

Air Quality Action Plan 2015



Foreword

Breathing healthy air is a crucial component of health and well being. Sheffield City Council and Health Colleagues want to work ensure healthy air for all.

Locally and nationally air quality has generally been improving. However, in the most polluted areas, near motorways and within busy urban centres, it has not improved (or has even worsened). Sheffield, like many other major cities in the UK, currently breaches national and European thresholds for air quality.

This Air Quality Action Plan proposes a suite of effective actions to protect peoples' health. A House of Commons report¹ on air quality said: *“The cost benefit is clear; what we need now is the political will to make this a priority and to commit the resources to address it now so that we can reap the benefits of improved health.”*

The cause of air pollution in the City is largely due to both road transport and industry, and to a lesser extent, other processes that burn fossil fuels, such as commercial or domestic heating systems (e.g. gas boilers).

The purpose of this plan is to set out the committed actions of the Local Authority and its partners in addressing local air pollutants as required by Central Government. This plan sets out a vision which aims to:

- Achieve national health-based air quality targets by 2015,
- Protect areas where air pollution is low, and
- Improve areas where air pollution is elevated.

By achieving these aims the health of people in Sheffield will be improved.

In addition to our main objectives, this work will support and help us achieve a number of other priorities for the City, including the reduction of greenhouse gases.

Poor air quality adversely affects human health, and has recently been estimated to account for up to **500 premature deaths** per year in Sheffield, with health costs of around **£160 million** per year². It has short and long-term health impacts, particularly for respiratory and cardiovascular health, including increased admissions to hospital.

The impact of air quality on life expectancy and health is unequal, with the young, the old and those with pre-existing heart and lung conditions more affected. Individuals who are particularly sensitive and exposed to the most elevated levels of pollution, have an estimated reduction in life expectancy of as much as nine years.

¹ Environmental Audit Committee - Fifth Report Air Quality, Summary, printed 16 March 2010

² Sheffield City Council's interpretation of the Evidence of Robert Vaughn from DEFRA to Environment Select Committee 2010 accessed at <http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/inquiries/parliament-2010/air-quality-a-follow-up-report/>

A key message from leading respiratory and cardio-vascular physicians as well as environmental health experts; is that modest reductions in pollution would lead to significant health gains. Overall, the adverse effects of poor air quality are such that it has a bigger impact on life expectancy than road traffic accidents or passive smoking.

The challenge is not an easy one and there is a need for both local and national commitment and action. The House of Commons Environmental Audit Committee³ is keen to see more action taken to improve air quality and protect human health.

An ambitious set of local measures have been outlined in this plan, which when fully implemented should lead to a significant reduction in levels of nitrogen dioxide (NO₂), and fine particles (PM₁₀) in the air. These actions will help the Council work towards achieving air quality standards in the city by 2015; helping to reduce health effects caused by air pollution.

We will carefully monitor progress on this plan and regularly assess whether further and stronger local action or national policy measures and interventions are necessary.

A modern, vibrant city needs to have a high-quality local environment, including cleaner air and cleaner transport, for the benefit of local people, and in order to attract people to the city for work and leisure.

Sheffield aspires to be a city where health inequalities are reduced and air is healthy for all to breathe.

Councillor Jack Scott

Cabinet Member for Environment, Recycling and Streetscene

³ Environmental Audit Committee - Ninth Report Air quality: A follow up report

Air Quality Action Plan 2015

Executive Summary

Sheffield aspires to be a city where health inequalities are reduced and air is healthy for all to breathe. Sheffield City Council is committed to help improve the health and wellbeing for the people of Sheffield, and ensuring we are an environmentally-responsible city. A key component of this is protecting and improving air quality.

Air quality is about the level of air pollution. When we say acceptable air quality we mean a low level of air pollutants, specifically nitrogen dioxide (NO₂) and fine particles (PM₁₀) as these have a key impact on public health. Unacceptable air quality exists where these pollutants exceed National and European Union thresholds. We will make sure air quality does not exceed EU limit values to protect the health of people of Sheffield.

Air quality in Sheffield

Sheffield reflects the national picture, in that generally air quality is improving. However in many areas, near the motorway and within the busy urban centre, it has not improved, with some places seeing air quality worsening.

Reflecting national trends and many other major cities in the UK, Sheffield currently breaches UK and European Union thresholds⁴ for air quality. Exceeding national air quality targets means not complying with EU law. There is the potential for the UK government to be fined if the EU limits are exceeded past 2015, consequently this is a risk for the Council.

In Sheffield both nitrogen dioxide (NO₂) and fine particles (PM₁₀) are monitored at key sites within the urban area. Nitrogen dioxide levels at many sites are below the EU threshold for 2015⁵ however some locations show higher concentrations which are unacceptable. These sites experience a high volume of diesel vehicles, particularly buses and taxis which pass through this route.

Annual average levels of fine particles (PM₁₀) are consistently below EU thresholds for 2015⁶, however this masks daily average levels which are subject to EU limits. Our data tells us some locations exceed this limit more times than is acceptable in one year⁷. This plan covers actions to reduce both pollutants.

⁴ The 2008 ambient air quality directive (2008/50/EC) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health including particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

⁵ Figure 4, page 15

⁶ Figure 5, page 15

⁷ Based on 2008 data

What does this plan aim to achieve?

We want to reduce nitrogen dioxide (NO₂) and fine particle (PM₁₀) pollution in Sheffield in order to improve the health of local people; by protecting areas of low air pollution and improving areas where pollution is elevated.

We aim to contribute to the reduction of greenhouse gases and assist in the delivery of the City Strategy and the Council's Corporate Plan outcomes.

This revised Air Quality Action Plan aims to reduce air pollution in Sheffield and achieve national air quality targets and EU limit values by 2015.

This will provide a better quality of life for all, particularly those living alongside the city's main transport corridors where exposure to elevated pollution levels is more likely. This can be achieved by acting to reduce the emissions of air pollutants created mainly from the burning of fossil fuels, particularly from vehicles on our roads.

This plan sets out the commitments of Sheffield City Council and its partners to address local air pollutants by 2015. These commitments will help to deliver our ambitions for the environment as set out in "Standing up for Sheffield", the Council's Corporate Plan 2011-14 by contributing to the outcomes areas of:

- Better Health and Wellbeing
- An Environmentally Responsive City
- A Great Place to Live

What is the impact of elevated air pollution?

Health

Air pollution adversely affects human health, and has recently been estimated to account for up to 500 premature deaths per year in Sheffield. Poor air quality has short and long term health impacts, particularly for respiratory and cardiovascular health, including increased hospital admissions.

Overall the adverse effects of elevated air pollution are such that it has a bigger impact on life expectancy than road traffic accidents and passive smoking⁸.

The impact on life expectancy and health is unequal, with more effects on the young, the old and those with pre-existing heart and lung conditions. Individuals who are particularly sensitive and exposed to the most elevated levels of pollution, have an estimated reduction in life expectancy as high as nine years.

Economy

Air pollution has economic health costs of around £160 million per year⁹ to society (i.e. the impact on Sheffield's economy as a result of lost working days).

⁸ Department of Health, EV 142

⁹ Sheffield City Council interpretation of the Evidence of Robert Vaughn from DEFRA to Environment Select Committee 2010 accessed at

This is likely to be a conservative estimate because these figures do not take account of chronic conditions linked to air quality such as chronic lung and heart related problems, or secondary costs to wider services and families.

Climate Change

As well as direct effects, these pollutants can be transported great distances by weather systems, and combine in the atmosphere to form ozone, a harmful air pollutant and potent greenhouse gas. This contributes to our wider impact on climate change.

What causes elevated air pollution?

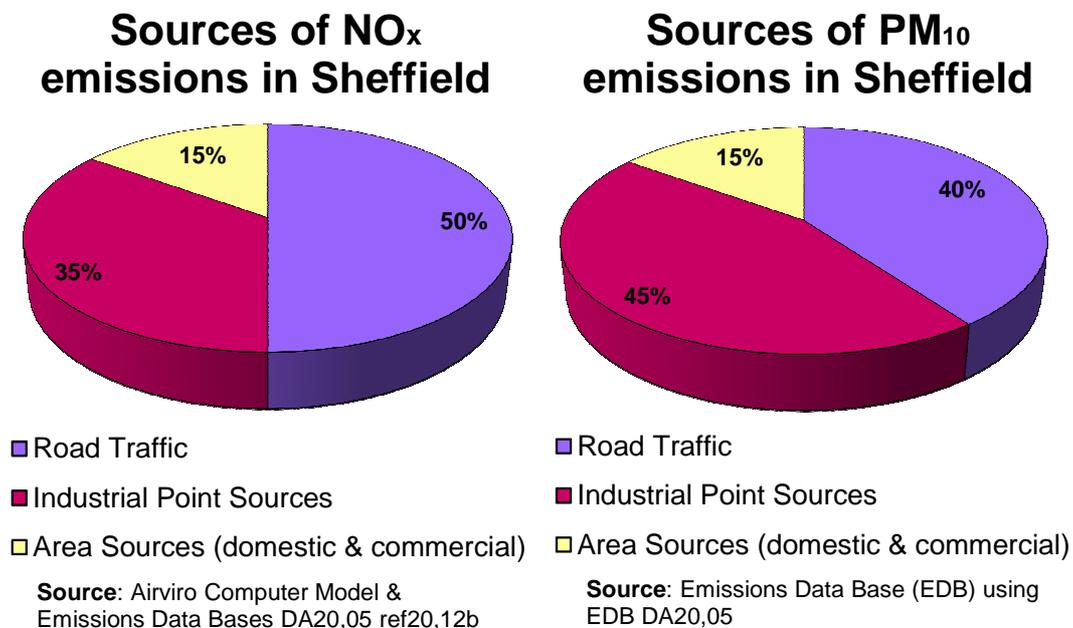
Road transport and industrial sources cause 85% of the pollutants in the city. Other processes that contribute are those that burn fossil fuels, such as commercial or domestic heating systems (e.g. gas boilers). Heavy diesel vehicles make up only about 7% of total traffic, but create 35% of the cities total nitrogen dioxide (NO₂) and 19% of fine particles (PM₁₀).

Road transport accounts for 50% of the oxides of nitrogen (NO_x¹⁰); with a further 35% from regulated industrial sources.¹¹

45% of the fine particles (PM₁₀) found in Sheffield's air comes from regulated industrial sources, with a further 40% from road traffic (see Figure 1).

Heavy diesel vehicles create 70% of the nitrogen dioxide (NO₂) emitted from transport and 48% of fine particles (PM₁₀).

Figure 1



<http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/inquiries/parliament-2010/air-quality-a-follow-up-report/>

¹⁰ NO_x converts to NO₂ in the air

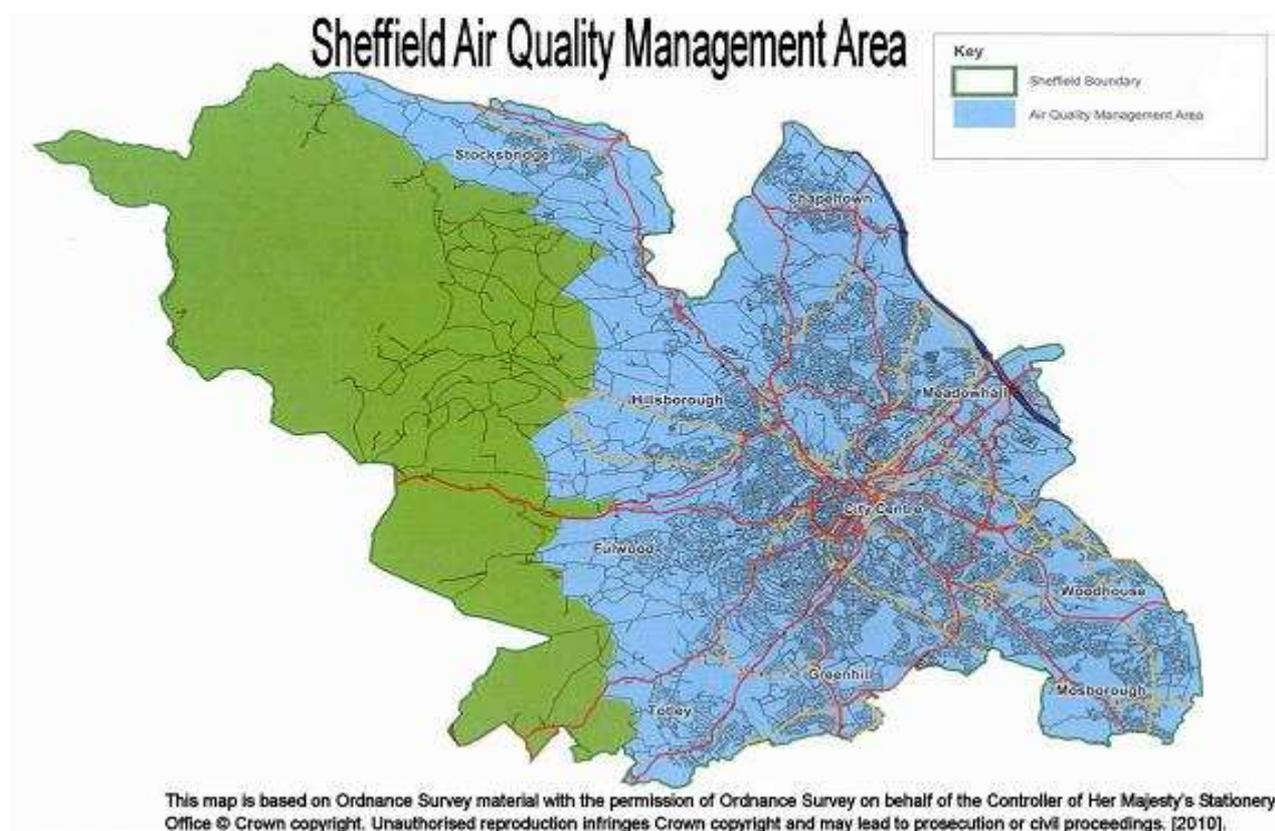
¹¹ See Appendix 1 - Source apportionment for pollutants for further details (page 42)

What are we already doing?

The existing Air Quality Action Plan from 2003 is currently the main plan for reducing air pollution in Sheffield. The 2003 plan took a very broad view and incorporated multiple actions and measures across a wide range of areas. Whilst this reduced nitrogen dioxide (NO₂) emissions, levels did not decline sufficiently to achieve national standards and EU Limit Values.

Ongoing monitoring shows areas in Sheffield where nitrogen dioxide (NO₂) or fine particles (PM₁₀) amounts is likely to breach national and EU legislation. As such an Air Quality Management Area (Figure 2) was declared across the whole of the urban area of the city for nitrogen dioxide (NO₂) and fine particles (PM₁₀) in March 2010, following approval by Cabinet¹².

Figure 2



The declaration of the management area means the Council is required to produce an Air Quality Action Plan to cover the period up to 2015, with the aim of reducing levels of nitrogen dioxide (NO₂) and fine particles (PM₁₀) to below EU thresholds¹³.

This plan has been led by the City Council and informed by a multidisciplinary group (the Air Quality Action Plan Working Group); including representatives from the local community, the Highways Agency, Environment Agency, health colleagues and South Yorkshire Passenger Transport Executive (SYPTTE).

¹² Air Quality Management in Sheffield, Sheffield City Council Cabinet Report 13 January 2010

¹³ Annual limit of 40µg.m⁻³ for NO₂ and the daily limit of 50µg.m⁻³ for PM₁₀ (which is not to be exceeded more than 35 times a year) do not continue to be breached

How will this plan improve air quality?

We have set out 7 commitments and because of the tight regulation already in place for the main-polluting industrial processes we will concentrate on tackling pollution from road transport. This source remains under-regulated and the City Council and its partners must take action to ensure that emissions are reduced¹⁴.

Public Consultation

This approach was reinforced in a public consultation exercise, undertaken in 2011. Strong support was shown for our aspiration to reduce emissions from traffic, encourage public transport use and to actively promote improvements in engine technology and the use of less polluting fuels.

Respondents ranged from individuals to community groups and public and private sector organisations. They ranked activities in order of preference, as well as suggesting some additional measures.

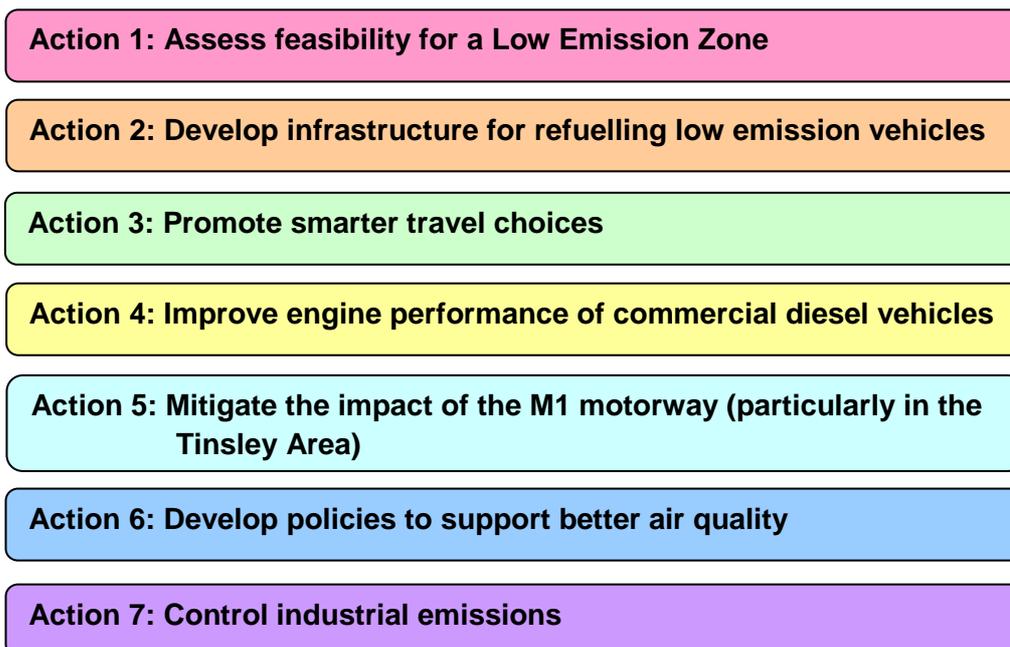
Our commitments

We took these responses alongside our estimation of their impact on air quality to develop our key actions, shown in Figure 3.

The order of the actions below reflects the likely impact on improving air quality. If fully implemented the most effective actions together could achieve the EU and DEFRA objectives for nitrogen dioxide (NO₂) and fine particles (PM₁₀).

Some of these actions are already happening, which we will continue to improve. Others are in the early planning stages and we (like other major cities) need to decide whether they would have the desired impact in Sheffield.

Figure 3 Our commitments



¹⁴ Environment Act 1995

Action 1 - Assess feasibility for a Low Emission Zone

We are undertaking a detailed feasibility and modelling study to demonstrate the costs and potential air quality improvements of introducing a Low Emission Zone. This is a geographically defined area, subject to enforcement powers, where operators of vehicles must comply with a specified low emissions policy.

The zone would encourage operators, particularly of lorries (HGVs) and buses to move to alternative fuel sources and improved engine performance vehicles. The hybrid Stagecoach Buses are one example of such a change. We are also working with the bus companies to formulate a voluntary strategy to reduce vehicle idling and to progress the commitment for 100% low floor buses which will get higher Euro Star engines in place.

The feasibility study will set out how the scheme could operate and the potential costs to both the City Council and affected businesses and transport operators. Enforcement will require an agreement with bus operators about vehicle emissions and replacement, and implementing an emissions policy for Taxi Licensing (*these are covered in Action 4: Improving the engine performance of commercial diesel vehicles*).

Action 2: Develop infrastructure for refuelling low emission vehicles

We will enable commercial operators and the wider public to switch to cleaner fuel such as electric or gas¹⁵, through the development of a gas refuelling site and electric vehicle recharging sites across South Yorkshire. The development of this infrastructure is subject to successful funding bids¹⁶. Any low emission vehicles working in Sheffield would be able to refuel at these sites and could also operate within a Low Emission Zone, if implemented.

We will work with partners to develop other energy alternatives for the city, such as hydrogen. We will also promote and encourage the uptake of low emission vehicles through a positive marketing and promotion programme

Action 3: Promote smarter travel choices

We will encourage changes to the way people travel by improving public transport and marketing services such as travel awareness campaigns, setting up websites for car share schemes, supporting car clubs and encouraging teleworking. We will also establish a Bus Partnership Agreement as part of our efforts to help improve smarter travel choices (modal shift). This will remove some of the buses on the network, reduce congestion and air pollution. We will develop specific schemes to get employees to and from work and children to and from school, such as 'Bike It' which promotes cycling through schools.

The first principles of reducing the need to travel by car would be to ensure that all destinations are accessible to public transport, walking and cycling to ensure the provision of alternatives to the car. This includes developing Park and Ride

¹⁵ (bio-methane or compressed natural gas)

¹⁶ Bids have been submitted to the South Yorkshire Local Transport Plan, Local Sustainable Transport Fund and European Regional Development Fund

schemes, journey planning tools, cycle paths, cycle storage and better footpaths, subject to a successful funding bid¹⁷. We will also be investing in public transport, such as the Bus Rapid Transit (BRT) Northern Route¹⁸ and support the implementation of the Government-led 2 year Tram-Train pilot scheme¹⁹ to promote innovation in sustainable travel, improve reliability and increase modal shift from cars to tram.

Action 4: Improve engine performance of commercial diesel vehicles

We will encourage cleaner fleets, by enhancing the South Yorkshire ECO Stars Fleet Recognition Scheme, subject to a successful funding bid⁸. This is a free, voluntary scheme where operators of commercial diesel vehicles²⁰ are assessed and ranked on fuel saving and sustainable activities across their transport fleet. ECO Stars rate individual vehicles and the whole fleet for their overall transport operation.

Currently, thousands of lorries, vans and buses operating across South Yorkshire are included in the scheme and are making fuel savings which result in reduced emissions. The Council fleet (currently 680 vehicles) has a 3-Stars ECO Star rating, which we are seeking to improve over 2012/13.

We are also assessing the introduction of an emissions policy for the vehicles we license, either as private hire or hackney carriages (taxis). This aims to facilitate the replacement of all old and more polluting taxis with newer and less polluting ones by 2017.

Action 5: Mitigate the impact of the M1 motorway (particularly in the Tinsley Area)

Our efforts on mitigating the impact of the M1 are dependent on national Government and without their commitment, it is unlikely that we can adequately address air quality in Tinsley. At present, we believe the introduction of speed management will improve air quality around the M1 motorway. As such, the Council will continue to lobby the Department for Transport (DfT) to reduce and enforce a speed limit on the M1 through Tinsley, and to work with us to develop alternative actions that would improve air quality.

The Government have announced their Managed Motorway programme will go ahead on the M1 through Sheffield and proposes to reduce congestion by using the hard shoulder to increase capacity for the motorway. If this also results in an increase in traffic, air pollution will almost certainly worsen. As such, we want this programme to include a reduced speed limit, particularly when air pollution is expected to be elevated, such as peak traffic times and in certain weather conditions.

¹⁷ Bid made to the Local Sustainable Transport Fund

¹⁸ <http://www.sy-busrapidtransit.co.uk/default.asp?pageid=3&groupid=3>

¹⁹ <http://www.bbc.co.uk/news/uk-england-south-yorkshire-18100674>

²⁰ Commercial diesel vehicles are defined as goods vehicles (lorries), buses and coaches

We will also develop alternative actions that would improve air quality around the M1, particularly in the Tinsley area.

Action 6: Develop policies to support better air quality

We will introduce and enforce a planning policy to ensure that for significant developments predictable resulting loss of air quality would be appropriately mitigated.

We will expect all new developments to implement or support actions that make a positive contribution to improving air quality, such as by reducing the demand for fuel consumption. We are working to develop an anaerobic digestion plant (to complement *Action 2*) that will enable gas powered vehicles to be used for deliveries that we could condition in planning applications.

We will also improve the current travel planning process, help to expand car club options and parking schemes for low emission vehicles, to promote smarter travel choices.

We will integrate policies for spatial and transport planning to reduce travel demand and open up possibilities for walking and cycling.

Action 7: Control industrial emissions

We will work closely with the Environment Agency and industries controlled by Sheffield City Council to ensure permits are granted and enforced to reduce emissions. Efforts to further control emissions by upgrading processes are ongoing at regulated sites, with improvements required as new pollution reduction technology is available.

How we will measure success?

Overall, we will measure success through decreasing levels of nitrogen dioxide (NO₂) and fine particles (PM₁₀) at key sites in the city, improving people's health and achieving air quality objectives in the city by 2015.

We will need to carefully monitor progress on the Action Plan and regularly assess our achievements in order to determine whether further and stronger local action or national policy measures and interventions are necessary.

Progress against these measures will be regularly monitored and reviewed through the Council's performance management framework, incorporating these targets into the 2012/13 Business Plan for Development Services.

We will follow Government guidance, as detailed in Local Air Quality Management Policy Guidance²¹, and report to the Secretary of State (DEFRA) on our progress, any improvements in air quality and any challenges experienced. We will also produce an Annual Progress / Monitoring Report each year from April 2013.

²¹ LAGM.PG(O9): Part IV of the Environment Act 1995: LOCAL AIR QUALITY MANAGEMENT Policy Guidance (PG09), February 2009

Air Quality Action Plan 2015

1 Introduction

- 1.1 Sheffield aspires to be a city where health inequalities are reduced and air is healthy for all to breathe.
- 1.2 Sheffield City Council is committed to help improve the health and wellbeing for the people of Sheffield, and ensuring we are an environmentally-responsible city. A key component of this is protecting and improving air quality.

What is Air Quality and why is this important?

- 1.3 Air quality is about the level of air pollution. When we say acceptable air quality we mean a low level of air pollutants, specifically nitrogen dioxide (NO₂) and fine particles (PM₁₀). Unacceptable air quality exists where these pollutants exceed National and European Union thresholds.
- 1.4 We also refer to nitrogen oxides (NO_x) and other fine particles (PM_{2.5}) within this plan. This is because nitrogen oxides (NO_x) convert to nitrogen dioxide (NO₂) in the air and fine particles (PM_{2.5}) are a smaller fraction found within the larger fine particles (PM₁₀), which have a particular impact on air quality-related ill health.
- 1.5 Elevated levels of air pollution have a negative impact on our health, particularly on the young and the elderly, resulting in significant levels of illness, early death and financial costs to the NHS and wider society.
- 1.6 Central Government has consistently predicted air quality will improve as vehicle technology improves. In reality this has not occurred as forecast improvements on emission levels have been shown to be over-optimistic
- 1.7 Our air pollution modelling work²² shows that the areas of concern are those particularly close to busy roads, especially where the annual average daily traffic flow is greater than 17,000 vehicles per day and at busy junctions.

Air quality in Sheffield

- 1.8 Sheffield reflects the national picture, in that generally air quality is improving. However in many areas, near the motorway and within the busy urban centre, it has not improved, with some places seeing air quality worsening.

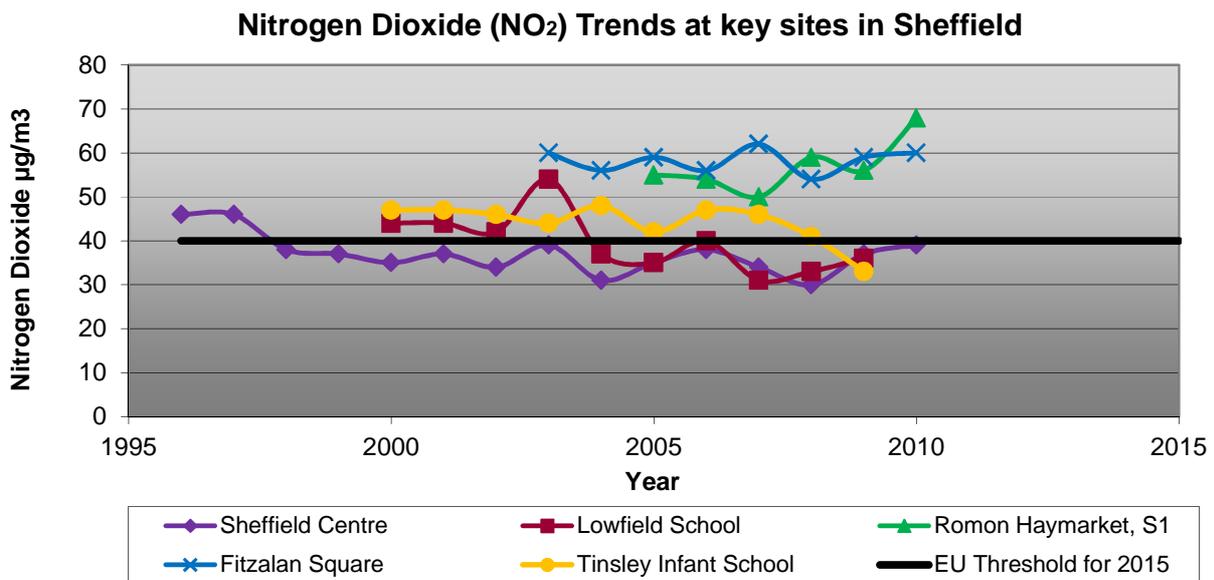
²² Progress report to DEFRA 2008

- 1.9 Again, this reflects national trends and so like many other major cities in the UK, Sheffield currently breaches National and European Union thresholds²³ for air quality.
- 1.10 Given the continued rise in emissions, it is clear that we must achieve greater impact from the actions we implement.
- 1.11 The first Air Quality Action Plan was published by Sheffield City Council in 2003 to address breaches in nitrogen dioxide (NO₂) levels. Many of the actions in the 2003 plan were dependent on national policy and therefore outside of what the Council could achieve. As such it was unable to deliver sufficient reductions in this pollutant to reach acceptable air quality standards.
- 1.12 In Sheffield three air quality objectives are currently exceeded:
- A long term objective²⁴, the annual average level of nitrogen dioxide (NO₂);
 - A short term objective, the hourly mean level of nitrogen dioxide (NO₂); and
 - The 24 hour mean level for fine particles (PM₁₀).
- 1.13 Nitrogen dioxide (NO₂) levels are so high in some areas of the Sheffield that without major interventions the objectives are unlikely to be achieved until at least 2020. These areas are adjacent to arterial routes into the city where there are large numbers of heavy diesel vehicles. This is of major concern where there are people living close to the roads.
- 1.14 Figure 4 shows nitrogen dioxide (NO₂) concentrations monitored at a sample of key sites in the Sheffield urban area. This shows concentrations are following different trends at the different sites.
- 1.15 The locations at Fitzalan Square and Romon Haymarket, at Waingate, S1 experience some of the highest levels of nitrogen dioxide (NO₂) concentrations in the city and the annual average at these sites breaches EU threshold for 2015. These particular sites have a high proportion of diesel vehicles, particularly buses and taxis using these routes.
- 1.16 We also know a few areas can exceed the hourly nitrogen dioxide (NO₂) limits at peak traffic times or in certain weather conditions, and other sites where the data is modelled indicates that this may also be exceeded. As such, our focus is to achieve EU limits for both annual and hourly levels.

²³ The 2008 ambient air quality directive (2008/50/EC) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health including particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

²⁴ Local Air Quality Management Technical Guidance LAQM.TG(09) p1-3.

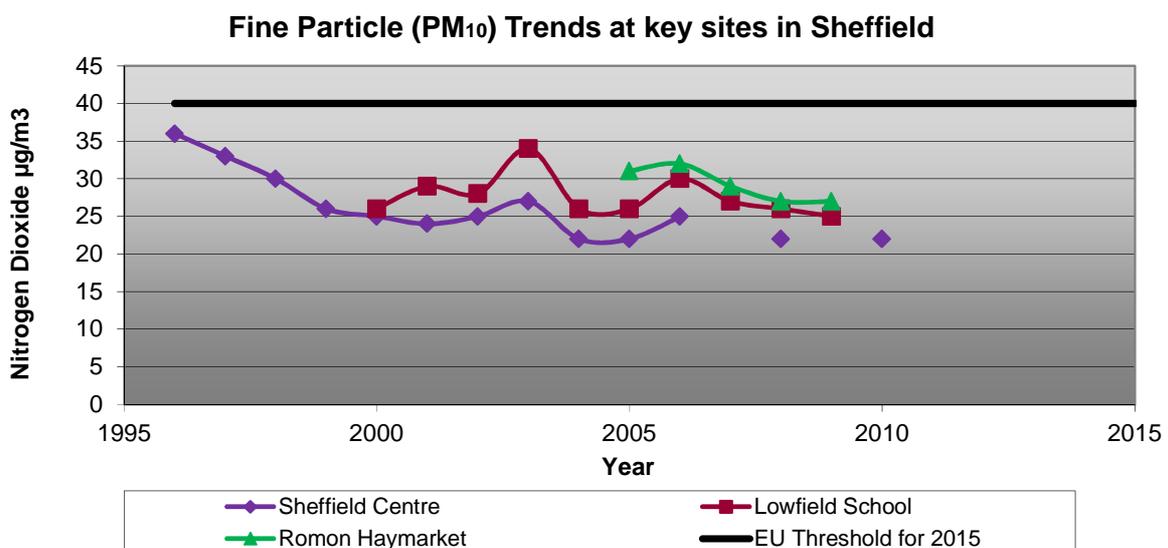
Figure 4



1.17 Fine particles (PM₁₀) are measured at a limited number of locations in Sheffield. Although Figure 5 (page 15) demonstrates that the annual averages are significantly below the EU threshold for 2015 it is the daily variations that are of concern with this pollutant.

1.18 The EU threshold for 2015 is to ensure the daily average levels of fine particles (PM₁₀) do not exceed 50 µg.m⁻³. However, our results showed that concentrations were higher than this more times than the acceptable limit (35 days within a year)²⁵. As such fine particles have been included within this plan and as a key pollutant within the Air Quality Management Area.

Figure 5



²⁵ Based on 2008 monitoring data

2 What does this plan aim to achieve?

We want to reduce nitrogen dioxide (NO₂) and fine particle (PM₁₀) pollution in Sheffield in order to improve the health of local people; by protecting areas of low air pollution and improving areas where pollution is elevated.

We aim to contribute to the reduction of greenhouse gases and assist in the delivery of the City Strategy and the Council's Corporate Plan outcomes.

- 2.1 This revised Air Quality Action Plan for 2015 aims to reduce air pollution in Sheffield and achieve national air quality targets and EU thresholds by 2015. This will provide a better quality of life for all, particularly those living alongside the city's main transport corridors, where exposure to elevated pollution levels is more likely.
- 2.2 This can be achieved by acting to reduce the emissions of air pollutants created from the burning of fossil fuels, particularly the engines of vehicles on our roads.
- 2.3 The purpose of this plan is to set out the commitments of Sheffield City Council and its partners to address local air pollutants by 2015. These commitments will help to deliver our ambitions for the environment set out in "Standing up for Sheffield", the Council's Corporate Plan 2011-14 contributing to the outcomes:
 - Better Health and Wellbeing
 - An Environmentally Responsive City
 - A Great Place to Live
- 2.4 Not achieving the air quality targets nationally means not complying with EU law. There is the potential for the UK government to be fined if the EU limit values are exceeded past 2015, consequently this is a risk for the Council. The government however, can only pass the fines on if they can show that we have not taken appropriate steps to comply with EU law.
- 2.5 The reserve powers of the Localism Act to passport EU fines to local authorities and public bodies (where they failed to take action when they could) highlights the link between EU obligations and the Local Authority responsibilities to improve air quality.

3 What is the impact of elevated air pollution?

Health

- 3.1 Air pollution adversely affects human health, and has recently been estimated to account for up to 500 premature deaths per year in Sheffield; Poor air quality has short and long term health impacts,

particularly for respiratory and cardiovascular health, including increased hospital admissions.

- 3.2 The impact on life expectancy and ill health is unequal, with more effects on the young, the old and those with pre-existing heart and lung conditions. For individuals who are particularly sensitive and exposed to the most elevated levels of air pollution, the reduction in life expectancy is estimated to be as high as nine years.
- 3.3 Overall the adverse effects of elevated air pollution are such that it has a bigger impact on life expectancy than road traffic accidents and passive smoking, see Table 1 below:

Table 1 Comparing the impact on life expectancy from reductions in fine particles PM_{2.5}²⁶

	Reduction in PM _{2.5}	Elimination of road traffic accidents	Elimination of passive smoking
Expected gain in life expectancy	7-8 months	1-3 months	2-3 months

Source: Department of Health, EV 142

Economy

- 3.4 Air pollution also has economic health costs of around £160 million per year²⁷ to society (i.e. the impact on Sheffield's economy as a result of lost working days).
- 3.5 This is likely to be a conservative estimate because these figures do not take account of chronic conditions linked to air quality such as chronic lung and heart-related problems, or secondary costs to wider services and families.

Climate Change

- 3.6 As well as direct effects, these pollutants can be transported great distances by weather systems, and combine in the atmosphere to form ozone, a harmful air pollutant and potent greenhouse gas. This contributes to our wider impact on climate change.

4 What causes elevated air pollution?

- 4.1 Road transport and industrial sources cause 85% of the pollutants in the city. Other processes that contribute are those that burn fossil fuels, such

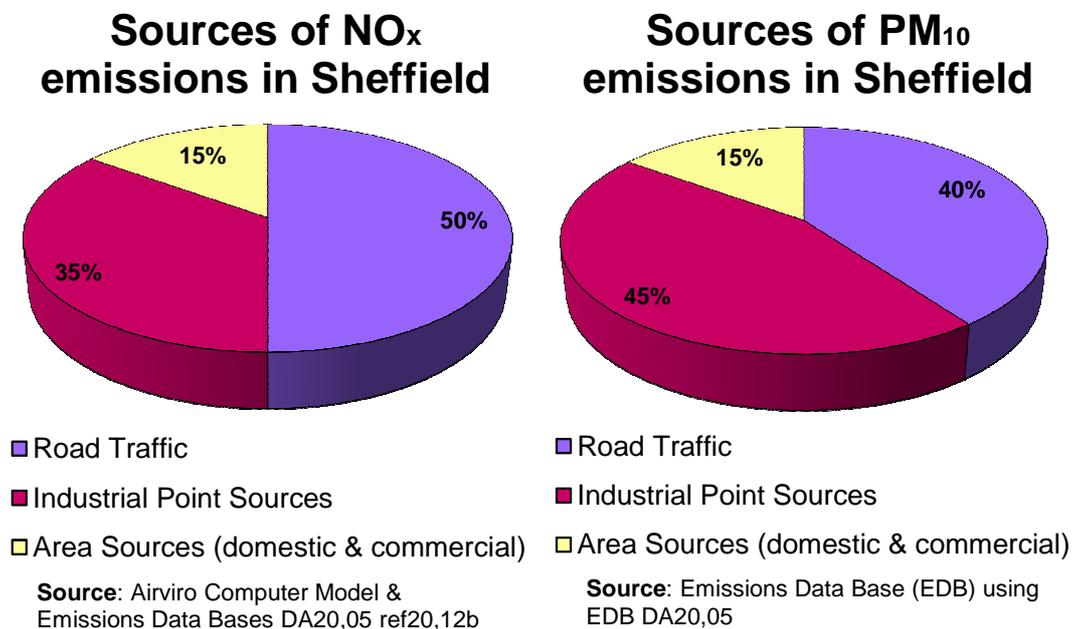
²⁶ PM₁₀ particles contain PM_{2.5} particles, however the PM_{2.5} particles can be measured separately and penetrates further into the lungs, which is why they are used when assessing health impacts

²⁷ Sheffield City Council interpretation of the Evidence of Robert Vaughn from DEFRA to Environment Select Committee 2010 accessed at <http://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/inquiries/parliament-2010/air-quality-a-follow-up-report/>

as commercial or domestic heating systems (e.g. gas boilers). Heavy diesel vehicles make up only about 7% of total traffic, but create 35% of the cities nitrogen dioxide (NO₂) and 19% of fine particles (PM₁₀).

- 4.2 Road transport accounts for 50% of the oxides of nitrogen (NO_x); with a further 35% from regulated industrial sources.²⁸
- 4.3 45% of the fine particles (PM₁₀) found in Sheffield's air come from regulated industrial sources, with a further 40% from road traffic. (see Figure 6)
- 4.4 Heavy diesel vehicles create 70% of the nitrogen dioxide (NO₂) emitted from transport and 48% of fine particles (PM₁₀).

Figure 6



- 4.5 Sheffield's main polluting industrial process emissions are already tightly regulated. For example, from iron and steel producing industries or metal surface treatment processes. As a result, most of the measures in this plan concentrate on tackling pollution from road transport, because this source remains under-regulated meaning the City Council and its partners must take action to ensure that vehicle emissions are reduced²⁹.

5 What are we already doing?

- 5.1 The existing Air Quality Action Plan from 2003 is currently the main plan for reducing air pollution in Sheffield. The 2003 plan took a very broad view and incorporated multiple actions and measures across a wide range of areas. Whilst this reduced nitrogen dioxide (NO₂) emissions,

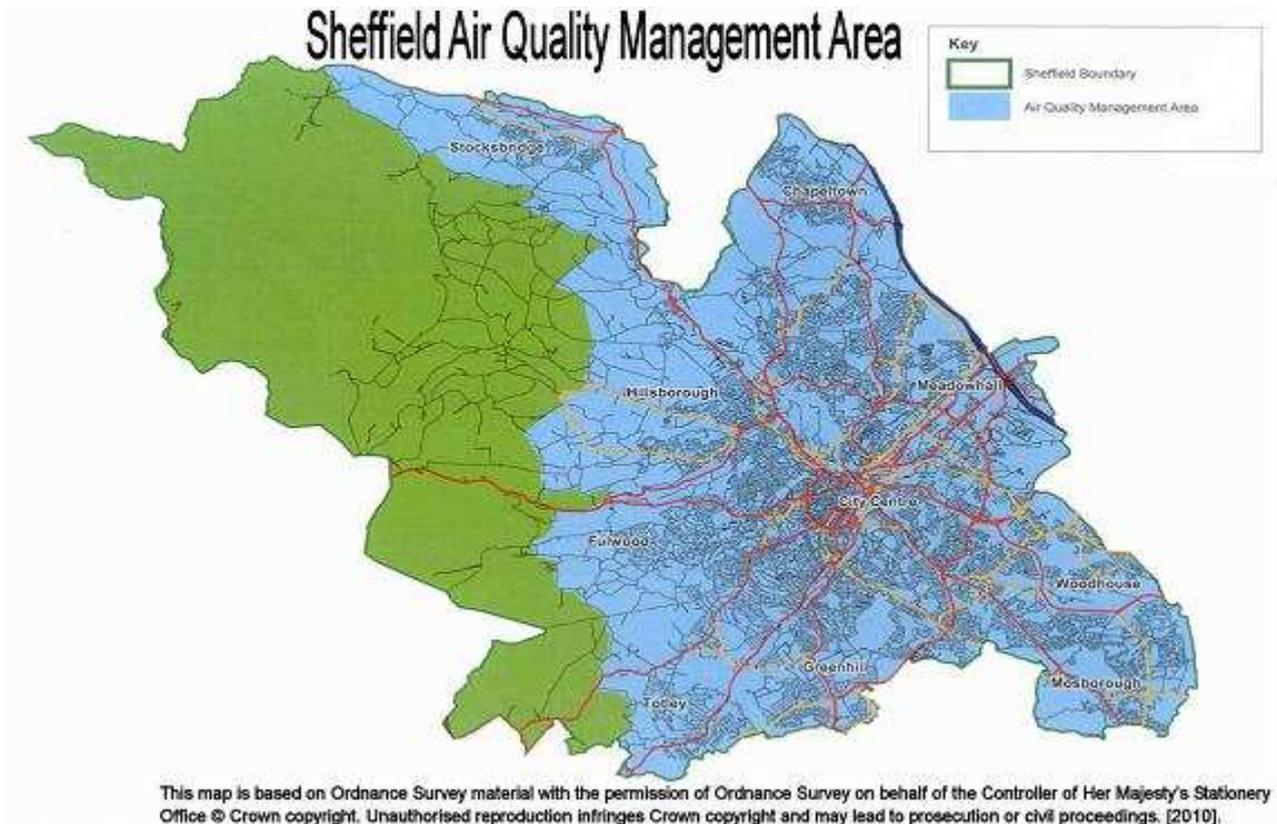
²⁸ See Appendix 1 - Source apportionment for pollutants for further details (page 42)

²⁹ Environment Act 1995

levels did not decline sufficiently to achieve national standards and EU Limit Values.

- 5.2 Following ongoing monitoring, an Air Quality Management Area (Figure 7, page 19) was declared across the whole of the urban area of the city for nitrogen dioxide (NO₂) and fine particles (PM₁₀) in March 2010, following a report to Cabinet³⁰.

Figure 7



- 5.3 The declaration of this area was based on the evidence reported in the formal Detailed Assessment (2008) and Updating and Screening Assessment (2009) reports respectively, to DEFRA, showing areas of Sheffield where nitrogen dioxide (NO₂) or fine particles (PM₁₀) amounts are likely to breach national and EU legislation.
- 5.4 This means the Council is required to produce an Air Quality Action Plan to cover the period up to 2015, with the aim of reducing levels of nitrogen dioxide (NO₂) and fine particles (PM₁₀)³¹ to below EU thresholds.
- 5.5 The production of the plan has been led by the City Council and informed by a multidisciplinary group (the Air Quality Action Plan Working Group); including representatives from the local community, the Highways Agency, Environment Agency, health colleagues and South Yorkshire Passenger Transport Executive (SYPTTE).

³⁰ Air Quality Management in Sheffield, Sheffield City Council Cabinet Report 13 January 2010

³¹ Annual limit of 40µg.m⁻³ for NO₂ and the daily limit of 50µg.m⁻³ for PM₁₀ (which is not to be exceeded more than 35 times a year) do not continue to be breached

6 How will this plan improve air quality?

6.1 As stated, Sheffield's main polluting industrial processes are already tightly-regulated. As such this plan concentrates on tackling pollution from road transport which remains under-regulated meaning the City Council and its partners must act to ensure emissions are reduced³².

Summary

6.2 We ranked the actions proposed in our consultation using the responses received, including the additional actions suggested and our assessment of the impact³³ on improving air quality based on Table 2 to develop the commitments made in this plan, shown in Figure 8.

Table 2

Category	Impact
Low	No measurable effect on air quality
Medium	Measurable air quality effects but insufficient to achieve objectives.
High	If used in a package of measures, EU and DEFRA objectives for nitrogen dioxide (NO ₂) and fine particles (PM ₁₀) could be achieved

6.3 The order of the actions below reflects the likely impact on improving air quality. If fully implemented the most effective actions together could achieve the EU and DEFRA objectives for nitrogen dioxide (NO₂) and fine particles (PM₁₀).

6.4 Some of these actions are already happening, which we will continue to improve. Others are in the early planning stages and we (like other major cities) need to decide whether they would have the desired impact in Sheffield.

Figure 8 Our commitments

³² Environment Act 1995

³³ As assessed by professional judgement of the Air Quality Action Plan Working Group

Action 1: Assess feasibility for a Low Emission Zone

Action 2: Develop infrastructure for refuelling low emission vehicles

Action 3: Promote smarter travel choices

Action 4: Improve engine performance of commercial diesel vehicles

Action 5: Mitigate the impact of the M1 motorway (particularly in the Tinsley Area)

Action 6: Develop policies to support better air quality

Action 7: Control industrial emissions

6.5 The proposed actions were also assessed in terms of their estimated costs, and timescales. The categories used are shown in Table 3 and Table 4 below:

Table 3 Estimated financial costs of Action Plan Actions

Costing category	Estimated costs of actions
Low	< £100,000
Medium	£100,000 – £1m
High	>£1m

Table 4 Estimated timescales

Time Category	Time required to implement and impact on air quality
Long	> 5 years
Medium	2-5 years
Short	< 1 year

Commitments in detail

Action 1 - Assess feasibility for a Low Emission Zone

6.6 We are undertaking a detailed feasibility and modelling study to demonstrate the costs and potential air quality improvements of introducing a Low Emission Zone. This is a geographically defined area, subject to enforcement powers, where operators of vehicles must comply with a specified low emissions policy.

6.7 The zone would encourage operators, particularly of lorries (HGVs) and buses to move to alternative fuel sources and improved engine

performance vehicles. The hybrid Stagecoach Buses³⁴ are one example of such a change. We are also working with the bus companies to formulate a voluntary strategy to reduce vehicle idling and to progress the commitment for 100% low floor buses which will get higher Euro Star engines in place.

- 6.8 The feasibility study will set out how the scheme could operate and the potential costs to both the City Council and affected businesses and transport operators. Enforcement will require an agreement with bus operators about vehicle emissions and replacement, and implementing an emissions policy for Taxi Licensing (*these are covered in Action 4: Improving the performance of commercial diesel vehicles*).
- 6.9 Appendix 3 - Low Emissions Zone Feasibility Study (page 46) sets out some of the issues that are being considered in the feasibility study.

Action 1	Assess feasibility for a Low Emission Zone
Air Quality Impact	The introduction of a Zone would potentially reduce emissions and it will therefore, have a beneficial effect on health. The impact is expected to be medium / high .
Cost / Benefit	The cost of undertaking the feasibility study would be medium to the City Council. The cost of introducing this scheme is expected to be high to both the City Council, businesses and transport operators. The benefits to air quality are expected to be high to members of the public within the Zone. There would also potentially be a positive impact outside the Zone (medium / high) as many vehicles will travel across Sheffield District as a whole and not just through the controlled area. So where their emission performance improves, this in turn would help to improve air quality in other areas that they pass through.
Timescale	The feasibility study should be completed within 12 months.
Funding	Funding for the feasibility study is being provided through the DEFRA Air Quality Grant and South Yorkshire Local Transport Plan 3. If the Zone is progressed to implementation, then the scheme would be likely to be funded through Grants, from private sector investment, from revenue generation and may also be supported with capital funding from South Yorkshire Local Transport Plan 3.
Ownership	Sheffield City Council; South Yorkshire Passenger Transport Executive
Partners	Sheffield City Council; South Yorkshire Passenger Transport Executive, Eco stars programme

³⁴ See Appendix 3 - Low Emissions Zone Feasibility Study page 46

Action 2: Develop infrastructure for refuelling low emission vehicles

- 6.10 We will enable commercial operators and the wider public to switch to cleaner fuel such as electric or gas³⁵, through the development of a gas refuelling site and electric vehicle recharging sites across South Yorkshire. The development of this infrastructure is subject to successful funding bids³⁶.
- 6.11 Any low emission vehicles working in Sheffield will be able to refuel at these sites and could also operate within a Low Emission Zone, if implemented.
- 6.12 We will work with partners to develop other energy alternatives for the city, such as hydrogen. We will also promote and encourage the uptake of low emission vehicles through a positive marketing and promotion programme

Implementation Plan:

- Develop a low emission vehicle refuelling infrastructure to include electric charging points and gas filling stations
 - Develop and source alternative fuel supply within the City
 - Promote and encourage the uptake of low emission vehicles through a positive marketing and promotion programme
- 6.13 Several strands of work are already being progressed within Sheffield and South Yorkshire including:
- Development of a Compressed Natural Gas Refuelling Station project – business case to be developed, funded through the South Yorkshire Local Transport Plan 3, by April 2014.
 - Bio-methane production³⁷ - facilitating the development of an Anaerobic Digestion plant in the City by 2014.
 - Plugged in (South) Yorkshire, demonstration project being led by CO₂ Sense to catalyse the uptake of electric vehicles supporting Small Medium Enterprises with reduced price electric vehicle trials and installation of charging points - funding bids submitted through Local Sustainable Transport Fund main bid and European Regional Development Fund. Initial funding in 2011/12 through South Yorkshire Local Transport Plan 3.
- 6.14 Appendix 4 - Upgrading vehicles to low emissions fuels (page 48) provides further details of some of the costs and considerations.

³⁵ (bio-methane or compressed natural gas)

³⁶ Bids have been submitted to the South Yorkshire Local Transport Plan, Local Sustainable Transport Fund and European Regional Development Fund

³⁷ Science for Environment Policy Report,

Action 2	Develop infrastructure for refuelling low emission vehicles
Air Quality Impact	Initially the impact will be smaller as fleets switch from diesel. However, as the infrastructure develops its impact will increase leading to significant reductions in nitrogen dioxide (NO ₂), fine particles (PM ₁₀) and carbon. This in turn will result in a beneficial effect on health.
Cost / Benefit	The cost of establishing this scheme will be high and the benefits to air quality would be medium . Where take-up is achieved in large volumes of vehicles within fleets a significant improvement in emissions and air quality would be expected.
Timescale	Feasibility study should be complete in 2 years (short-medium).
Funding	Development of this measure is ongoing via South Yorkshire Local Transport Plan 3 funding for the gas refuelling station, and through a bid to the Local Sustainable Transport Fund and European Regional Development Funding for electric refuelling stations to de-risk investment from the private sector. Site preparation for the refuelling station will de-risk private sector involvement so that a commercial organisation could then fund, procure, install and operate the infrastructure, thereby providing a business opportunity and job creation, with their costs being recovered through a margin on the gas pumped to the users.
Ownership	Sheffield City Council; South Yorkshire Passenger Transport Executive; ITA (Freight Group)
Partners	Sheffield City Council; Public transport operators; South Yorkshire Passenger Transport Executive

Action 3: Promote smarter travel choices

- 6.15 We will encourage changes to the way people travel by improving public transport and marketing services such as travel awareness campaigns, setting up websites for car share schemes, supporting car clubs and encouraging teleworking. We will also establish a Bus Partnership Agreement as part of our efforts to help improve smarter travel choices (modal shift). This will remove some of the buses on the network, reduce congestion and air pollution. We will develop specific schemes to get employees to and from work and children to and from school, such as 'Bike It' which promotes cycling through schools. We will also be investing in public transport, such as the Bus Rapid Transit (BRT) Northern Route³⁸, and support the implementation of the Government-led 2 year Tram-Train pilot scheme³⁹ to promote innovation in sustainable travel, improve reliability and increase modal shift from cars to tram.
- 6.16 One of the first principles of reducing the need to travel by car would be to ensure that as many destinations as possible are accessible to public

³⁸ <http://www.sy-busrapidtransit.co.uk/default.asp?pageid=3&groupid=3>

³⁹ <http://www.bbc.co.uk/news/uk-england-south-yorkshire-18100674>

transport, walking and cycling. This includes developing Park and Ride schemes, journey planning tools, cycle paths, cycle storage and better footpaths, subject to a successful funding bid⁴⁰. The Council is developing a Cycle to Work scheme for its employees, to build on the other benefits aimed at promoting cycling that already exist⁴¹.

- 6.17 Investment and commitment will be needed in order to achieve significant mode shift, and resulting improvements in air quality. For example, Darlington, Peterborough and Worcester participated in a DfT funded Sustainable Travel Demonstration project, costing £10 million over 5 years (2004-2008).
- 6.18 Car use was cut by 9%, equivalent to 53 million miles of car travel and saving 17,000 tonnes of carbon dioxide. Levels of walking increased by more than 10% in each location, while bus use grew by more than a third in Peterborough and by a fifth in Worcester.
- 6.19 There was also a 12% increase in cycling in Peterborough and a 19 per cent increase in Worcester. Darlington, which received further Government funding to improve facilities for cyclists, saw levels of cycling more than double over the same period.⁴²

Action 3	Promote smarter travel choices
<p>Air Quality Impact</p>	<p>Emissions from transport form the single biggest contributor to air pollution. Increasing use of public transport and active travel, such as walking and cycling, should reduce single occupancy car use, improve air quality and result in a beneficial effect on health.</p> <p>How people choose to travel is measured through annual traffic cordon surveys and trends in modal shift are analysed yearly – please see Appendix 5 - Traffic Flow (page 50)</p> <p>The impact of smarter travel choices on air quality will be low initially, but should progressively increase over time as further investment in measures and actions encourages greater mode shift.</p>
<p>Cost / Benefit</p>	<p>The cost of continuing this scheme would be high in total while the costs of individual actions within the scheme are low cost to both the City Council and businesses. The benefits to air quality would be low for individual projects but combined together are potentially medium (or high) to air quality overall.</p>
<p>Timescale</p>	<p>Ongoing and will include timescale for increased work through Local</p>

⁴⁰ Bid made to the Local Sustainable Transport Fund

⁴¹ Council benefits include a cycle business mileage at 20p per mile, secure cycle parking, and the offer of an interest free loan of £300 to enable bike purchase

⁴² <http://www.rudi.net/node/21125>

	Sustainable Transport Fund.
Funding	Funding will be pursued through Local Sustainable Transport Fund main bid. Ongoing additional funding will be sought for 2014 / 15.
Ownership	Sheffield City Council; South Yorkshire Passenger Transport Executive; South Yorkshire Travel Behaviour Change Unit
Partners	Employers; Public transport operators; Urban Cycle Coaching (Pedal Ready & Sheffield City Council)

Action 4: Improve engine performance of commercial diesel vehicles

- 6.20 We will encourage cleaner fleets, by enhancing the South Yorkshire ECO Stars Fleet Recognition Scheme, subject to a successful funding bid⁸. This is a free, voluntary scheme where operators of commercial diesel vehicles⁴³ are assessed and ranked on fuel saving and sustainable activities across their transport fleet. ECO Stars rate individual vehicles and the whole fleet for their overall transport operation.
- 6.21 Currently, thousands of lorries, vans and buses operating across South Yorkshire are included in the scheme and are making fuel savings which result in reduced emissions. The Council fleet (currently 680 vehicles) has a 3-Stars ECO Star rating, which we are seeking to improve over 2012/13.
- 6.22 We are also assessing the introduction of an emissions policy for the vehicles we license, either as private hire or hackney carriages (taxis). This aims to facilitate the replacement of all old and more polluting taxis with newer and less polluting ones by 2017.

Action 4	Improve engine performance of commercial diesel vehicles
Air Quality Impact	The impact of these measures on air quality will be medium . Transport is the single biggest source of air pollution, especially from diesel vehicles. Measures and actions which contribute to fuel savings and therefore reduced emissions will have a positive impact on air quality and a beneficial effect on health.
Cost / Benefit	The Eco Stars scheme is free to join and can save an operator up to £2,300 per vehicle a year. Each business is assessed and advised how to improve engine performance, leading to fuel savings resulting in reduced emissions and better air quality. Operators bear the costs associated with implementing the scheme, but gain recognition for best practice in fleet management and accrue fuel savings. Consequently, the cost of this scheme is low / medium and the air quality benefit medium . Any actions to minimise taxi emissions would be subject to a cost-benefit analysis prior to agreement

⁴³ Commercial diesel vehicles are defined as goods vehicles (lorries), buses and coaches

Timescale	The Eco Stars scheme is ongoing, but dependent on the success of bids to the Local Sustainable Transport Fund. The aim is to implement the Taxi Emissions Policy by 2017.
Funding	A bid to the Local Sustainable Transport Fund has been submitted to allow the Eco Stars scheme to continue to roll out across South Yorkshire.
Ownership	The Air Quality and Climate Group of the SY Local Transport Plan; Sheffield City Council; Barnsley Metropolitan Borough Council; Taxi Operators
Partners	The Air Quality and Climate Group of the SY Local Transport Plan; Sheffield City Council; Barnsley Metropolitan Borough Council; Local Transport businesses; Taxi Operators

Action 5: Mitigate the impact of the M1 motorway on air quality (particularly in the Tinsley Area)

- 6.23 Our efforts on mitigating the impact of the M1 are dependent on national Government, without their commitment, it is unlikely that we can adequately address air quality in Tinsley. At present, we believe the introduction of speed management will improve air quality around the M1 motorway. As such, the Council will continue to lobby the Department for Transport (DfT) to reduce and enforce a speed limit on the M1 through Tinsley, and to work with us to develop alternative actions that would improve air quality.
- 6.24 The Government have announced their Managed Motorway programme will go ahead on the M1 through Sheffield and proposes to reduce congestion by using the hard shoulder to increase capacity for the motorway. If this also results in an increase in traffic, air pollution will almost certainly worsen. As such, we want this programme to include a reduced speed limit, particularly when air pollution is, or is expected to be, elevated. For example, at peak traffic times and in certain weather conditions.
- 6.25 We will also develop alternative actions that would improve air quality around the M1, particularly in the Tinsley area.
- 6.26 Tinsley is an urban industrial area in the northeast of Sheffield. The M1 motorway is a major inter-urban haulage route that connects northern cities to those in the south. The M1 passes through the Tinsley area at Junction 34 and traffic flow on average at that point is usually in the region of over 110,000 vehicles per day, with up to 20% heavy goods vehicles, travelling at high speeds.
- 6.27 The M1 is a major contributor to the high concentrations of nitrogen dioxide (NO₂) and fine particles (PM₁₀) in the area and speed management is a targeted action to help improve air quality.

6.28 The City Council and the Highways Agency are currently undertaking a six month assessment of nitrogen dioxide (NO₂) levels around Bawtry Road and the M1 Junction 34 South, Tinsley. The findings will be reported in summer 2012, when specific actions will be developed.

Action 5	Mitigate the impact of the M1 motorway on air quality (particularly in the Tinsley area)
Air Quality Impact	The air quality impact of this action will be medium / high . The action will largely result in the reduction of transport emissions and will therefore; have a beneficial effect on health.
Cost / Benefit	The cost of any speed management measure would be medium ; but if implemented would be borne by the Highways Agency for installing and operating the Gantry and Variable Message Signage. The air quality benefits will be medium / high and the implementation could lead to the annual average standards for nitrogen dioxide (NO ₂) being achieved in the Tinsley area. There will also be health benefits as a consequence. Any alternative methods to mitigate the impact of M1 motorway would be subject to a cost-benefit analysis prior to agreement.
Timescale	Ongoing, but potentially achievable in 1 - 2 years (short-medium)
Funding	This action would require officer time, plus appropriate funding to both implement and enforce speed limit and any other mitigation action hence this measure is considered to be medium / high cost.
Ownership	Sheffield City Council; Department for the Environment, Food and Rural Affairs; Department for Transport; Highways Agency.
Partners	Sheffield City Council; East End Quality of Life Initiative; Department for Transport, Department for the Environment, Food and Rural Affairs; Highways Agency.

Action 6: Develop policies to support better air quality

6.29 We will introduce and enforce a planning policy to ensure developments sensitive to air pollution are located in areas where national air quality objectives are achieved, unless they provide overriding regeneration benefits, and sufficient measures to protect air quality are incorporated. For significant developments, predictable resulting loss of air quality will need to be appropriately mitigated.

6.30 The City Council is currently undertaking a review of the way in which air quality is assessed as part of the Planning Application process. We will expect all new developments to implement or support actions that make a positive contribution to improving air quality, such as by reducing the demand for fuel consumption. We are also working to develop an anaerobic digestion plant (to complement *Action 2*) that will enable gas powered vehicles to be used for deliveries that may open up the possibility of making gas vehicles for deliveries a condition of planning permission in some instances..

- 6.31 We will also produce updated guidance on Sustainable Transport in 2012/13. This will improve the current travel planning process, help to expand car club options and parking schemes for low emission vehicles, to promote smarter travel choices.
- 6.32 We will integrate policies for spatial and transport planning. This will ensure accessible local facilities are close to high-density residential developments, to reduce travel demand and open up possibilities for walking and cycling. Spatial planning policy can also limit the amount of parking capacity available at new or altered developments.
- 6.33 The City Council will also develop a package of measures to encourage low emission car use as appropriate, linked to the implementation of *Action 2* and *Action 6*.
- 6.34 The Council will continue to develop and review its parking policies in order to promote acceptable levels of air quality. For example, it currently has a 'Green Parking Scheme' in the city centre, designed to encourage the uptake of alternatively fuelled vehicles by providing low-cost parking. The Scheme is currently being reviewed to ensure that it continues to contribute to the objectives of the Air Quality Action Plan. In addition, The Council has reduced long stay parking in the city centre in favour of short stay provision. This will help to reduce commuter parking and congestion during the busiest periods.

Action 6	Develop policies to support better air quality
Air Quality Impact	<p>The air quality impact of this action will be low / medium and is dependent upon the amount of new development coming forward. The action will largely result in the reduction of transport emissions and will therefore; have a beneficial effect on health. There would potentially be a positive impact across Sheffield especially where there are new developments.</p> <p>Where implementation of this measure results in emissions reduction from transport associated with new developments, this could help other areas they pass through including those neighbourhoods which have elevated air pollution.</p>
Cost / Benefit	<p>The cost of this measure will be low / medium, as this could include the potential cost of defending a planning application decision. The air quality benefits will be low / medium and the implementation could lead to the annual average standards for nitrogen dioxide (NO₂) being achieved in many areas of Sheffield. There will also be health benefits as a consequence.</p>
Timescale	Ongoing
Funding	<p>This action would mainly require officer time and it is not likely to be significant in terms of direct cost, unless there is a need to defend a planning application decision. There would also be a cost to the developer as a result of implementation.</p>

Ownership	Sheffield City Council
Partners	Sheffield City Council; Developers; Consultants; the Public

Action 7: Control industrial emissions

6.35 We will work closely with the Environment Agency and industries controlled by Sheffield City Council to ensure permits are granted and enforced to reduce emissions⁴⁴. Industrial emissions in Sheffield are an important source of air pollution, particularly fine particles (PM₁₀), contributing up to 45% of the City's total. Efforts to further control emissions by upgrading processes are ongoing at regulated sites, with improvements required as new pollution reduction technology is available.

Action 7	Control industrial emissions
Air Quality Impact	The cost of this measure will be low and the air quality benefits medium . Continued control of industrial emissions should progressively reduce fine particle (PM ₁₀) emissions from industry, with nitrogen dioxide (NO ₂) being maintained.
Cost / Benefit	The air quality impact of this action will be medium . The action will largely result in the reduction of industrial pollutant emissions and will therefore; have a beneficial effect on health. There would potentially be a positive impact across Sheffield and especially in areas where residential properties are in close proximity to industry.
Timescale	Ongoing
Funding	This action would mainly require officer time and it is not likely to be significant in terms of cost. The cost of regulation is borne by the regulating authorities – Sheffield City Council, Environmental Protection Service and the Environment Agency.
Ownership	Sheffield City Council; Environment Agency
Partners	Sheffield City Council; Environment Agency

7 How we will assess progress

- 7.1 Overall we will measure success by decreasing levels of nitrogen dioxide (NO₂) and fine particles (PM₁₀) at key sites in the city, improving people's health by achieving air quality standards in the city by 2015.
- 7.2 We will need to carefully monitor progress on this plan and regularly assess our achievements in order to determine whether further and stronger local action or national policy measures and interventions are necessary.

⁴⁴ Some of these emissions are regulated by the Environment Agency and Sheffield City Council under the Integrated Pollution and Control Directive which is implemented via the Environmental Permitting (England and Wales) Regulations.

- 7.3 We will do this by integrating this into the Council's performance management framework, by incorporating these targets into the 2012/13 Business Plan for Development Services.
- 7.4 We will follow Government guidance, as detailed in Local Air Quality Management Policy Guidance⁴⁵, and report to the Secretary of State (DEFRA) on our progress, any improvements in air quality made and the challenges experienced. We will also produce an Annual Progress / Monitoring Report each year.
- 7.5 Once the Low Emission Zone initial feasibility study has been completed in autumn 2012, the Council will update and strengthen this plan, following consultation on any proposed amendments.
- 7.6 As such this plan for 2015, published in June 2012 is the first report in a three year rolling programme. The Air Quality Action Plan for 2015 will be reviewed and updated in June 2013 and June 2014.

Governance

- 7.7 An Air Quality Action Plan Steering Group⁴⁶ was formed to oversee the development of this plan and lead on the implementation. The Steering Group was supported by a multidisciplinary group, the Air Quality Action Plan Working Group, who produced the plan for 2015.
- 7.8 The Working Group comprised of representatives from the local community, the Highways Agency, Environment Agency, health colleagues, South Yorkshire Passenger Transport Executive (SYPT), and Sheffield City Council officers.
- 7.9 The Working Group reviewed the sources of air pollution in the city (described in detail in Appendix 1 - Source apportionment for pollutants, page 42) and considered what actions should be included in the plan for 2015.
- 7.10 These actions were reviewed following the public consultation and aligned to current city and regional plans including; the Sheffield Transport Vision and the Sheffield City Region Transport Strategy, 2011 - 2026. The latter identifies the role of transport in supporting economic growth whilst reducing emissions, enhancing social inclusion and maximising safety. It also identifies a set of policies which are specifically focussed upon tackling emissions and which will support the implementation of the Air Quality Action Plan for 2015.
- 7.11 The Council's overall Air Quality Champion will be the Director of Public Health as part of their role on the city's Health and Well Being Board. The

⁴⁵ LAGM.PG(O9): Part IV of the Environment Act 1995: LOCAL AIR QUALITY MANAGEMENT Policy Guidance (PG09), February 2009

⁴⁶ Part IV of the Environment Act 1995, Local Air Quality Management Policy Guidance (PG09), p21.

Executive Director of the Place Portfolio will have responsibility for delivery of this plan.

- 7.12 In addition, each action in the plan has a lead officer on both the Steering Group and Working Groups for air quality supported by a member of the local community (see Appendix 2 – Air Quality Champions, page 45).

8 Our duties within the legal framework

- 8.1 Under Part IV of the Environment Act 1995, Local Authorities are required to review and assess air quality in their areas and to report against objectives for specified pollutants of concern, to the Department for Environment, Food and Rural Affairs (DEFRA).
- 8.2 Prompted by an earlier assessment of local air quality in Sheffield, an Air Quality Management Area was declared in 2003 for the whole urban area. An action plan was developed in response to the elevated levels of air pollution in the city. Whilst this reduced nitrogen dioxide (NO₂) emissions, levels did not decline sufficiently to achieve national standards and EU limit values.
- 8.3 Action to manage and improve air quality is largely driven by European Union (EU) legislation. The 2008 ambient air quality directive (2008/50/EC) sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health including particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).
- 8.4 As part of this process, Sheffield City Council declared an Air Quality Management Area across the whole of the urban area of the city for both nitrogen dioxide (NO₂) and fine particles (PM₁₀) in March 2010. The declaration was based on the evidence reported in the formal Detailed Assessment (2008) and Updating and Screening Assessment (2009) reports respectively, to DEFRA, showing areas of Sheffield where nitrogen dioxide (NO₂) or fine particles (PM₁₀) amounts are likely to breach national and EU legislation.
- 8.5 This means that the Council is required to produce an Air Quality Action Plan to cover the period up to 2015, with the aim of improving nitrogen dioxide (NO₂) and fine particles (PM₁₀) levels, specifically that the annual limit of 40µg.m³ for NO₂ and the daily limit of 50µg.m³ for PM₁₀ (which is not to be exceeded more than 35 times a year) do not continue to be breached.

Achieving compliance with UK Objectives and EU Limit Values

- 8.6 Nationally and locally air quality is a major issue⁴⁷. The UK is likely to continue to breach EU air quality directives⁴⁸. For example, European law

⁴⁷ Environmental Audit Committee - Fifth Report Air Quality

<http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.htm>

⁴⁸ http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm

required that the nitrogen dioxide (NO₂) air quality objective of 40µg.m⁻³ be achieved by 2010. In September 2011 the commissioner of the European Union started to look at the nitrogen dioxide levels as reported by the UK government in order to consider the UK's proposed remedies as laid out in its action plan and decide upon the level of fines to be imposed for non compliance. This decision has not yet been made.

- 8.7 Not achieving the air quality targets nationally means not complying with EU law and consequently, this is a risk for the Council. There is the potential for the UK government to be fined if EU limit values are exceeded. The government however, can only pass the fines on if they can show that we have not taken appropriate steps to comply with EU law. The UK is likely to continue to breach EU air quality directives. Potentially the fines which can be imposed are significant.
- 8.8 The reserve powers in the Localism Act to passport EU fines to local authorities and public bodies (where they have failed to take action when they could) is significant and helps to highlight the need for a clear line of sight between EU obligations and Local Authority responsibilities to improve air quality and provide clarity on the role local authorities play.
- 8.9 DEFRA has recently announced the results of the Environment Theme of the Governments "Red Tape Challenge"⁴⁹. The implications of this report on Local Air Quality Management Review in the future will be to reduce the burden on Local Authorities, whilst at the same time improving focus on delivery of local measures. Over the next year DEFRA has committed to review the impact of existing legislation, including the Clean Air Act, and then consult on the findings¹³.

9 How we will tackle the wider causes

- 9.1 Air pollution from emissions associated with domestic and commercial space and water heating are already being tackled in a number of ways:
- The city's energy from waste recovery plant now provides 39 megawatts of heat via 43 km of pipe to over 140 buildings in the city centre saving 13,000 tonnes of carbon per year. Connecting buildings to the network reduces the reliance on fossil fuels and improves local air quality by reducing nitrogen oxide emissions. The plant itself emits less than a quarter of its particulate emission limits and around 60% of its NO_x limits.
 - Biomass – The aim is to minimise emissions from biomass. Energy generation from biomass as a renewable source will be enabled and encouraged, where it has a neutral impact on air quality
 - Work is currently underway to extend the district heating network through the inclusion of heat and power generated by E.ON UK's biomass plant in the lower don valley (currently under construction)

⁴⁹DEFRA: Red Tape Challenge – Environment Theme Proposals, March 2010

- A feasibility study for the conversion of existing community heating schemes in council housing to state of the art biomass plant is being drafted
 - Work on developing several community heating schemes to biomass combined heat and power is being developed with private sector
 - A citywide Free Insulation Scheme has helped cut emissions from 35,000 households by providing free cavity wall and loft insulation, so reducing fuel use and assisting the reduction of fuel poverty. It is estimated that these measures have cut carbon by around 16,500 tonnes per year.
- 9.2 A proportion of Sheffield's industry that we know contributes to the air pollution in the city is tightly regulated. For example, iron and steel producing industries or metal surface treatment processes.
- 9.3 We will promote individual contributions from the residents of Sheffield by demonstrating everyone has a role to play in improving air quality. In addition to the specific campaigns to support our commitments in this plan, we will promote the use of Care4Air (<http://www.care4air.org>).
- 9.4 This site aims to raise awareness of air quality issues and highlight what is happening in the region to improve the quality of our air. In particular, Care4Air aims to provide individuals, organisations, schools and businesses with information that will enable them to 'do their bit' and improve air quality.

10 Background

Air Quality and Health

- 10.1 This plan focuses on the need to comply with UK and EU Limit Values for air pollution; limits which have been set to protect health. The most up to date evidence suggests that in Sheffield there are around 350 to 500 premature deaths per year, due to elevated air pollution.^{50,51}
- 10.2 The impact of air pollutants on health is well documented and includes impact on lung function and respiratory disease (see Table 5). Air quality that does not meet acceptable levels leads to increases in medication usage and hospital admissions.

Table 5 Health effects associated with exposure to different air pollutants

Pollutant	Effects related to short term exposure	Effects related to long term exposure
-----------	--	---------------------------------------

⁵⁰ <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.htm>

⁵¹ Sheffield City Council 13/1/2010 cabinet report <http://www.sheffield.gov.uk/your-city-council/council-meetings/cabinet/agendas-2010/agenda-13th-january-2010>

Pollutant	Effects related to short term exposure	Effects related to long term exposure
Nitrogen Dioxide In ambient air, nitrogen dioxide serves as an indicator for a complex mixture of mainly traffic-related air pollution	<ul style="list-style-type: none"> • Effects on pulmonary function, particularly in asthmatics • Increase in airway allergic inflammatory reactions • Increase in hospital admissions • Increase in mortality 	<ul style="list-style-type: none"> • Reduction in lung function • Increased probability of respiratory Symptoms
Particulate matter (PM ₁₀)	<ul style="list-style-type: none"> • Lung inflammatory reactions • Respiratory symptoms • Adverse effects on the cardiovascular system • Increase in medication usage • Increase in hospital admissions • Increase in mortality 	<ul style="list-style-type: none"> • Increase in lower respiratory symptoms • Reduction in lung function in children • Increase in chronic obstructive pulmonary disease • Reduction in lung function in adults • Reduction in life expectancy, mainly due to cardiopulmonary mortality and probably lung cancer
Ozone (NO ₂ and PM ₁₀ , combine in the atmosphere to form Ozone)	<ul style="list-style-type: none"> • Adverse effects on pulmonary function • Lung inflammatory reactions • Adverse effects on respiratory symptoms • Increase in medication usage • Increase in hospital admissions • Increase in mortality 	<ul style="list-style-type: none"> • Reduction in lung function development

Adapted from World Health Organisation (2004) ⁵²

10.3 Children (and unborn foetuses) are especially vulnerable to the effects of air pollution. This is because their lungs, metabolic and immune systems are still developing⁵³. The effects in childhood and foetal development include:

- Aggravation of asthma
- Increased cough and bronchitis

⁵² Health Aspects of Air Pollution results from the WHO project 'systematic review of health aspects of air pollution in Europe page 7 (with thanks to Barbara Rimmington, East End Quality of Life Initiative for the link) <http://www.euro.who.int/document/E83080.pdf>

⁵³ Air Pollution and Noise their effects on human health and social inclusion a review of recent literature. Report prepared by Barbara Rimmington, Research Officer, East End Quality of Life Initiative, Revised January 2006.

- Low birth weight
- Infant deaths (due to respiratory and Sudden Infant Death Syndrome)
- Pre-term births
- Birth defects leading to effects throughout adult life of:
 - Premature ageing
 - Higher risk of infection
 - Susceptibility to tobacco smoke
 - Susceptibility to occupational exposure⁴¹.

10.4 The adverse effects of elevated air pollution are such that it has a bigger impact on life expectancy than road traffic accidents or passive smoking (Table 6).

Table 6 Benefit comparison based on reducing PM_{2.5} µg/m³ by 10 µg/m³⁵⁴, the elimination of motor vehicle traffic accidents and the elimination of exposure to passive smoking

	Reduction in PM _{2.5}	Elimination of road traffic accidents	Elimination of passive smoking
Expected gain in life expectancy	7-8 months	1-3 months	2-3 months
Est. equivalent gain in life years in England and Wales population 2005–2010 (including people born during that time)	39,058,000	8,126,000	13,194,000

Source: Department of Health, EV 142 Taken from House of Commons Environmental Audit committee (2010)

10.5 The most conservative estimates of the cost to the NHS are that ill health related to elevated air pollution costs nationally up to £20 billion a year⁵⁵. The impact on health is unequal with more effects on the young, the old and those with pre existing heart and lung disease. For individuals who are particularly sensitive and are exposed to the most elevated levels of air pollution the reduction in life expectancy is estimated to be as high as 9 years⁵⁶.

10.6 The number of hospital admissions rises with the increased concentrations of fine particles (PM₁₀). Admissions for patients over 65 with chronic obstructive pulmonary disease (COPD) or asthma rise 1% per extra 10µg/m³ PM₁₀, and admission for people with cardiovascular disease go up 0.5% with the same concentration increase⁵⁷.

10.7 Maheswaran and colleagues from the University of Sheffield found 6% of coronary heart disease deaths and 11% of stroke deaths in Sheffield

⁵⁴ (equivalent to eliminating manmade PM_{2.5} in 2005)

⁵⁵ DEFRA low emissions paper 2010

⁵⁶ <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvaud/229/22902.htm>

⁵⁷ Brunekreef and Holgate (2002) Air pollution and health. The Lancet Vol 360 p 1233-1242

attributable to outdoor air pollution^{58,59}. This work, based on figures from 1994-1998, for people aged 45 modelled air pollution data for a number of pollutants including fine particles (PM₁₀) and nitrogen dioxide (NO₂) and took into account age, sex, socioeconomic deprivation and smoking prevalence.

- 10.8 National committees have also shown that exposure to air pollutants in both the short and long term impacts on development of cardiovascular disease and leads to an increase in hospital admissions and an increase in the risk of death⁶⁰.
- 10.9 A recent study based on the greater London Population of 7.6 million found that reducing fine particles (PM_{2.5}) by 1µg/m³ would gain 400,000 years of life for the current population of London⁶¹. Extrapolated to Sheffield this would mean a saving of 28,000 years of life for the current population of Sheffield⁶²
- 10.10 The number of Hospital admissions rises with the increased concentrations of fine particles (PM₁₀). Admissions for patients over 65 with COPD or asthma increase 1% per extra 10µg/m³ PM₁₀ and admission for people with cardiovascular disease go up 0.5% with the same concentration increase⁶³. The target, which is being exceeded for Sheffield for fine particles (PM₁₀), is an annual average mean of 40µg/m³ plus a daily mean not to exceed 50µg/m³ more than 35 times a year.
- 10.11 In Sheffield there were 647 emergency admissions for asthma (average 1.8% rate⁶⁴) in 2008/2009, which while lower than the Yorkshire or national average represents only part of the admissions that potentially are affected by elevated air pollution.

Inequality and Air Pollution Related Ill Health

- 10.12 Air quality is closely linked to traffic pollution so that communities living close to main arterial routes will be most affected by elevated air pollution. Although air quality is an issue affecting the whole of the Sheffield urban area, the busiest and polluted main routes, especially

⁵⁸ Maheswaran R, Haining RP, Brindley P, Law J, Pearson T, Fryers PR, Wise S, & Campbell MJ (2005a) Outdoor air pollution, mortality, and hospital admissions from coronary heart disease in Sheffield, UK: a small-area level ecological study, in *European Heart Journal* 25:43-2549

⁵⁹ Maheswaran R, Haining RP, Brindley P, Law J, Pearson T, Fryers PR, Wise S, & Campbell MJ (2005b) Outdoor air pollution and stroke in Sheffield, United Kingdom: a small-area level geographical study, in *Stroke* 36:239-243

⁶⁰ Committee on the Medical Effects of Air Pollution (2006) *Cardiovascular Disease and Air Pollution* London: Department of Health

⁶¹ Miller B G (2010) Report on estimation of mortality impacts of particulate air pollution in London. Edinburgh IOM

⁶² Based on a current Sheffield population of 547,000 and the effects of a reduction being the same in Sheffield as in London.

⁶³ Brunekreef and Holgate (2002) Air pollution and health. *The Lancet* Vol 360 p 1233-1242

⁶⁴ Per 100 patients on disease register. Taken from www.nhscomparitors.nhs.uk Date accessed: 2 Aug 2010

those leading into the city centre and the M1, are in valleys. These built up valleys are close to some of the most disadvantaged areas in the City.

- 10.13 In Sheffield, adult asthma admissions are moderately correlated with deprivation at GP practice level. Tinsley, the area of Sheffield most exposed to air pollution from the M1, has a particularly high level of hospital admissions for COPD and asthma.^{65,66}
- 10.14 Deprivation plus current unacceptable air quality, results in further susceptibility to unacceptable air quality. This greater susceptibility is due to:
- increased exposure to other pollutants and allergens (including tobacco smoke)
 - existing chronic disease
 - unhealthy behaviours (such as poor diet and alcohol consumption)
 - chronic stress (raised inflammatory disease markers)
- 10.15 The public health white paper “Healthy Lives Healthy People⁶⁷” proposes that local authorities should play a stronger role in the delivery of public health at local level, including setting objectives and priorities locally.
- 10.16 Further, the recently published “Public Health Outcomes Framework⁶⁸” includes an objective 'the population's health is protected from major incidents and other threats while reducing health inequalities' for which an indicator is air pollution. This framework sets the objectives by which the delivery of public health by local authorities will be measured against.

The Scale of the Problem in Sheffield

- 10.17 According to the Department for Transport’s monitoring data there has been a 15% increase in total vehicle kilometres travelled in Sheffield District between 1993 and 2010. Nationally, there has been an 18% increase over the same period, with South Yorkshire experiencing much higher growth than England as a whole. Traffic trends are shown in Appendix 5 - Traffic Flow (page 50)
- 10.18 In contrast, it can be seen from the City Council’s monitoring data that in 2011 overall traffic levels in the City Centre were very similar to those recorded in 1993.

⁶⁵ Adult and Childhood Asthma Health Needs Assessment October 2008 Sue Thackray and Andrew Booth Public health Department NHS Sheffield.

⁶⁶ From presentation by Sue Thackray ‘COPD care: opportunities’ at the Quality Improvement Academy 30 April 2010

⁶⁷ Healthy Lives Healthy People Update and Way Forward July 2011
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_128120

⁶⁸ Public Health Outcomes Framework
"http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_132358"

- 10.19 However, there are now fewer heavy diesel vehicles, such as lorries (Medium Goods Vehicles / Heavy Goods Vehicles) and buses, but more cars, taxis and light vans (Light Goods Vehicles) entering and leaving the City Centre.
- 10.20 Nonetheless, the City Centre still does not currently meet national air quality standards and (like the wider urban area of Sheffield District) is not expected to comply with EU limits without implementing the interventions recommended in this plan.
- 10.21 There was a general expectation across the country that cleaner engine technologies would lead to some improvement in air quality, however this has not been observed either in Sheffield or nationally.
- 10.22 The precise reason for this disparity is not fully understood, and is currently under investigation, but it is thought to be related to the actual on-road performance of diesel road vehicles when compared with test bed calculations based on the Euro standards. Preliminary studies suggest that⁶⁹ emissions from diesel vehicles have not improved for engines up to and including Euro 5 standard.
- 10.23 A further factor is the increase in diesel cars and vans on our roads. The growth nationally⁷⁰ in the amount of diesels as a percentage of the UK total number of vehicles has led to a drop off in the improving air quality trend, and in many cases a worsening of recorded pollution levels.

Controlling the Sources of Air Pollution

- 10.24 A computer prediction method was used to determine proportions of nitrogen dioxide (NO₂) and fine particles (PM₁₀) being emitted from sources in the city. (See Appendix 1 - Source apportionment for pollutants, page 42 for the full results).
- 10.25 As stated the results of the computer modelling showed that both road transport and industrial processes are the most significant emitters of both fine particles (PM₁₀) and nitrogen dioxide (NO₂) in Sheffield.
- 10.26 Air pollution from emissions associated with domestic and commercial space and water heating are already being tackled using a number of regulatory powers.
- 10.27 Industry is largely regulated using IPPC (Integrated Pollution Prevention and Control) legislation, with significant improvements being made in recent years. Efforts to further control emissions by upgrading processes are ongoing, with continued improvements being required as new pollution reduction technology is available.

⁶⁹ Review and Assessment Helpdesk September 2010.
www.defra.gov.uk/environment/quality/air/airquality/local/support

⁷⁰ <http://www.guardian.co.uk/business/2010/aug/05/diesel-car-sales-overtake-petrol>

10.28 There is, however, a large proportion of industrial processes that emit nitrogen oxides (NO_x) and fine particles (PM₁₀) that are not required to be regulated, either because they fall below a certain threshold or aren't covered by the regulations. This includes processes such as heat treatment, oil quenching sites, commercial incinerators and boilers which therefore have no environmental controls imposed upon them. The aggregated pollution from these unregulated processes is also contributing to the air pollution problem but there aren't currently powers to deal with them, as the City Council cannot impose standards upon these installations.

10.29 Switching to alternative fuels (rather than diesel) such as gas or electric could also have significant benefits. The introduction of significant proportions of low emission vehicles could have a very significant effect on air quality. Gas powered vehicles, for example, emit about half the amount of nitrogen oxides (NO_x) as petrol and diesel vehicles and emit virtually no particulate matter⁷¹.

Air Quality Action Plan 2003

10.30 The existing Air Quality Action Plan from 2003 is currently the main plan for air pollution mitigation in Sheffield. The 2003 plan took a very broad view and incorporated multiple actions⁷² across a wide range of areas. Whilst this reduced nitrogen dioxide (NO₂) emissions, levels did not decline sufficiently to achieve national standards and EU Limit Values.

- Public Transport Actions
- Road and Rail Network Actions
- Traffic Control Actions
- Cleaner Vehicle Actions
- M1 Specific Actions
- Industry Actions
- Eco-Efficiency and Planning
- Putting Pressure on the Government

10.31 Many of the actions in the 2003 plan were dependent on national policy and therefore outside of what the Council could achieve. In particular, there had been an over reliance on national measures such as fleet improvements through better engine technologies which have not materialised.

Consultation on the Air Quality Action Plan for 2015

10.32 Consultation was conducted in spring 2011 by referring the plan to:

- Community Assemblies

⁷¹ Technical Guidance for Biofuels. Biofuel Cities- A European Partnership www.biofuel-cities.eu

⁷² www.sheffield.gov.uk/environment/environmental-health/pollution/air/management/action-plan

- The Sheffield Clean Air Partnership⁷³
- The general public via the Council website
- Statutory consultees⁷⁴, for example, the Secretary of State, Environment Agency, Highways Agency, neighbouring Local Authorities, National Park Authority, other public authorities as appropriate, such as NHS Sheffield
- Bodies representing local business interests and other organisations, for example, the Chamber of Commerce, and business adviser panel.

Summary of Consultation Results

- 10.33 Replies to the consultation process indicated that there was strong support for the Action Plan's aspirations to reduce emissions from traffic, encourage public transport use and to actively promote improvements in engine technology and the use of less polluting fuels.
- 10.34 Air pollution was seen as a big problem in the City, with a high level of awareness of the serious health implications of air pollution. Respondents identified and ranked the following activities in order of preference:
- a. Smarter Choices, to influence travel behaviour
 - b. City Centre Low Emission Zone
 - c. Sustainable Transport Policies
 - d. Planning Policies which support improved air quality
 - e. Low Emission Vehicles
 - f. SCC Procurement Policy (Low Emission Fleet)
 - g. Thriving District and Local Centres Strategy
- 10.35 Respondents also supported the more ambitious measures in the proposed plan but indicated that the Council should develop strategies and policies in pursuit of air quality improvements, matched with adequate resources.
- 10.36 Additional measures prioritised for implementation, ranked by respondents, included:
- h. – Anti vehicle idling campaign and enforcement
 - i. – Low Emissions Refuelling Infrastructure
 - j. – Speed management on the M1 Motorway

⁷³ The Clean Air Partnership was set up to improve air quality in Sheffield and to act as key consultees and stakeholders around major air quality decisions.

⁷⁴ Part IV of the Environment Act 1995, Local Air Quality Management Policy Guidance (PG09), p23.

11 Appendix 1 - Source apportionment for pollutants

11.1 Source apportionment is a computer prediction method used to determine proportions of pollutants (in this case nitrogen oxides (NO_x⁷⁵) and PM₁₀) being emitted from sources in the city.

Source Apportionment for Nitrogen Oxides (NO_x)

11.2 This exercise was carried out using the Airviro computer model and Emission databases⁷⁶. Vehicle types were also subdivided into eight vehicle types rather than just heavy and light vehicles. The results are shown in Table 7 below.

Table 7 Source Apportionment for Nitrogen Dioxide (NO₂)

Source	Proportion of NO ₂ Emissions
Road Traffic	50%
Industrial Point Sources	35%
Area Sources (in this case domestic and commercial heating)	15%

Table 8 Breakdown of road traffic emissions (NO₂)

Source of road traffic emissions (NO ₂)	Heavy Vehicles	Light Vehicles
Petrol Motorcycle		<1%
Petrol Car / Taxi		17 %
Diesel Car / Taxi		6%
Petrol Light Goods Vehicle		<1%
Diesel Light Goods Vehicle		5%
Diesel Bus	19%	
Diesel Artic Heavy Goods Vehicle	26%	
Diesel Rigid Heavy Goods Vehicle	25%	
Total proportion of road traffic emissions	70%	30%

11.3 This demonstrates that 81% of all road traffic emissions for nitrogen dioxide (NO₂) can be attributed to diesel vehicles, with the remaining 19% linked to petrol vehicles.

11.4 The implications for this plan are that targeting heavy vehicles (for example in low emission zones or freight schemes) would be likely to have a positive effect on nitrogen dioxide (NO₂) levels, given the

⁷⁵ NO_x converts to NO₂ in air

⁷⁶ DA20,05 ref20,12b

comparatively low levels of traffic in this category and their disproportionate impact on air quality.

Source Apportionment for PM₁₀

11.5 This was done using the iAirviro system using the search function of the Emissions Data Base⁷⁷ for the whole of the Sheffield area.

11.6 Modelling for PM₁₀ is inherently difficult and the following assumptions were made:

- All air quality models assume that particles act like a gas.
- Re-suspension of particles is considered. These particles are largely from road vehicles which are deposited on roads and then remobilised by the action of traffic. Re-suspended dust in this exercise is considered to be equal to the primary exhaust emissions⁷⁸.
- Secondary particles formed from gases by chemical reactions are not considered.
- Trans-boundary particle pollution is not accounted for.
- All particle emissions from point sources are assumed to be PM₁₀.
- Future work will include updating of emission information to make more accurate assessments.

11.7 Nevertheless some broad conclusions can be made.

Table 9 Source Apportionment for PM₁₀

Source		Percentage of PM ₁₀ emissions
Area (domestic and commercial heating)		15%
Point (industrial stack emissions)		45%
Road Traffic	Exhaust emissions	20%
	Re-suspended dust	20%

11.8 It appears that for fine particles (PM₁₀) the largest source of emissions within the Sheffield area is industrial processes.

11.9 As stated a proportion of Sheffield's industry that we know contributes to the air pollution in Sheffield, is tightly regulated. For example, iron and steel producing industries or metal surface treatment processes. Therefore, most of the measures contained in the Air Quality Action Plan for 2015 concentrate on tackling pollution from road transport.

⁷⁷ EDB DA20,05

⁷⁸ Local Air Quality Management, Technical Guidance LAQM.TG(09) Appendix A2.43

Emissions of PM₁₀ from traffic

11.10 Emissions of PM₁₀ from traffic were further investigated using the South Yorkshire Emissions Data Base⁷⁹ which predicts traffic emissions for eight different vehicle types.

Table 10 Exhaust Emissions of PM₁₀ from traffic

Source of road traffic emissions (PM ₁₀)	Heavy Vehicles	Light Vehicles
Petrol Motorcycle		4%
Petrol Car / Taxi		6%
Diesel Car / Taxi		15%
Petrol Light Goods Vehicle		<1%
Diesel Light Goods Vehicle		26%
Diesel Bus	11%	
Diesel Artic Heavy Goods Vehicle	20%	
Diesel Rigid Heavy Goods Vehicle	17%	
Total proportion of road traffic emissions	48%	52%

11.11 This demonstrates that **89% of all road traffic emissions for fine particles (PM₁₀) can be attributed to diesel vehicles**, with the remaining 11% linked to petrol vehicles.

11.12 Whilst motorcycles are predicted to emit relatively large amounts of PM₁₀ (the predicted exhaust emissions factor is large) motorcycle numbers are low.

⁷⁹ EDB ref20,12b

12 Appendix 2 – Air Quality Champions

12.1 The Air Quality Action Plan for 2015 will be implemented through the Air Quality Steering Group and Air Quality Working Group.

12.2 The champions for each part of this plan, who will take ownership for each action are set out below:

Vision: Jeremy Wight, Director of Public Health

Delivery: Simon Green, Executive Director, Place Portfolio

Action	Steering Group Champion	Working Group Champion
Action 1: Assess feasibility for a Low Emission Zone	Les Sturch; Director of Development Services	Ogo Osammor; Air Quality Officer
Action 2: Develop infrastructure for refuelling low emission vehicles	Andy Nolan; Director of Sustainable Development	Mark Daly; Sustainable Development Officer
Action 3: Promote smarter travel choices	Dick Proctor; Transport Planning Manager	Greg Challis; Development Services Communications Co-ordinator
Action 4: Improve engine performance of commercial diesel vehicles	Neil Dawson; Head of Transport	Steve Ash; Assistant Transport Services Manager
Action 5: Mitigate the impact of the M1 motorway (particularly in the Tinsley Area)	John Bann; Head of Transport & Highways	Ogo Osammor; Air Quality Officer and Adam Swift; Environmental Strategy Support Officer
Action 6: Develop policies to support better air quality	Graham Withers; Business Manager, Development Management	Chris Heeley; Development Services Team Manager and Rachel Wileman; Planning Officer
Action 7: Control industrial emissions	Ian Ashmore; Head of Environmental Regulation	Jo Terry; Environmental Protection Services

13 Appendix 3 - Low Emissions Zone Feasibility Study

- 13.1 This feasibility study is currently underway. The following summarises some of the initial findings and considerations.
- 13.2 A low emission strategy provides a package of measures to reduce the air quality and climate change impacts of emissions associated with road transport. The aim is to promote measures which result in the reduction of emissions, and accelerate the uptake of emissions reduction technologies, including low emissions vehicles and fuels.
- 13.3 Various possibilities exist for implementing a Low Emission Zone, including through enforceable restrictions and voluntary partnerships. Many cities across Europe have opted for these Zones as a means of controlling vehicle emissions. Previous studies^{80,81} have demonstrated that the most common vehicles to target in a scheme with enforceable restrictions are commercial diesel powered Heavy Duty Vehicles due to their cost-effectiveness compared to schemes that would restrict other vehicle types.
- 13.4 Modelling results show that across the City as a whole about 50% of nitrogen oxide (NOx) emissions are from road traffic and of this about 20% is from buses. In addition fine particles (PM₁₀) emissions from road transport (including contributions from re-suspension) make up 40% of emissions across the City, with about 10% of these being from buses. In some locations in the city centre, which are affected by high levels of nitrogen dioxide, bus traffic predominates.
- 13.5 It is felt that at this time in Sheffield the most appropriate way to achieve air quality improvements may be by agreement with bus operators through a partnership scheme. This would involve investment from the bus companies, City Council and Passenger Transport Executive to improve the environmental performance of the fleet.
- 13.6 Stagecoach has recently announced that it will introduce a fleet of 19⁸² hybrid electric buses (with regenerative braking) onto the Sheffield 52 route in early 2013. This follows a successful bid for part funding of new low carbon vehicles from the Governments Green Bus Fund. The 52 service carries around 3 million passengers per year and runs between Hillsborough, Crookes, Attercliffe, Darnall and Woodhouse.
- 13.7 Air Quality Prediction Modelling to demonstrate potential air quality improvements from the Zone will be carried out in 2012 / 2013 (and possibly 2013 / 2014) funded by DEFRA Air Quality Grant.

⁸⁰ Feasibility Study on a Low Emission Zone for Sheffield, 2006.AEA Energy and Environment.

⁸¹ Low Emission Zones in Europe, Sadler Consultants
www.dft.gov.uk/pgr/scienceresearch/orresearch/lez/

⁸² <http://assets.dft.gov.uk/publications/green-bus-fund-round3/green-bus-fund-round-3-winners.pdf>

- 13.8 In addition to emissions reductions related to a Low Emission Zone, a City Centre Low Emission Strategy for Sheffield would consider emissions related to freight, taxis and private cars.
- 13.9 A South Yorkshire Freight Quality Partnership has now been established which has an agreed Freight Action Plan that includes an action to develop freight route mapping from the strategic network for individual industrial areas, taking account of air quality management areas, as well as to develop a web site for freight information within South Yorkshire with links to other sites such as Eco Stars.
- 13.10 The City Council is currently working to progress the commitment for 100% low floor buses which will get higher Euro Star engines in place.

Anti idling campaign

- 13.11 This aims to reduce the numbers of public transport vehicles leaving their engines running when stationary. The South Yorkshire Passenger Transport Executive are working with bus companies to formulate a voluntary strategy to reduce vehicle idling⁸³. Currently there is an anti-idling agreement in place at bus stations.

⁸³ Bus idling and emissions, www.pteg.net/Publications/Reports.htm

14 Appendix 4 - Upgrading vehicles to low emissions fuels

- 14.1 Alongside developing an infrastructure for refuelling low emissions vehicles, it will be necessary to support the uptake of new technologies including hybrid, gas and electric. This will be addressed in a feasibility study.
- 14.2 Heavy diesel vehicles (buses and lorries) make up 7% of total traffic, but create 70% of nitrogen dioxide (NO₂) and 48% of fine particles (PM₁₀) emitted from road traffic. These emissions could be significantly reduced (see Table 11) by upgrading these vehicles. This can be achieved in three ways:
1. Biogas could potentially reduce NOx emissions from the transport sector overall by 56% (2,240 / 4000 tonnes). There would also be no PM₁₀ emitted from the vehicles which have been upgraded.
 2. Hybrid could potentially reduce NOx emissions from the transport sector overall by 17% (700 / 4000 tonnes).
 3. Better than Euro V emission standards by retrofitting Emission Selective Catalytic Reduction Technology (SCRT) could potentially reduce NOx emissions from the transport sector overall by 62% (2464 / 4000 tonnes). There would also be a 77% PM₁₀ reduction.

Table 11 Reduction in nitrogen dioxide (NO₂) emissions from road traffic⁸⁴ by upgrading to alternative fuels

Source	Proportion of NOx Emissions (%)	Proportion of NOx Emissions (Tonnes)	Emission reduction upgrading to Biogas (Tonnes)	Emission reduction upgrading to Hybrid (Tonnes)	Emission reduction upgrading to better than Euro V std (Tonnes)
Petrol Motorcycle	<1%	<40	N/A	N/A	N/A
Petrol Car / Taxi	17%	680	-374		
Diesel Car / Taxi	6%	240	-192	-60	-211
Petrol LGV	<1%	<40	-<22	<10	
Diesel LGV	5%	200	-160	-50	-176
Diesel Bus	19%	760	-608	-190	-669
Diesel Artic HGV	26%	1,040	-832	260	915
Diesel Rigid HGV	25%	1,000	-800	-250	-880
Total heavy vehicles	70%	2,800	-2,240	-700	-2,464
Total light vehicles	30%	1,200			
Total Diesels	81%	3,240	-2592	-810	-2851
Total Petrol	19%	760	418	418	669

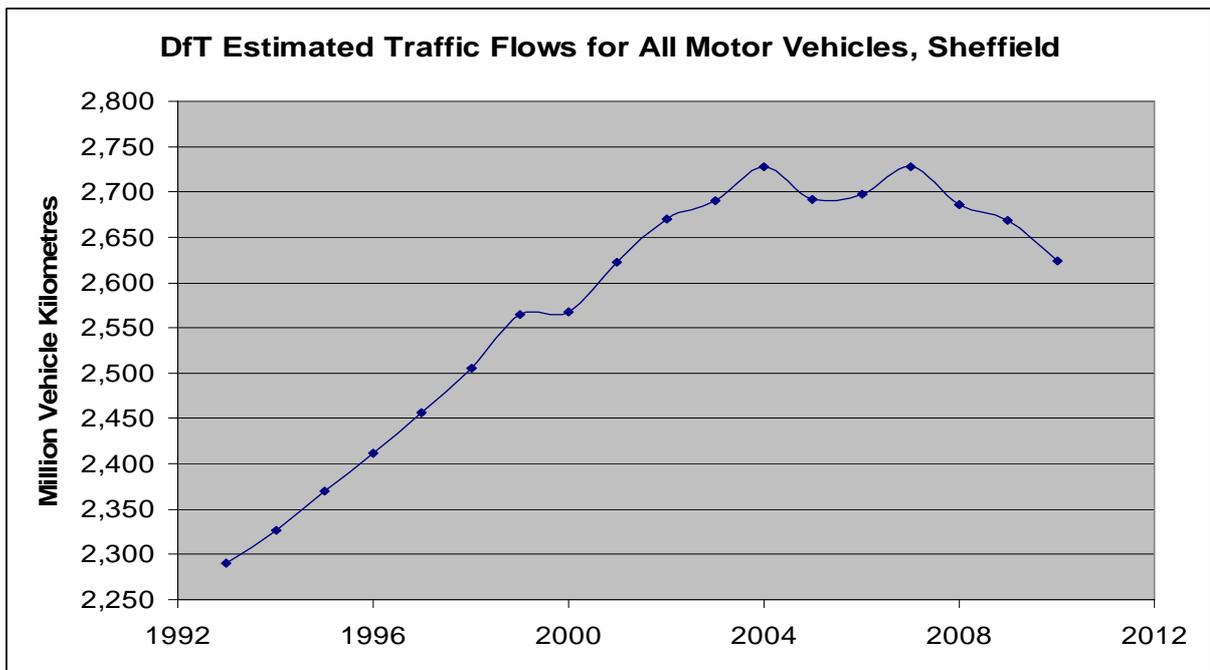
⁸⁴ Road traffic accounts for 50% of nitrogen dioxide (NO₂) equivalent to 4,000 tonnes per year

- 14.3 The potential level of investment needed to achieve this is significant. For example, each bus (a new standard Double Decker) upgrade would cost £230,000 per vehicle for Biogas, £280,000 for Hybrid, in addition to the costs of providing appropriate Refuelling Infrastructure. Also, each existing bus conversion would cost:
- £45,000 – £50,000 per vehicle for Biogas
 - £5,000 per vehicle for NO_x only retrofitting SCRT
 - £10,000 per vehicle for NO_x and PM₁₀ retrofitting SCRT, in addition to a £200 annual maintenance cost.

15 Appendix 5 - Traffic Flow

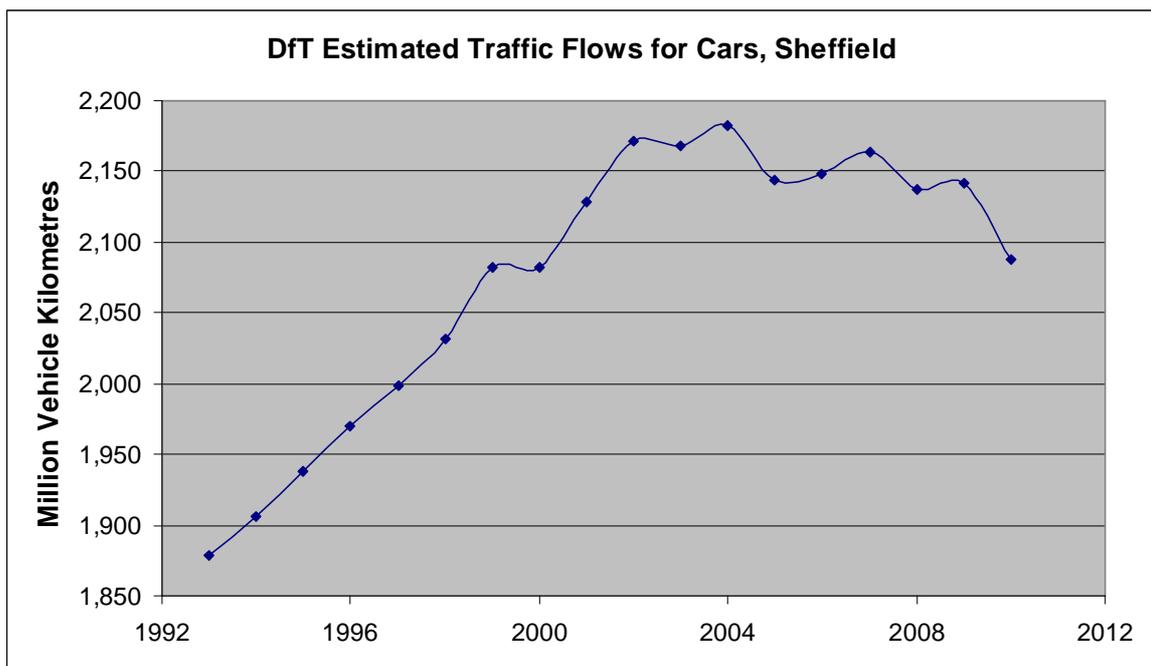
15.1 The Department for Transport's data shows the growth in traffic (in terms of total vehicle kilometres travelled) in Sheffield District is reflected nationally and to a somewhat greater level across South Yorkshire as a whole.

Figure 9 DfT Estimated Traffic Flows (in Vehicle Kilometres) for All Motor Vehicles, Sheffield District 1993 - 2010



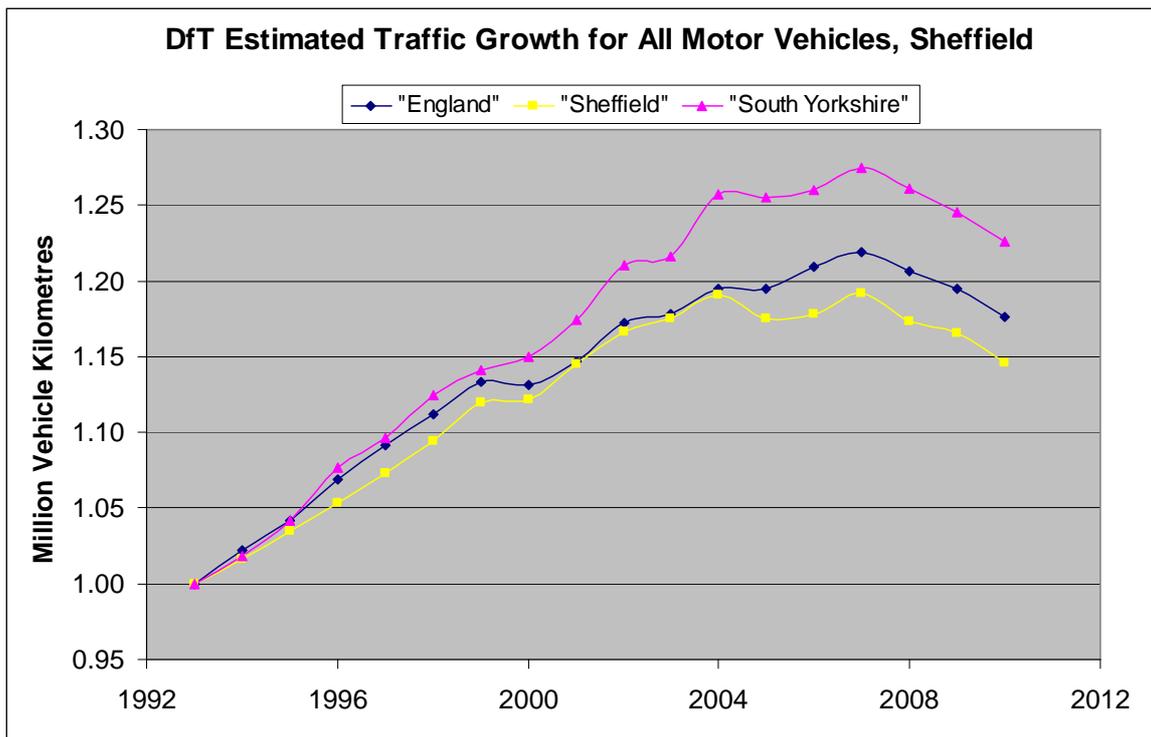
Source: Department for Transport's National Road Traffic Survey (outside the scope of National Statistics)

Figure 10 DfT Estimated Traffic Flows (in Vehicle Kilometres) for Cars, Sheffield District 1993 - 2010



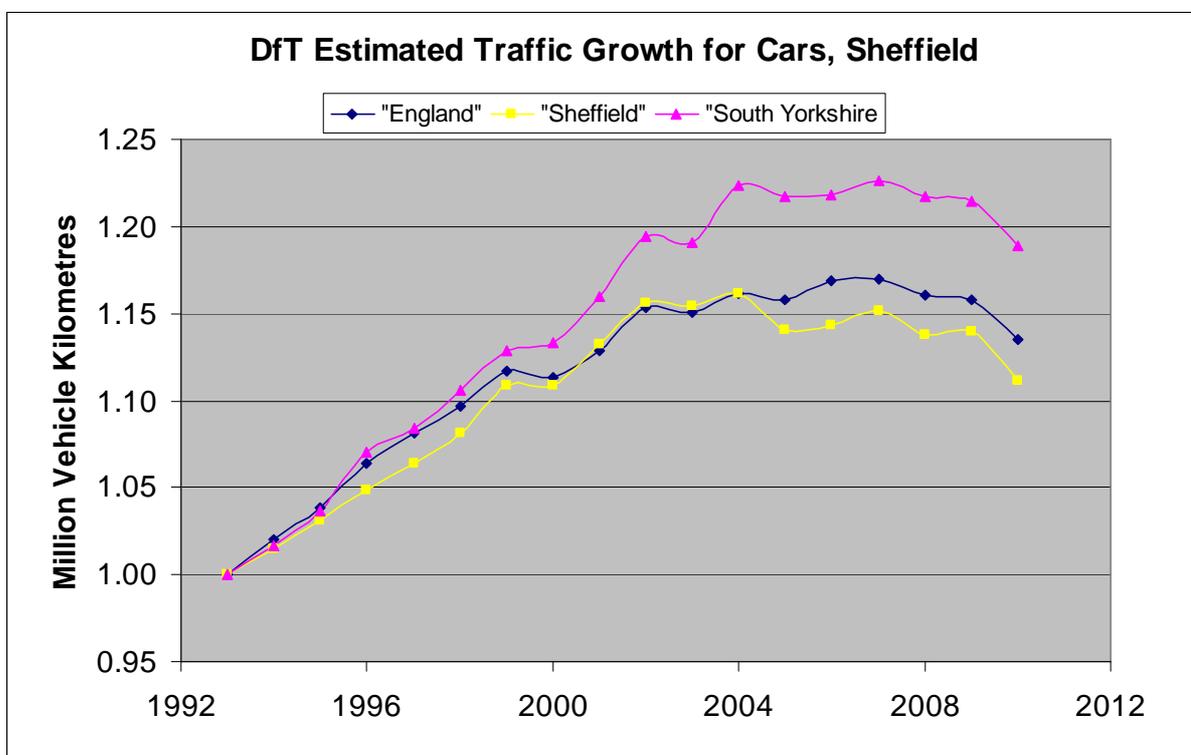
Source: Department for Transport's National Road Traffic Survey (outside the scope of National Statistics)

Figure 11 DfT Estimated Traffic Growth (in Vehicle Kilometres) for All Motor Vehicles, Sheffield District 1993 - 2010



Source: Department for Transport's National Road Traffic Survey (outside the scope of National Statistics)

Figure 12 DfT Estimated Traffic Growth (in Vehicle Kilometres) for Cars, Sheffield District 1993 - 2010



Source: Department for Transport's National Road Traffic Survey (outside the scope of National Statistics)

15.2 It can be seen from the Council's monitoring data below that in 2011 overall traffic levels in the City Centre were very similar to those recorded in 1993.

15.3 There are now fewer heavy diesel vehicles, such as lorries (Medium Goods Vehicles / Heavy Goods Vehicles) and buses, but more Cars / Taxis and light vans (Light Goods Vehicles) entering and leaving the City Centre.

Sheffield City Centre Annual Cordon (Vehicle Occupancy) Surveys
Total 2 Way Weekday Flow (7am - 7pm)

Table 12 Vehicle Trips by Mode of Travel 1993 - 2011

Number of Vehicle Trips by Mode	Motor Cycle	Car / Taxi	Light Goods Vehicle	Medium Goods Vehicle	Heavy Goods Vehicle	Bus / Coach	Tram	Total
1993 Urban Centre	2,245	220,571	31,133	7,533	8,816	14,223	N/A	284,521
1994 Urban Centre	2,212	232,827	33,332	8,135	8,374	13,926	N/A	298,806
1995 Urban Centre	2,250	241,753	33,368	7,828	8,614	13,634	615	308,062
1996 Urban Centre	2,113	245,473	34,370	8,177	8,365	12,705	627	311,830
1997 Urban Centre	2,060	238,726	33,639	7,352	7,663	12,403	676	302,519
1998 Urban Centre	1,824	238,983	33,025	7,290	7,980	11,916	691	301,709
1999 Urban Centre	2,092	237,576	31,855	7,204	7,332	11,409	664	298,132
2000 Urban Centre	2,016	239,302	32,948	7,067	7,300	11,057	676	300,366
2001 Urban Centre	2,400	242,541	32,785	7,084	7,432	11,058	674	303,974
2002 Urban Centre	2,578	240,522	32,632	6,727	7,773	11,001	688	301,921
2003 Urban Centre	2,480	244,302	33,142	6,692	7,251	10,350	668	304,885
2004 Urban Centre	2,200	245,202	33,864	6,204	7,299	9,725	661	305,155
2005 Urban Centre	2,268	232,465	32,399	5,768	6,379	9,437	667	289,383
2006 Urban Centre	2,236	227,433	33,415	5,480	6,951	9,755	673	285,943
2007 Urban Centre	2,310	211,535	31,575	5,615	6,611	9,616	667	267,929
2008 Urban Centre	2,255	220,899	34,632	5,905	6,319	9,792	665	280,467
2009 Urban Centre	2,254	226,866	32,138	5,648	5,450	9,840	667	282,863
2010 Urban Centre	2,257	229,740	33,163	5,400	5,369	9,560	669	286,158
2011 Urban Centre	2,163	224,093	33,266	5,326	4,524	9,469	663	279,504

Source: Sheffield City Council Monitoring Data

Note: 2005 / 2006 / 2007 affected by Northern Inner Relief Road / Sheaf Square Construction

Table 13 Proportion of Vehicle Trips by Mode

Proportion of Vehicle Trips by Mode	Motor Cycle	Car / Taxi	Light Goods Vehicle	Medium Goods Vehicle	Heavy Goods Vehicle	Bus / Coach	Tram	Total
1993 Urban Centre	0.8%	77.5%	10.9%	2.6%	3.1%	5.0%	N/A	100.0%
1994 Urban Centre	0.7%	77.9%	11.2%	2.7%	2.8%	4.7%	N/A	100.0%
1995 Urban Centre	0.7%	78.5%	10.8%	2.5%	2.8%	4.4%	0.2%	100.0%
1996 Urban Centre	0.7%	78.7%	11.0%	2.6%	2.7%	4.1%	0.2%	100.0%
1997 Urban Centre	0.7%	78.9%	11.1%	2.4%	2.5%	4.1%	0.2%	100.0%
1998 Urban Centre	0.6%	79.2%	10.9%	2.4%	2.6%	3.9%	0.2%	100.0%
1999 Urban Centre	0.7%	79.7%	10.7%	2.4%	2.5%	3.8%	0.2%	100.0%
2000 Urban Centre	0.7%	79.7%	11.0%	2.4%	2.4%	3.7%	0.2%	100.0%
2001 Urban Centre	0.8%	79.8%	10.8%	2.3%	2.4%	3.6%	0.2%	100.0%
2002 Urban Centre	0.9%	79.7%	10.8%	2.2%	2.6%	3.6%	0.2%	100.0%
2003 Urban Centre	0.8%	80.1%	10.9%	2.2%	2.4%	3.4%	0.2%	100.0%
2004 Urban Centre	0.7%	80.4%	11.1%	2.0%	2.4%	3.2%	0.2%	100.0%
2005 Urban Centre	0.8%	80.3%	11.2%	2.0%	2.2%	3.3%	0.2%	100.0%
2006 Urban Centre	0.8%	79.5%	11.7%	1.9%	2.4%	3.4%	0.2%	100.0%
2007 Urban Centre	0.9%	79.0%	11.8%	2.1%	2.5%	3.6%	0.2%	100.0%
2008 Urban Centre	0.8%	78.8%	12.3%	2.1%	2.3%	3.5%	0.2%	100.0%
2009 Urban Centre	0.8%	80.2%	11.4%	2.0%	1.9%	3.5%	0.2%	100.0%
2010 Urban Centre	0.8%	80.3%	11.6%	1.9%	1.9%	3.3%	0.2%	100.0%
2011 Urban Centre	0.8%	80.2%	11.9%	1.9%	1.6%	3.4%	0.2%	100.0%

Note: 2005 / 2006 / 2007 affected by Northern Inner Relief Road / Sheaf Square Construction