service provision • Low emission waste collection services • Bike/e-bike hire schemes • Bike infrastructure • Contribution to renewable fuel and energy generation projects • Incentives for the take-up of low emission vehicle technologies and fuels • Air Quality Monitoring programmes • Other sustainable transport provision as appropriate to the development • Contribution towards other public transport improvements • Contribution towards Metrocards for residential occupants or subsidised employee public transport travel

Where **Type 3** mitigation is required, the planning authority and developer will agree measures that are appropriate and in scale and kind to the development. Such measures may be taken forward by condition, where possible, or through the use of a Section 106 Agreement.

[34] http://www.defra.gov.uk/environment/quality/air/air-quality/economic/damage/

The planning authority will need to take into account of any Type 3 mitigation measures that are included on a Community Infrastructure Levy (CIL) list.

Bradford Council has begun implementing this new low emission strategy approach and has found developers receptive to it. An example of the new approach is provided below in the planning condition attached to a recent Waste to Energy Scheme, approved by the Council in late 2012

LES Planning Condition – Waste to Energy Scheme

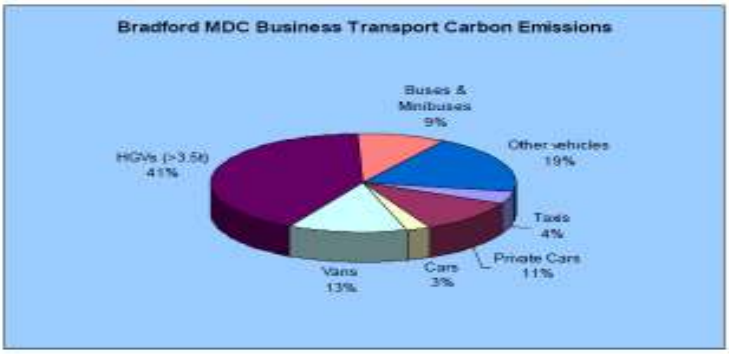
A **Low Emission Strategy** for the operations at the site and its associated road transport shall be submitted for approval in writing by the Local Planning Authority 12 months from implementation of this planning decision notice.
The Low Emission Strategy shall include, amongst other matters;
i) Assessment of Low Emission Vehicle technology and infrastructure (e.g. Electric Vehicle dedicated parking and charging, gas refuelling station etc)
ii) Assessment of fleet emission specification (e.g. current best practice - this may be current Euro standard vehicles).
This should include all vehicles forming part of the operation and accessing the site, such as refuse collection vehicles,
bulk transfer vehicles, forklifts, heavy goods vehicles, staff vehicles etc
iii) Assessment of Procurement policy (including planned vehicle replacement and suppliers of other goods and services)
iv) Measures such as eco-driving (driver training and technological aids to eco-driving), and policies regarding vehicle idling.

The Low Emission Strategy shall have targets for emission reduction and timescales, with pollution savings quantified.
At the end of each calendar year an implementation plan shall be submitted for approval in writing by the Local Planning Authority, which on approval shall be fully implemented in accordance with the details and measures so approved. The Low Emission Strategy shall take into account future changing standards and available technologies and be updated accordingly in agreement with the Local Planning Authority.

Reason: In the interests of improving air quality, reducing green house gases and ensuring that the effects on the environment and occupants of adjoining land is minimised, in accordance with policies UR3, P1, P8 and P11 of the Replacement Unitary Development Plan and paragraphs 30 and 120 of the National Planning Policy Framework.

Appendix 3 - Fleet Fuel & Emission Saving Initiatives

Bradford Council manages a liveried fleet of 750 vehicles and also oversees the operation of private cars, used by Council employees during the course of their work – otherwise known as the Grey Fleet. The chart below shows the relative Carbon emissions of both the grey and liveried fleets.



Vehicle emissions of Oxides of Nitrogen (NOx) and Particulate Matter are regulated through **European Emission Standards (Euro Standards)**[35]**.** These standards are tightened at regular intervals and apply to all new vehicles. Euro 5 (V for HGVs) is the current standard, tightening to Euro 6 (VI) next year. Almost a quarter of the Bradford Fleet is currently Euro 4 (IV) or 5 (V) Standard, with overall emissions projected to improve year on year through the fleet replacement programme. A key issue is that all vehicles, when produced, are tested over artificial drive cycles and are known to have higher emissions when driven under real-world conditions.

Bradford Fleet procurement complies with the most stringent requirements of the **Cleaner Road Transport Vehicles Regulations 2011**[36] and follows good practice (best practice where possible) of the **Government Buying Standards for Transport**[37]**.**

Council departments are committed to reducing the impact on the environment from its business travel. This means both looking at ways to reduce miles travelled and also identifying methods of transport with lower carbon emissions per mile. The Councils' Grey Fleet Procedure includes the following measures:

- Promotion of video/tele-conferencing to reduce the need to travel
- Use of public transport whenever possible

[35] http://www.dieselnet.com/standards/eu/hd.php
[36] http://www.legislation.gov.uk/uksi/2011/1631/contents/made
[37] http://sd.defra.gov.uk/advice/public/buying/products/transport/standards/

- Car sharing to meetings where possible
- Recommendation to use 'A' energy-rated options when hiring vehicles
- Provision of pool Metrocards for staff to use when travelling on Council business

In terms of the liveried fleet, the Council has introduced several initiatives with the aim of reducing fuel consumption and, consequently, emissions of Carbon and regulated air pollutants. These include:

- **Safe and Fuel Efficient Driver (SAFED)** training for drivers. Following data analysis, savings in fuel use have shown to be in the region of 5%

- **Eco-Drive Assist (EDA)** units have been fitted to 28 refuse collection vehicles (RCV). The EDA is an electronic control device designed to reduce fuel consumption by optimising driving for "stop/start" refuse collection driving cycles. Trials have shown that the device achieves a 9.25% fuel saving – equivalent to £1,500 per annum.

- An **Engine Rev Control System** has been fitted to 2 Passenger Transport Services buses. The system prevents over-revving when driving in urban conditions and achieves a 5% fuel saving

Appendix 4 - Natural Gas & Biomethane Vehicle Trial

In line with the requirements of the **Air Quality Strategy**, Bradford Council has trialled several low emission vehicles to evaluate performance and costs. In September 2012, a **Natural Gas & Biomethane Vehicle Trial** was carried out for 3 months, testing several compressed natural gas (CNG) vehicles against diesel counterparts. The vehicle types tested are shown below.

Mercedes Sprinter NGT Mini-Bus

Sprinter NGT Van

Iveco Daily Gas Van

All the vehicles tested were capable of running on biomethane (renewable gas produced by anaerobic digestion). The results for the mini-bus are provided below:

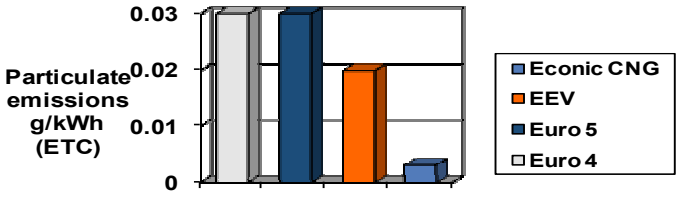
Table 1 - Methane / Biomethane Vehicle Test Results

Vehicle	Sprinter NGT Mini-bus
Methane MPG	0.16 kg / km
Fuel Saving Bio/Methane v Diesel	£916 to £1,476 per vehicle / year
Cost Saving for Council Mini-Bus Fleet	£77,842 (Bio-Methane) to £125,500 (Natural Gas) per year
Carbon Dioxide Savings	1% (Natural Gas) to 76% (Bio-Methane)
Air Pollutant Standard	NOx – Environmentally Enhanced (EEV) PM – Beyond Euro 6
Driver Perceptions	"Good to drive", "Quieter than diesel", "Similar performance to diesel"

As part of the gas vehicle trials, Leeds Council allowed the use of one of their CNG refuse collection vehicles, which performed in line with trials undertaken in Leeds[38].

[38] http://www.cenex.co.uk/news/newsid609/295/leeds-biomethane-refuse-collection-vehicle-trial-report-released

The trials demonstrated that, while gas vehicles are more expensive than their diesel counterparts, there are significant benefits in terms of lower fuel costs and reduced emissions when compared with diesel. The particulate emissions of the Leeds CNG refuse truck, in comparison to standard diesel refuse trucks, are shown in the graph above.



Leeds Econic CNG Refuse Truck

Based on the real-world performance of the Leeds CNG refuse truck, Fleet Management has assessed the **whole life costs** of gas and diesel refuse trucks, based on typical Bradford mileage and maintenance costs. The results are shown in Table 2. It should be noted that the emissions for diesel trucks are based on manufacturers information and not real-world driving. It is also noted that savings should be set against the extra cost of vehicles and infrastructure, and the best savings would be achieved by first replacing the vehicles with highest fuel consumption.

Table 2 – Whole Life Costs of Refuse Collection Vehicles

RCV	Total km	Fuel Cost (£)	CO_2 Cost	NOx Cost (£)	PM Cost (£)	Maintenance Cost (£)	Total Cost (£)
Euro 5 Diesel	70,000	69,984	4,999	2,408	865	98,000	176,256
Euro 6 Diesel	70,000	73,483	5,249	482	432	98,000	177,646
CNG	70,000	43,865	5,974	382	28	98,000	148,248
Biomethane	70,000	62,142	1,368	382	28	98,000	161,919

[Note – The figures assume that the RCV covers 14,000 miles per annum and is kept for 5 years. The CNG and biomethane emission figures are based on real-world vehicle trials. The diesel emission figures are based on the assumption that these vehicles achieve the same rate as specified in their test drive cycles (i.e. they are not real-world). Diesel is assumed to cost £1.17 per litre and biomethane is assumed to cost 85p per kg]

A key barrier to the uptake of natural gas and biomethane vehicles is the cost of installing refuelling infrastructure. The Council is currently assessing the business case for installing gas infrastructure and exploring opportunities for partnership working with the private sector.

Appendix 5 – Whole life costing

Fleet Management will continue to research the real-world emissions of vehicles within the Bradford Fleet and share information where cost-effective emission reductions are identified. As part of a joint exercise with the **West Midlands Low Emission Towns and Cities Programme (LETC)**, the **whole life costs** of a range of natural gas/biomethane and electric vehicles were compared with diesel alternatives, using the methodology laid down in the **Cleaner Road Transport Vehicle Regulations 2011**. These Regulations apply to any public sector organisation either buying or leasing vehicles and require that the operational lifetime energy and environmental performance are considered in purchasing decisions. While not mandatory, the Regulations permit the **monetisation of environmental impacts.** Table 1 shows the CO_2 costs and total pollutant costs (including Non-Methyl Hydrocarbons). Table 2 shows the energy/fuel cost per vehicle and the total cost including CO_2 pollutant costs.

Table 1 - CO_2 costs and total pollutant costs (NOx, PM and NMHC) per vehicle

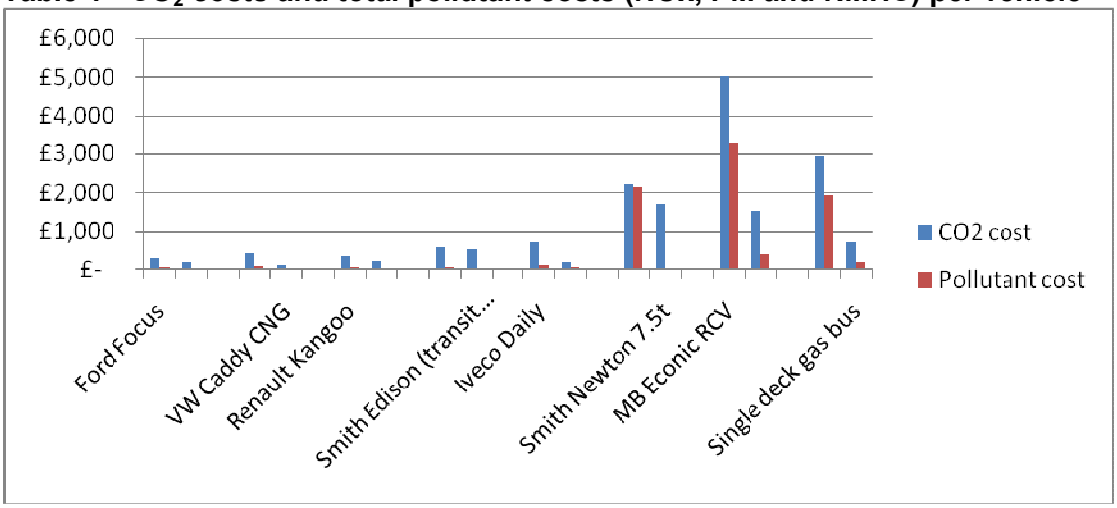
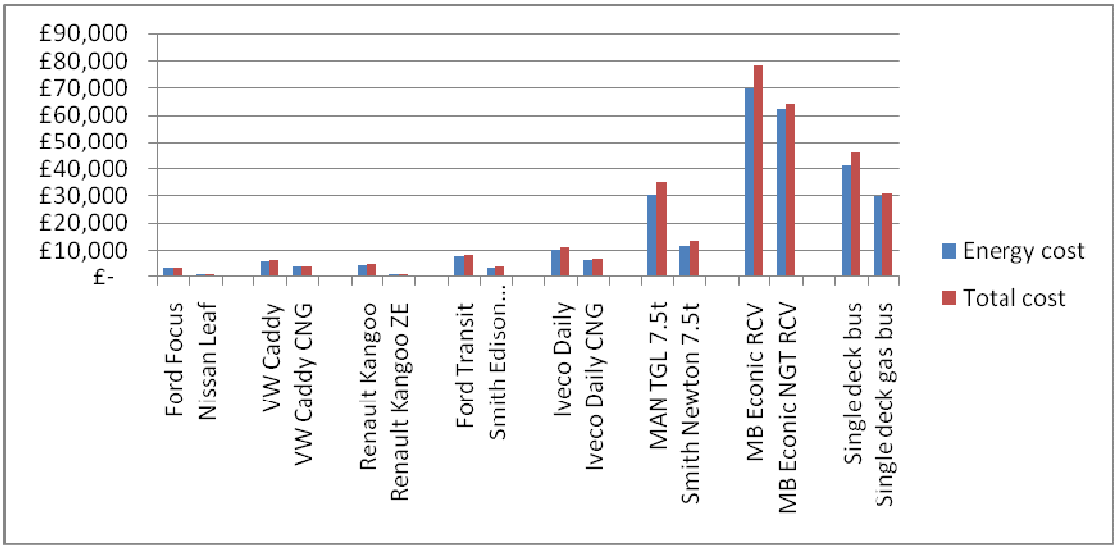


Table 2 - Total energy/fuel cost for each vehicle, and the energy cost plus CO_2 and pollutant costs



The evaluation of whole life costs will continue to inform vehicle procurement going forward.

Appendix 6 – Bus Emissions

Table 1 shows the regulated emission limits for buses according to European Emission (Euro) Standards which become increasingly more stringent. Graph 1 shows the relative emissions of buses according to their Euro standard and speed. It should be noted that Euro 5 buses with SCR (selective catalytic reduction) emit higher NOx emissions at lower speeds than Euro 4 buses. 75% of Euro 5 buses in the UK employ SCR technology.

Table 1 - EU Emission Standards for Buses, g/kWh (smoke in m^{-1})

Standard	Date	Test cycle	CO	HC	NO_x	PM	Smoke
Euro I	1992, < 85 kW	ECE R-49	4.5	1.1	8.0	0.612	
	1992, > 85 kW		4.5	1.1	8.0	0.36	
Euro II	October 1996		4.0	1.1	7.0	0.25	
	October 1998		4.0	1.1	7.0	0.15	
Euro III	*October 1999 EEVs only*	*ESC & ELR*	*1.0*	*0.25*	*2.0*	*0.02*	*0.15*
	October 2000	ESC & ELR	2.1	0.66	5.0	0.10 0.13*	0.8
Euro IV	October 2005		1.5	0.46	3.5	0.02	0.5
Euro V	October 2008		1.5	0.46	2.0	0.02	0.5
Euro VI	January 2013		1.5	0.13	0.4	0.01	

*** for engines of less than 0.75 dm³ swept volume per cylinder and a rated power speed of more than 3,000 revs per minute. EEV is "Enhanced environmentally friendly vehicle".**[39]

Graph 1 – Speed Related Emission of Euro 3, 4 and 5 Buses

[39] Wikipedia 2011

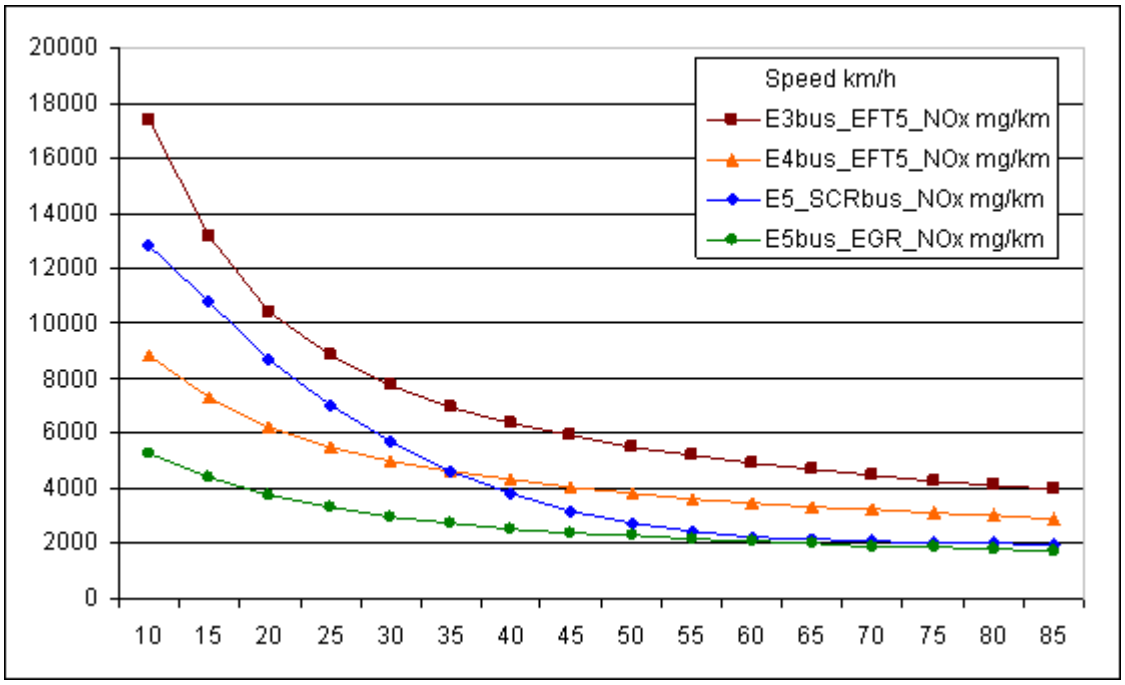
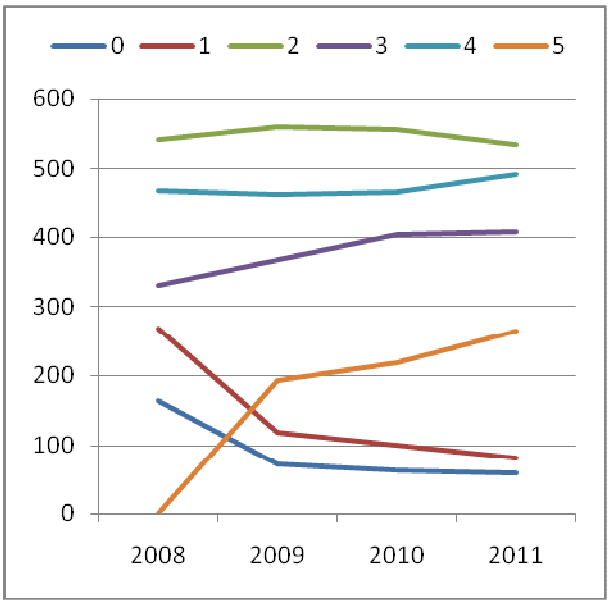


Figure 1 shows the number of buses in the West Yorkshire operational fleet that comply with each Euro Standard (figures are from 2008 to 2011). It should be noted that buses, as with most vehicles, usually have higher emissions in operation than those achieved under test cycle conditions.

Figure 1 – Number of Buses per Euro Standard in West Yorkshire Fleet



It can be seen from Figure 1 that bus emissions are improving through fleet replacement programmes. The LEZ Study will allow an evaluation of whether bus emission improvements

can be accelerated cost effectively. A key consideration is the take-up of low emission buses, such as diesel electric hybrids, compressed natural gas (CNG) and electric buses. In 2011, 2.6% of buses in Leeds were hybrids and these buses are starting to appear in Bradford.

Table 2 shows the relative emissions of different bus technologies compared with Euro V. This information has been collated as part of the LEZ Study and is based on a review of available bus emission data.

Table 2 – Bus Technologies and Emissions Relative to Euro V (Midi Buses)

Bus technology	*Price premium*	*CO_2e*	*PM*	*NOx*	*Notes*
Euro I to IV diesel	NA	+3% to -1%	+1000% to 0%	+44% to -15%	Fuel consumption increased slightly from Euro IV to Euro V with SCR.
Euro V diesel (SCR)	***£100,000***	***530 g/km***	***0.02 g/km***	***4.8 g/km***	***Note that for NOx, a lower emissions factor is provided for EGR. However, 75% of the UK fleet uses SCR, and SCR is the dominant technology choice for achieving further reductions to Euro VI***
Euro VI diesel	+ £10-15K	No change (assumed)	-90%	-92%	The reductions for NOx and PM are only assumed from the Euro VI standard.
Diesel hybrid	+ £60-80K	-20%	No change	-20%	The exact fuel (and hence NOx) saving from fitting a hybrid system is dependent on the reference vehicle chosen and the drive cycle. 20% is the estimate used in the NAEI, but a range of 10-40% is possible.
Electric	+ £100-120K	See notes	-100%	-100%	A variety of emissions savings for buses are quoted, but without transparent methodology. Electric vehicles are likely to have similar overall CO_2e emissions to diesel equivalents on current UK grid electricity emissions factors.
CNG EEV	+ £25-50	+/-10% or -60-80% with biomethane	-92%	-77%	The reductions for PM and NOx will probably be greater for a Euro VI CNG vehicle, but no test results are available yet. CO2e emissions for CNG are close to diesel emissions, but running on biomethane results in large CO2e savings.
Retro-fit SCR and DPF	+ £5-15K	No change	-75%	-50%	The reductions in PM and NOx shown are relative to the emissions standard of the vehicle to which the equipment is fitted.