

GREATER MANCHESTER LOW-EMISSION STRATEGY



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FOREWORD



Air quality and carbon emissions are two of the key challenges facing Greater Manchester. There is strong evidence that air pollution and greenhouses gases cause significant harm to the environment and to the health of our communities, and can damage our economy.

Both short- and long-term exposure to air pollutants can affect people's health, with poor air quality a contributory factor in respiratory illness, cardiovascular disease and some cancers. It is estimated that air pollution contributes to the premature deaths of thousands of people in the city region each year. Nitrogen oxides, specifically nitrogen dioxide, and particulates are the air pollutants causing most concern.

Climate change is one of the most important issues on the world agenda; while national governments reached an agreement in Paris in December 2015 on limiting climate change, regional and local government – along with a wide range of public and private sector organisations – have a responsibility to tackle carbon emissions.

Greater Manchester's previous Air Quality Strategy and Action Plan and Climate Change Strategy have made progress in reducing emissions and improving air quality. Nitrogen dioxide levels and carbon emissions in Greater Manchester are falling but, without additional action, they will not meet the necessary limits and targets in the near future and will continue to pose serious health, environmental and economic challenges for the city region.

Doing nothing is not an option.

Greater Manchester road transport accounts for 65% of nitrogen oxide and 79% of particulate emissions, along with 31% of carbon dioxide emissions. In this context, this Greater Manchester Low-Emission Strategy, and the complementary new Greater Manchester Air Quality Action Plan, concentrate on programmes and initiatives to address emissions from road transport – and encourage sustainable travel including public transport, cycling and walking – in order to improve air quality and to contribute to a reduction in carbon dioxide emissions in line with the Greater Manchester Climate Change Strategy and Implementation Plan.

The Low-Emission Strategy sets out a framework for policies and measures to:

- reduce air pollution as a contributor to ill-health in Greater Manchester;
- support the UK Government in meeting EU air quality thresholds;
- contribute to a reduction in Greater Manchester's carbon footprint; and
- encourage low-emission behaviours in the culture and lifestyles of the city region.

Acting on behalf of the Greater Manchester Combined Authority (GMCA), Transport for Greater Manchester (TfGM) oversaw public consultation on the Low-Emission Strategy and Air Quality Action Plan in spring 2016 and will lead with Greater Manchester's ten councils on their implementation over the coming years.

However, the need to achieve tough targets for air quality improvement and carbon reduction in these circumstances will require the collective commitment from a wide range of organisations across the public and private sectors.

The Greater Manchester Low-Emission Strategy offers a sustainable, long-term approach to support our wider economic, social and environmental ambitions, and ensure its continued development as one of the UK's foremost city regions.

A handwritten signature in black ink that reads "Tony Lloyd". The signature is written in a cursive, flowing style.

Tony Lloyd

Interim Mayor of Greater Manchester

1 CONTEXT

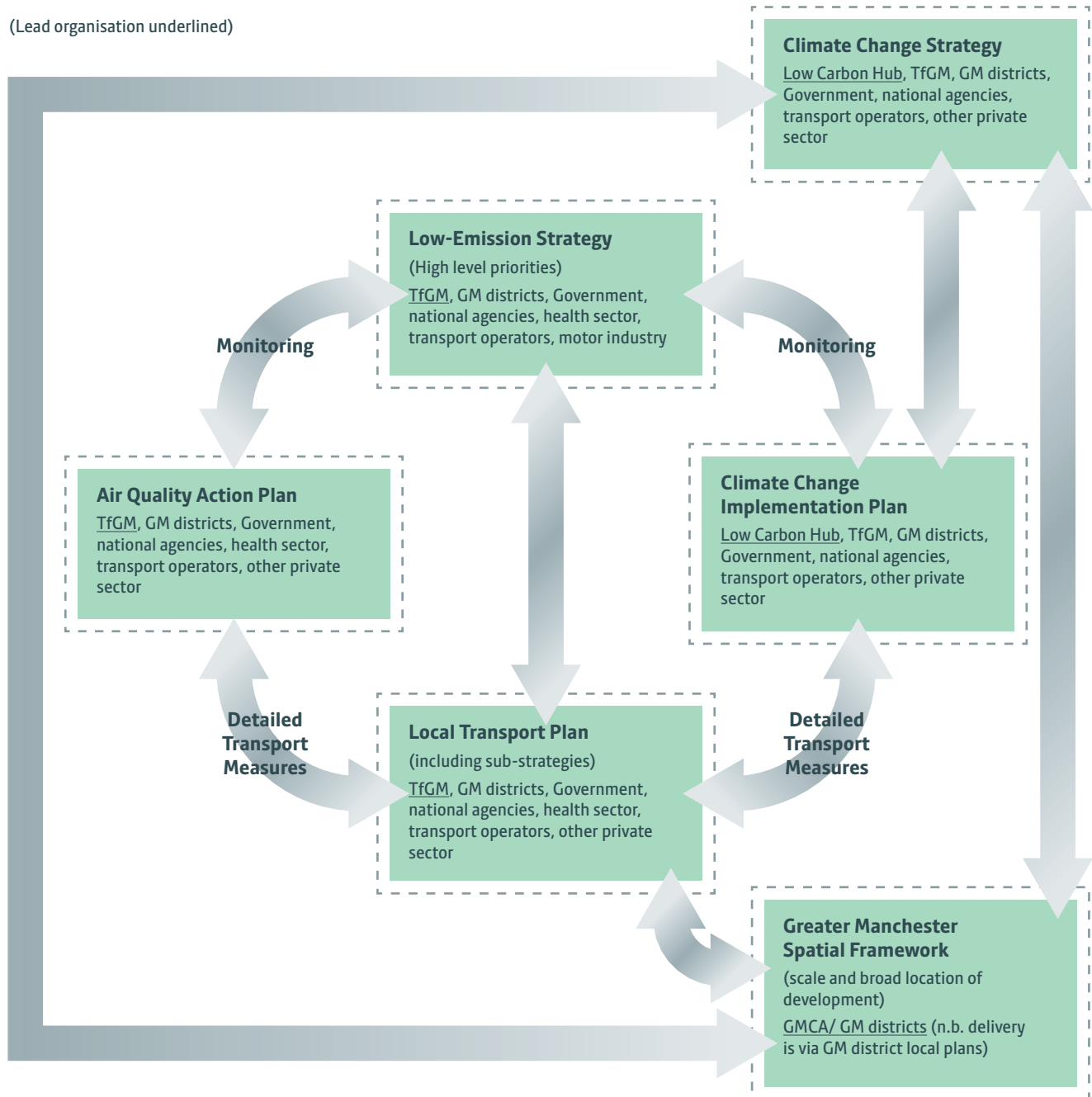
- 1.1 Greater Manchester already has both a Climate Change Strategy, aimed at tackling carbon emissions, and an Air Quality Strategy and Action Plan aimed at reducing major pollutants. Since both problems relate largely to the burning of fossil fuels, solutions to both are interlinked, particularly as transport is the major source of air pollution and a major contributor to carbon emissions.
- 1.2 While both strategies have made progress in reducing emissions, much more needs to be done. To meet our stringent targets we need to prioritise investment in the policies and actions that will have the greatest impact, both in the long and short term. We also need to avoid actions which improve one type of emission at the expense of others. For example, diesel cars, with their lower fuel consumption, were promoted as beneficial for carbon but have proved detrimental to air quality. Conversely, some types of particulate filters are effective in improving air quality but increase fuel consumption and therefore carbon emissions.
- 1.3 This 'Low-Emission Strategy' takes a long-term, integrated approach to carbon emissions and air quality in the period up to 2040, allowing us to focus investment to greatest effect. It establishes a framework within which we will develop detailed action plans to reduce carbon emissions and improve air quality.
- 1.4 **The aims of this strategy are to:**
- Support the UK Government in meeting all EU thresholds for key pollutants at the earliest date;
 - Contribute to reducing Greater Manchester's carbon footprint, in line with the Greater Manchester Climate Change Strategy and Implementation Plan; and
 - Reduce air pollution as a contributor to ill-health in Greater Manchester.

Relationship with Other Strategies

- 1.5 Greater Manchester's well-established Climate Change Strategy focuses on reducing usage, rather than emissions, through improving the energy efficiency of buildings, maximising opportunities for renewable energy, changing lifestyles, patterns of production and consumption and using energy and resources more efficiently in the production of goods and services. These measures are not repeated here. **This Low-Emission Strategy aims to focus on those aspects of carbon reduction which have the greatest synergy with improving air quality, namely emissions from transport.**
- 1.6 The Low-Emission Strategy aims to identify key actions which can be developed in more detail and included not only in the Climate Change Implementation Plan and the Air Quality Action Plan, but in the Local Transport Plan (LTP), Freight and Logistics Strategy and any accompanying sub-strategies. Given transport's contribution to emissions, the solutions need to be fully aligned and shape the direction of the Greater Manchester Transport Strategy 2040 while reflecting the city region's climate change targets. The Transport Strategy will itself influence, and be influenced by, the scale and location of new development set out in the Greater Manchester Spatial Framework (GMSF). This is shown diagrammatically in Figure 1, which also shows the range of organisations that will need to be involved in delivery and highlights the lead responsibility.

Figure 1: Relationship with Other Strategies

(Lead organisation underlined)



2 BACKGROUND

- 2.1 Air pollution and carbon emissions cause significant harm to health and the environment and, as a result, have an adverse impact on the economy. Climate change is one of the greatest challenges facing the world today and there is strong evidence that man-made emissions of greenhouse gases, particularly CO₂, are the main cause. The predicted impact of climate change is well understood: North West England can expect to experience warmer, drier summers impacting on water supply and soil shrinkage/subsidence, and warmer, wetter winters with increased flood risk from rivers and surface runoff. More extreme weather patterns are likely, with more intense rainstorms, heatwaves and droughts. In addition, climate change will impact on the behaviour and distribution of species and may encourage the spread of invasive species. It is also expected to change patterns of human settlement and travels.

Health Impacts

- 2.2 Poor air quality has a real and significant effect on people's lives, contributing to cancer, asthma, stroke and heart disease, diabetes, obesity, and changes linked to dementia. Long-term exposure to out-door air pollution is understood to be a contributory factor in deaths from respiratory and cardiovascular disease. It is likely that air pollution contributes a small amount to the deaths of a large number of people, rather than being the sole cause of the death of individuals. This health burden is estimated as an effect on annual mortality in the UK equivalent to around 40,000 deaths (2016 figures)¹. This mortality effect of air pollution is now included as an indicator in the national Public Health Outcomes Framework².
- 2.3 Short-term exposure to poor air quality can also have health effects. Some groups are at greater risk of symptoms, particularly adults and children with heart or lung problems, and public health advice is now included with the national Daily Air Quality Index³.
- 2.4 As a result of climate change, heat-related deaths are forecast to increase steeply in the UK, with the elderly population particularly vulnerable⁴. The impact of climate change will therefore be amplified by the ageing population. Levels of ozone, which is a respiratory irritant, will also increase, while changes in the seasons, temperature and weather patterns may also have an impact on exposure to pollen, therefore increasing allergies.

Economic Impacts

- 2.5 As well as the human cost of emissions, there is an indirect impact on the economy as a whole: health problems affect the ability to work and contribute to low productivity. The National Air Quality Strategy (DEFRA 2007) stated that poor air quality costs society between £8.5 billion and £20.2 billion a year. This impact is seen as comparable to those relating to physical inactivity at £10.7 billion and alcohol misuse at £12-£18 billion (Commons Select Committee 2010). Air pollution also has wide-ranging environmental impacts, including loss of biodiversity and reduced crop yields.

1 <https://www.rcplondon.ac.uk/file/2912/download?token=5pFurNnk>

2 PHOF indicator 3.1: Fraction of all-cause adult mortality attributable to long-term exposure to current levels of anthropogenic particulate air pollution'. <https://www.gov.uk/government/collections/public-health-outcomes-framework>

3 <http://uk-air.defra.gov.uk/>

4 Health impacts of Climate Change in the UK, Health Protection Agency, 2012

- 2.6 The 'Mini-Stern' review for Manchester⁵ concluded that, by not exploiting opportunities and mitigating effectively against climate change, the Greater Manchester economy could lose £20 billion by 2020. This would mean Greater Manchester falling short of its economic and regeneration goals.

National Policy

- 2.7 The European Ambient Air Quality Directive 2008 (2008/50/EC) sets legally binding limits for key pollutants in the air we breathe outdoors, based on World Health Organisation recommendations. Countries that are part of the EU must meet these limit values by a given date and the UK Government has therefore set national standards which local authorities must work to achieve. Local Authorities therefore have a statutory duty, under the provisions of the Environment Act 1995, the National Air Quality Strategy 2000 and Air Quality Regulations, to review and assess air quality against these standards.
- 2.8 The main pollutants of concern in the UK are oxides of nitrogen (NO_x), principally nitrogen dioxide (NO₂), and particulates (PM). The UK accepts that, under its current air quality plans, most major urban areas, including Greater Manchester, will not meet legal limits for NO₂ pollution until 2020. As a result, the EC has formally launched legal proceedings against the UK, which could result in fines, potentially costing millions of pounds. This process may take several years to complete and all parties are working together to try to ensure compliance as soon as possible. To this end the Commission has stated that it would like "...to achieve full compliance with existing air quality standards by 2020 at the latest".
- 2.9 There is a similar policy commitment to reduce carbon emissions in response to concerns about climate change. In line with international frameworks and targets, including the UNFCC Kyoto Protocol, the EU has committed to reduce carbon emissions by 20% (relative to 1990) by 2020. At the national level, the UK's Climate Change Act 2008 included the obligation to reduce national greenhouse gas emissions by 80%, relative to 1990, by 2050. It also sets legally binding carbon budgets between now and 2020.

Greater Manchester Policy

- 2.10 The Greater Manchester Strategy sets out a vision for achieving the considerable growth potential of the conurbation and enabling its residents to access the opportunities that growth presents. This is vital both in terms of increasing our contribution to the UK economic recovery and reducing the inequality which holds back productivity locally through higher than average levels of worklessness and low levels of economic activity.
- 2.11 Greater Manchester's population is growing rapidly and is expected to grow from 2.7 million people to at least 3 million by 2040. The Greater Manchester Spatial Framework (GMSF) is currently in development, and will set the scale and distribution of housing and employment growth across Greater Manchester to support delivery of significant levels of growth over the next 20 years. GMSF is currently considering a range of growth options. However, it is expected that in the period to 2035, Greater Manchester will need at least 227,200 new homes, at least 2,450,000m² of additional office space and at least 4,000,000m² of additional industrial and warehousing space.
- 2.12 This increased activity will inevitably increase the demand for travel, particularly with better transport links proposed across the north of England, to support the 'Northern Powerhouse'.
- 2.13 Greater Manchester aspires to lead the way in developing a low-carbon economy, and has therefore set an ambitious carbon reduction target in the Greater Manchester Strategy of a 48% reduction of 1990 levels by 2020 (this requires a 41% reduction from 2005 levels). There is also a commitment to improving air quality, with the declaration of an Air Quality Management Area in 2006. Both NO₂ and CO₂ levels are key performance indicators in the Local Transport Plan.

5 Assessing the economic impact of EU and UK climate change legislation on Manchester City region and the North West, Deloitte, 2008

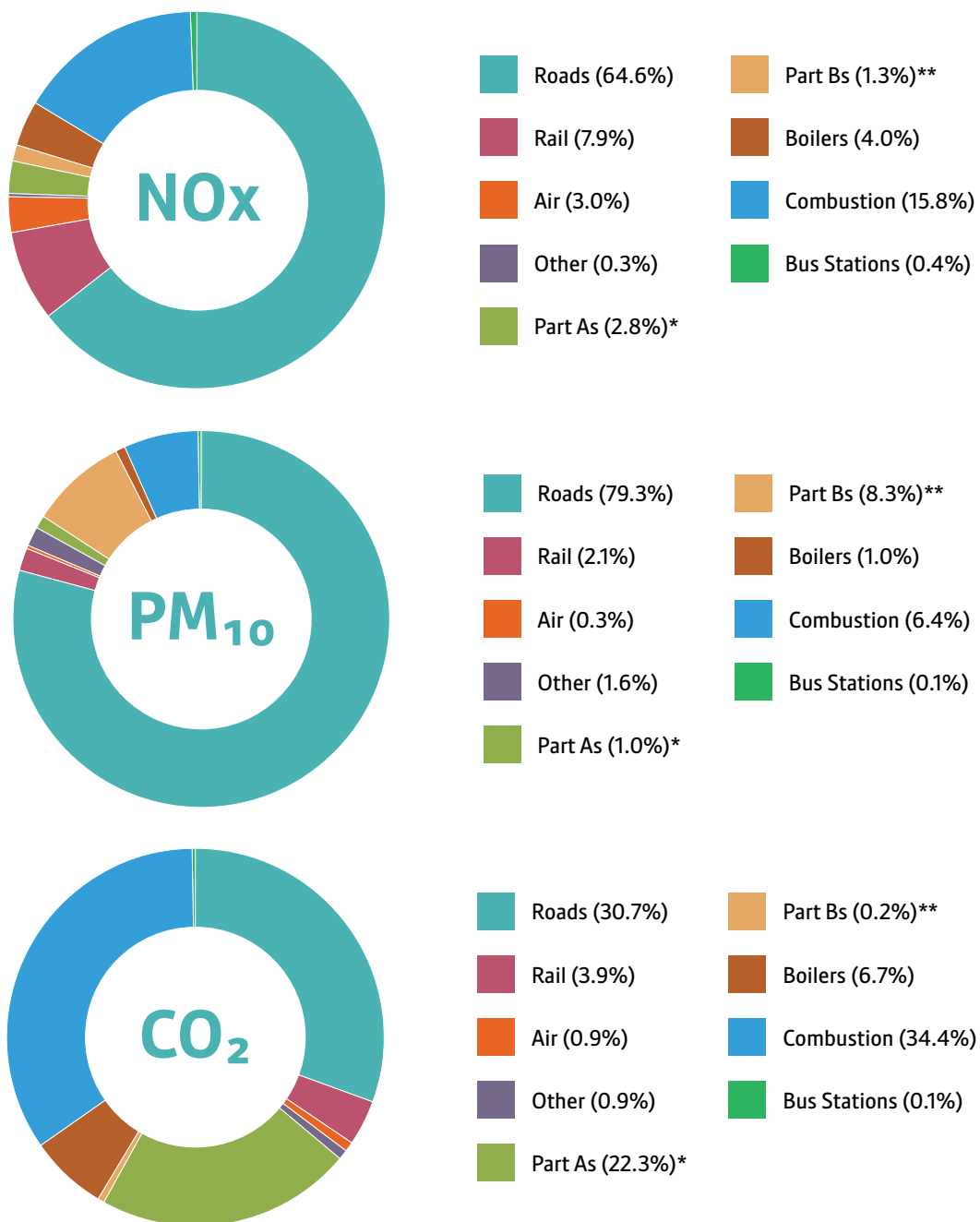
- 2.14 There is a particular need to improve health in the conurbation, which has some of the lowest life expectancy at birth in England for both men and women. In 2012, 150,000 people in Greater Manchester were claiming either Incapacity Benefit or its successor, Employment and Support Allowance. The inability to work not only impacts on those individuals' life chances, but also reduces Greater Manchester's productivity and increases the public cost of benefits.
- 2.15 Concentration of growth in urban areas like Greater Manchester is likely to be the most sustainable option, because they can support extensive public transport networks and, with facilities located relatively close to home, they offer the potential to make many essential trips by bike or on foot. However, this concentration of activity can also expose more people to poor air quality.
- 2.16 **The need to achieve very challenging targets for both carbon and NO₂ in the context of a growing economy means that a concerted effort, potentially requiring radical actions, is needed by all parties to reduce emissions and influence behaviour.**
- 2.17 **Improving air quality can improve health in the short and in the long-term. Better air quality will have particular benefits for people with heart or lung conditions or breathing problems. Reducing emissions will have a positive impact on active travel and improve public spaces, and thus improve quality of life. Reducing emissions will also provide additional benefits by reducing damage to the natural environment.**

3 EMISSIONS IN GREATER MANCHESTER

Source of the Problem

3.1 In Greater Manchester road transport contributes 65% of emissions of nitrogen oxides and 79% of particulates. It also accounts for 31% of carbon dioxide emissions. The proportions of emissions from all sources are shown in Figure 2.

Figure 2: Emissions in Greater Manchester, 2014. Source: Emissions Inventory for Greater Manchester (EMIGMA)



*Part As - Installations regulated by Environment Agency

**Part Bs - Installations regulated by local authorities

- 3.2 As might be expected from the volumes of traffic carried, Table 1 below shows that major roads are the largest source of transport emissions in Greater Manchester, although motorways are also very significant, particularly for NO_x. The Emissions Inventory from which the figures are taken is based on national fleet composition, so there may be local differences, for example, particulate emissions in Greater Manchester are higher than national data.

Table 1: Road Transport Sources (Tonnes/Year), 2014 (Emissions Inventory for Greater Manchester - EMIGMA)

Pollutant	Motorways	Other Major Roads	Minor Roads	Other*	Total
Carbon	359,044	519,276	33,325	12,503	924,148
NO _x	3,162	5,155	289	393	9,000
PM ₁₀	490	689	51	52	1,282

* includes extra emissions from starting up/cooling down engines and combustion of waste lubricants

- 3.3 Tables 2 and 3 below show how different road vehicles contribute to each type of emission. On both motorways and major roads, OGVs (all large goods vehicles) contribute the greatest proportion of the NO_x emissions, followed by cars. However, OGVs represent only about 10% of the vehicle kilometres travelled on motorways and 3% on other major roads, which means that their contribution to NO_x emissions is disproportionately large. This is also true of buses on major roads.

Table 2: Motorway Emissions by Vehicle Type 2014 (EMIGMA)

Emission Type	Cars		LGVs		OGVs		Buses	
	% of total emissions	% of total traffic	% of total emissions	% of total traffic	% of total emissions	% of total traffic	% of total emissions	% of total traffic
NO _x	42.2	74	19.7	16	36.6	10	1	<1
PM ₁₀	63.1		16.9		19.4		<1	
Carbon	46.1		16.9		36.2		<1	

Table 3: Major Road Emissions by Vehicle Type 2014 (EMIGMA)

Emission Type	Cars		LGVs		OGVs		Buses	
	% of total emissions	% of total traffic	% of total emissions	% of total traffic	% of total emissions	% of total traffic	% of total emissions	% of total traffic
NO _x	42.5	82	17.2	13	28.8	3	11.4	1
PM ₁₀	69.1		15.4		12.6		2.6	
Carbon	57.9		14.9		22.7		4.3	

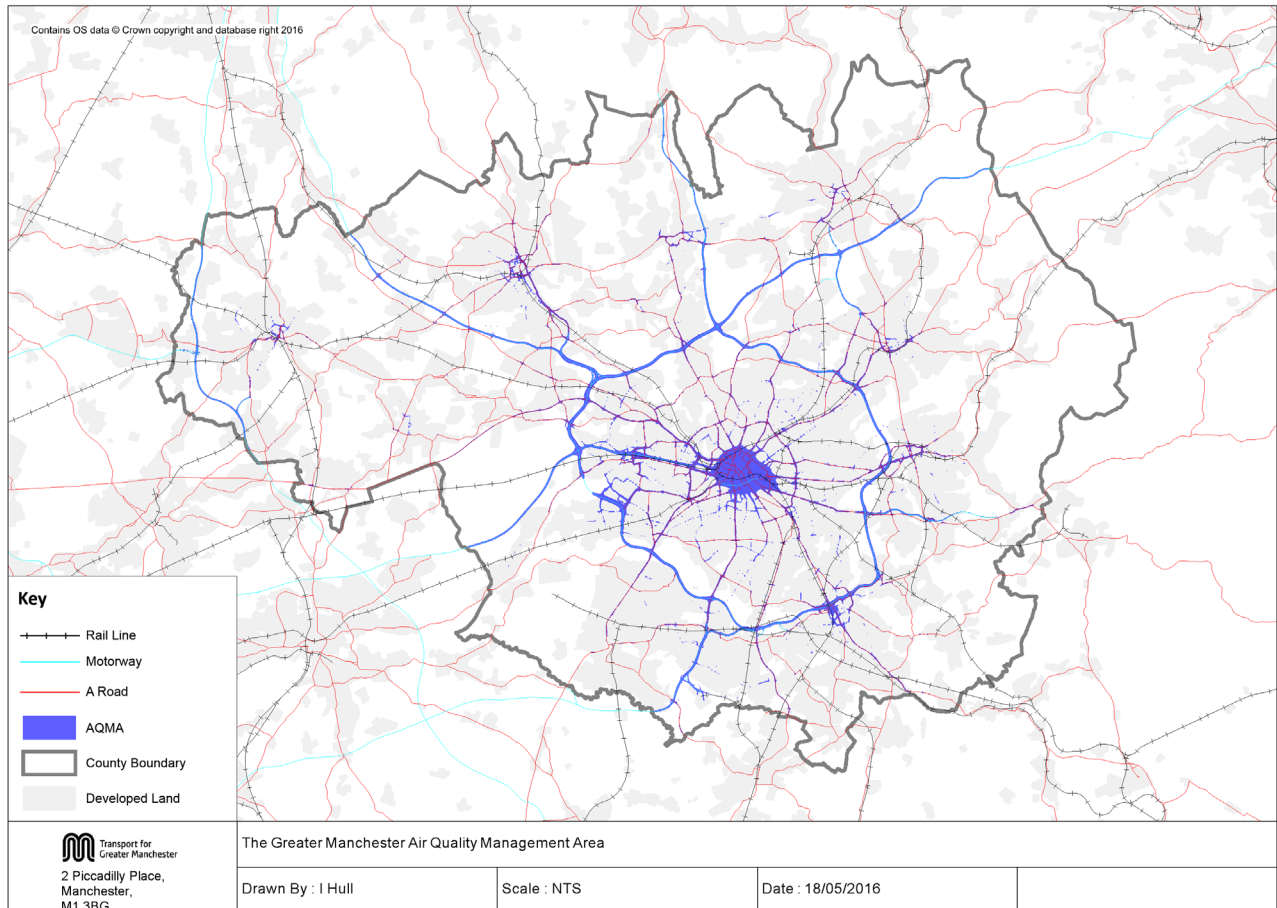
- 3.4 For carbon and particulates, cars are the main source of emissions. Goods vehicles are also significant, but buses make a relatively small contribution overall.

- 3.5 **Transport is by far the biggest source of NO₂ and PM₁₀ emissions and is a major contributor to carbon emissions. Goods vehicles and buses make a disproportionate contribution to NO₂ emissions.**

Scale of the Problem

- 3.6 Greater Manchester is one of a number of major UK conurbations where NO₂ limits are exceeded. The current Air Quality Management Area (AQMA), for areas where NO₂ limits are exceeded, is shown below in Figure 3.

Figure 3: Greater Manchester Air Quality Management Area



- 3.7 Given the contribution of transport to emissions, it is not surprising that the AQMA reflects the location of the motorways, major roads and urban areas. In terms of the effect on people, this is greatest where high-density residential areas coincide with major highways.
- 3.8 Recent modelling⁶ showed that the AQMA is reduced in size due to falling NO_x emissions, but measurements in some areas, particularly those close to the M60, show that concentrations of NO₂ experienced at the roadside have not gone down as expected. This is thought to be largely due to diesel cars having higher emissions 'in the real world' than was anticipated and the fact that there are now more of them on the road.
- 3.9 NO_x emissions are expected to decline sharply in the UK in the period up to 2020, as more Euro VI engines enter fleets. Table 4 below shows that:
- Petrol engines will contribute very little to NO_x emissions after 2015
 - The performance of diesel cars will only improve slightly over the period
 - Emissions from HGVs will fall dramatically by 2020, as haulage and logistics companies replace their vehicles every 5–7 years.
- 3.10 However, this will not be sufficient to meet EU limits. As with other major urban areas in the UK, Greater Manchester is not forecast to comply until 2020 unless additional action is taken.

3.11 Table 4: Fleet-weighted emission factors* on all UK roads for NO_x, (2005-2030)g km⁻¹
 (Source: derived from Defra emission factors by Clean Air Thinking, 2014)

Vehicle class	2005	2010	2015	2020	2025	2030
Artic HGVs	7.10	4.50	1.51	0.35	0.24	0.23
Rigid HGVs	5.08	3.88	2.07	0.63	0.27	0.23
Diesel LGVs	1.14	0.94	0.96	0.57	0.43	0.38
Diesel cars	0.77	0.68	0.67	0.63	0.45	0.42
Petrol cars	0.66	0.25	0.10	0.06	0.06	0.06

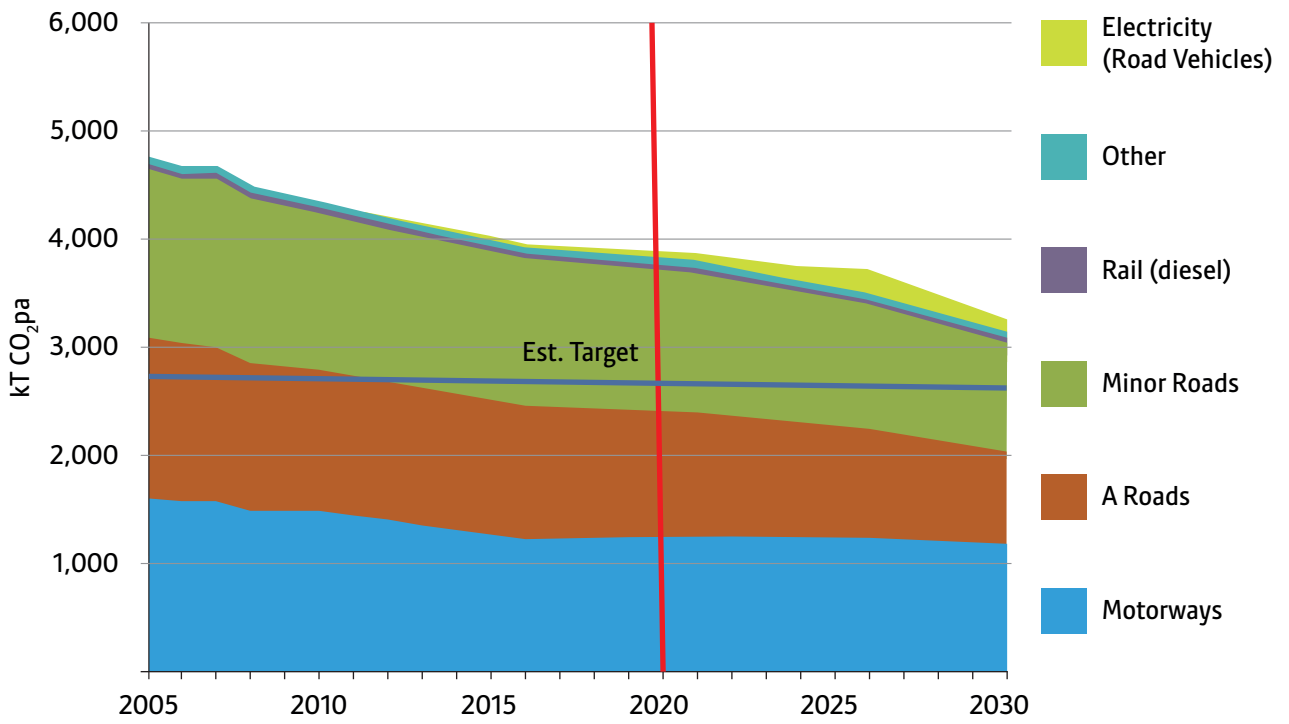
*Fleet-weighted emission factors accounts for the composition of a given vehicle class according to the assumed proportions of the various Euro standard-compliant vehicles across the national fleet.

3.12 Levels of particulates have fallen but have been stable over recent years. Although EU limits for particulates are currently being met, there is an ongoing significant health impact even at lower levels. To improve the health of the population, the EU has also set a target of a 20% reduction in urban background concentrations of PM_{2.5} between 2010 and 2020. It should be noted that the direct emission of particulates from vehicle exhausts is not the only source. Significant contributions are also made by tyre and brake wear, road surface wear and the re-suspension of particles. These sources will not be improved by Euro engine standards.

3.13 Carbon emissions have fallen and this is forecast to continue due to Euro engine standards and the use of biofuels. However, as Figure 4 shows, relying on these national actions alone means we will still fall some way short of our carbon reduction target. Given the level of growth forecast, achieving greater reductions through transport will be challenging and more of the required reduction may need to come from non-transport sectors such as domestic heating and power generation. An integrated approach across transport, domestic and commercial activities will be needed to ensure the target is met.

3.14 **Although progress has been made, further measures will be needed in order to achieve our aims of meeting carbon reduction targets, complying with EU standards and reducing exposure to harmful pollution.**

Figure 4: Forecast 'Business as Usual' emissions (kT CO₂ pa) with national action
 Source: Ticket to Kyoto Final Report 2014, Atkins for TfGM



4 THE WAY FORWARD

4.1 There are a large number of potential measures that will have some impact on both carbon emissions and air quality. These fall into the themes of:

- Changing travel behaviour;
- Managing emissions;
- Greening vehicle fleets; and
- Awareness-raising.

4.2 As Table 5 shows, we have made progress in introducing many of these since 2011. However, these measures have been less effective than hoped in tackling emissions, partly because their impact is dispersed across the conurbation, rather than focused on problem locations, but largely because the Euro IV and V engines have not delivered as big a reduction in emissions ‘on the road’ as was predicted in the laboratory. This is a problem for the whole of the UK. There is much greater confidence that newer Euro VI engines will deliver improvements.

Table 5: Existing Transport Measures

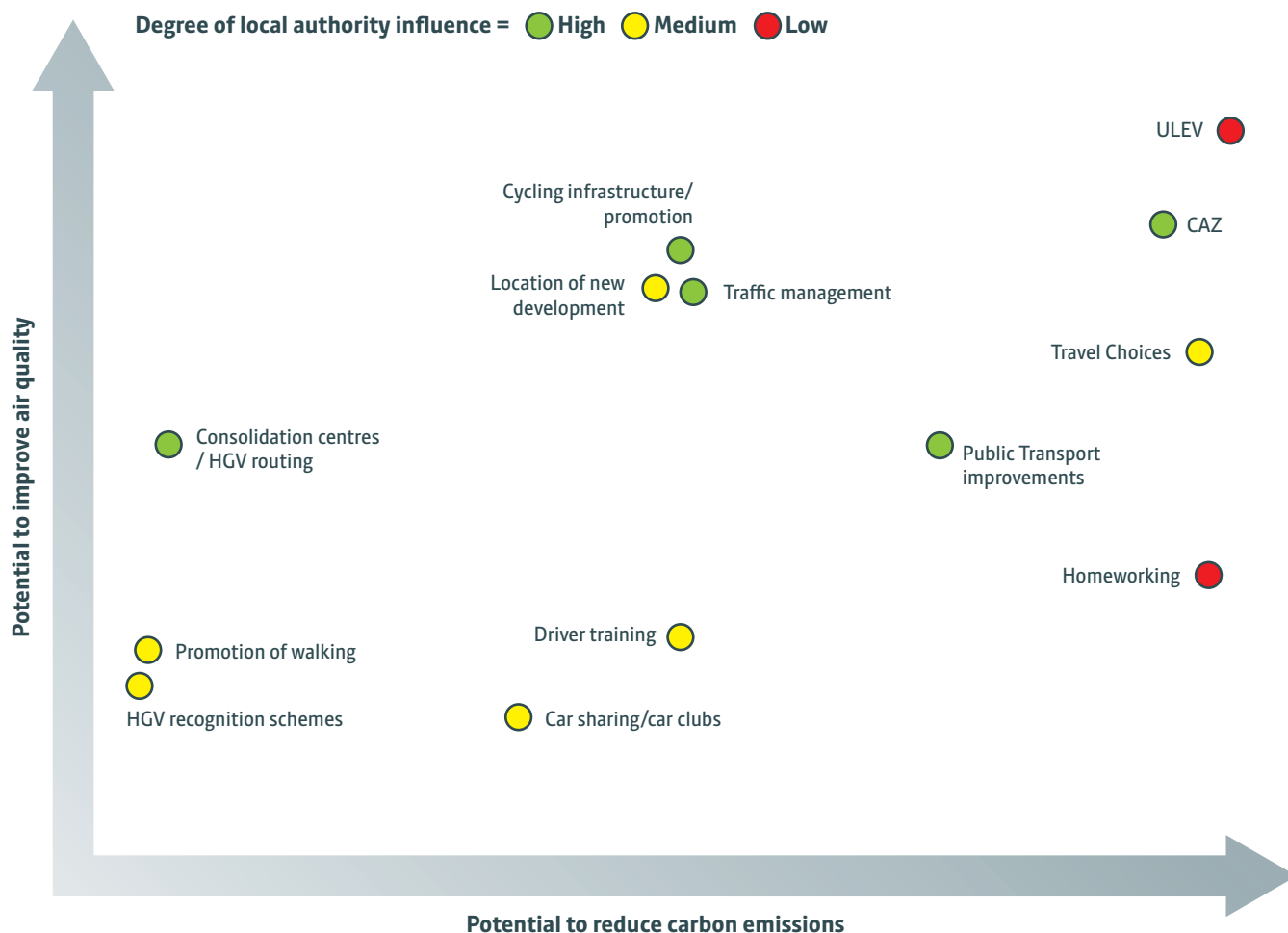
Type of Measure	Progress
Changing travel behaviour	<p>Encouraging sustainable travel through:</p> <ul style="list-style-type: none"> • A major programme to triple the size of the Metrolink network, which is zero-emission at the point of use. Extensions to Oldham/Rochdale, Ashton-under-Lyne, East Didsbury and Manchester Airport are now complete, and a second line across the city centre is nearly complete. The Government has granted TfGM legal powers for an extension of the network to Trafford Park and the intu Trafford Centre. • A very significant bus priority programme, with Cross-city Bus and the Leigh-Salford-Manchester Busway completed (building on an earlier network of Quality Bus Corridors) and future plans for the Bolton-Manchester corridor • New interchanges, with better passenger facilities, in a number of town centres • Investment by Network Rail in electrification and the Northern Hub (increase in capacity) • An extensive cycling programme (through the Local Sustainable Transport Fund and Cycle City Ambition Grant) • Extensive investment in cycling infrastructure and promotion • Travel Choices interventions, focused on the journey to work and school • Promotion of the health benefits of walking
Managing emissions	<p>Improving network efficiency through:</p> <ul style="list-style-type: none"> • Installing Bluetooth sensors to monitor flows on key traffic routes and enable proactive management of traffic lights to smooth flows and give priority to buses • Introducing a roadworks permit system (GMRAPS) to reduce congestion • Air quality assessment of planning applications and highway schemes • Promotion of good practice in relation to highways, procurement, vehicle fleet operations, taxi licensing etc. • Bus idling enforcement in Manchester city centre

Type of Measure	Progress
Greening vehicle fleets	<p>Reducing pollution from vehicles through:</p> <ul style="list-style-type: none"> • Purchase of new low-emission vehicles through bids to Green Bus Fund/Clean Bus Technology Fund • Introduction of 200 electric vehicle charging points through 'Plugged in Places' • Specifying emission standards in bus contracts and partnership agreements
Awareness-raising	<ul style="list-style-type: none"> • Cleaner vehicles campaigns • 'GreatAir Manchester' website

High Impact Measures

- 4.3 Many of the existing measures were originally developed for other reasons, e.g. reducing congestion, and will continue to be priorities within the Local Transport Plan. However, a Low-Emission Strategy needs to identify those measures which will have maximum impact on both carbon and air quality, bearing in mind the specific nature of the problem in Greater Manchester (i.e. where the problems are, which vehicles are contributing to them and how many people are affected).
- 4.4 Two sources have been used to gauge the likely impact of various measures:
- The recent Urban Transport Group publication 'Air Quality in the City Regions: A Transport Toolkit', which assesses various transport measures in term of their cost, effectiveness and timescales for implementation.
 - The GM Low Carbon Metrics Study, 2014, which highlights the 11 priority projects to best reduce carbon emissions, and their public sector cost.
- 4.5 Of the measures which benefit both types of emission, we can identify a subset which is likely to have the greatest impact on both carbon and air quality. Some of these will be measures that can be taken by TfGM and the local authorities, but others will require action from a range of partners. Figure 5 gives a high-level indication of the relative impact of different types of measure. The impact of measures will, of course, depend on their geographical distribution and on the level of investment made. This is particularly true of behaviour change measures, which only become very effective when a significant number of people adopt them.
- 4.6 Figure 5 suggests that the most effective measures to tackle both carbon and air pollution could be Ultra-Low-Emission Vehicles, Clean Air Zones and intensive travel choices interventions to persuade people to travel more sustainably. However, improved public transport and facilities for walking and cycling will be essential if people are to be persuaded to use these modes.
- 4.7 Planned changes to public transport, incentives to change behaviour and action to encourage cycling and walking will, in isolation, not decrease private car usage at the rate needed to meet carbon reduction targets. A recent analysis indicates that even if all currently proposed measures are delivered, there is still a shortfall of over 1.68 million tonnes in achieving the 2020 target. Therefore, Greater Manchester needs to rapidly deploy additional measures to decarbonise private cars to meet the shortfall.

Figure 5: Relative Impact of Measures



4.8 Public transport is a relatively efficient means of transport. Analysis by TfGM suggests that emissions per passenger kilometre in the Greater Manchester area are less than 60g CO₂ per person per kilometre travelled for Metrolink, rail and buses in quality corridors (which benefit from improved flow, newer vehicles and more patronage relative to less efficient standard buses). This emission rate equates to less than half the emissions per kilometre for car travel on average.

4.9 However, the volumes of public transport passenger trips are relatively low, in line with national trends, and public transport journeys (particularly bus and Metrolink) are often relatively short. This means that the proportion of total travel accounted for by public transport is limited. This implies a limit to the scope for public transport to reduce overall transport emissions through mode switch. Even if public transport patronage doubled, abstracting all new patronage from car travel (driver and passenger), it would achieve approximately a 10% reduction in total car emissions (assuming similar average trip lengths and occupancies to those currently observed), which in turn only accounts for approximately 70% of road transport emissions. Similarly, while walking and cycling are zero-emission modes, they are mainly chosen for short trips, which means that the impact on total emissions will be relatively small.

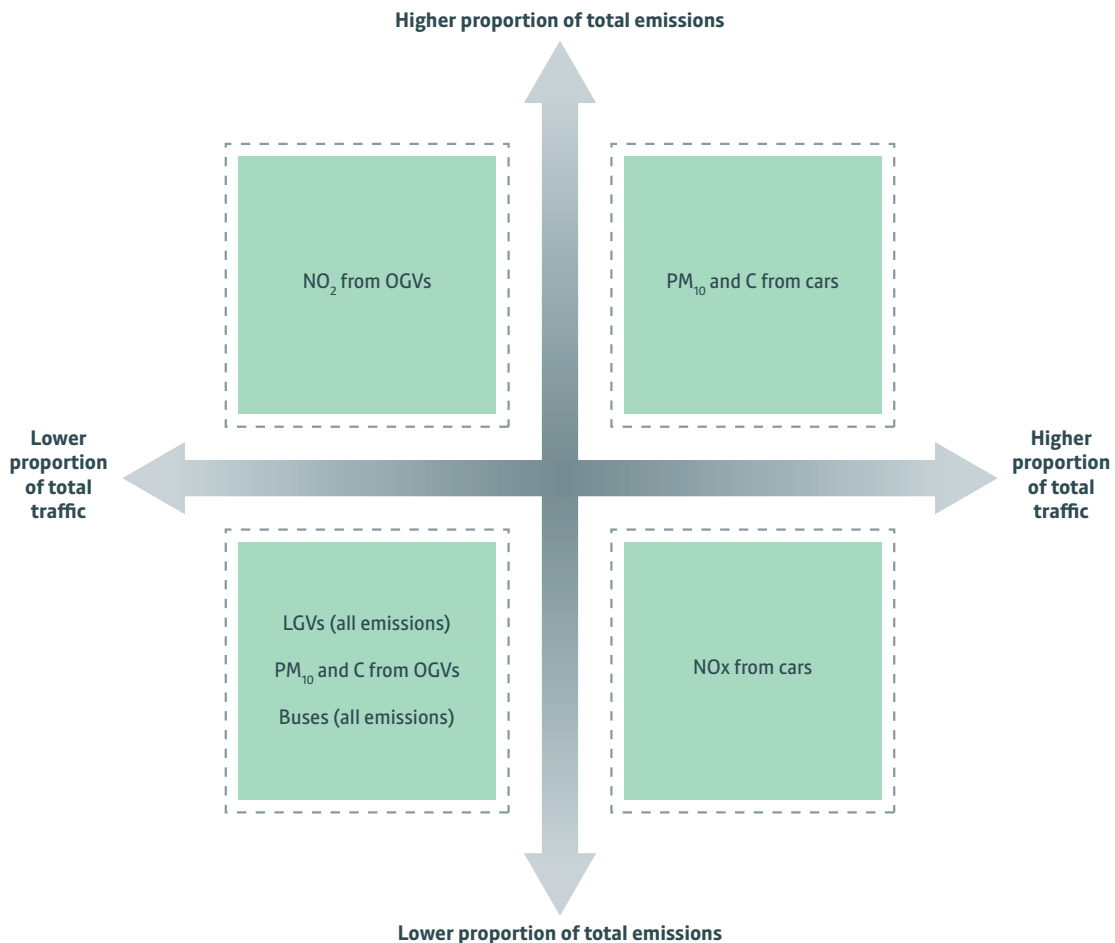
4.10 **While a mode shift to public transport, walking and cycling will reduce emissions, this will not be sufficient to meet targets without radical action to clean up vehicle engines.**

4.11 However, while cleaner vehicles are essential for significantly reduced emissions, this will require working with national bodies, vehicle manufacturers to encourage the development of cleaner engines, alternative fuels and supporting infrastructure. The role of Greater Manchester authorities will be to encourage the uptake of cleaner vehicles as they become available, through planning and traffic management policies (which can be designed to favour these vehicles) and through their own contracts.

Future Focus

- 4.12 **Given the need to meet EU limits for NO₂ as soon as possible, the short-term focus will need to be on NO₂.** Many of the measures that will help achieve this will also be of some benefit in reducing carbon and particulates, which will be the focus over the longer-term.
- 4.13 Section 3 described the contribution that different vehicle types make to each emission on motorways and major roads in Greater Manchester. This can be summarised as in Figure 6 below.
- 4.14 This shows that, while OGVs make up a smaller proportion of total traffic, their contribution to emissions is proportionately higher, i.e. tackling emissions in a relatively small number of vehicles could be highly effective. While buses contribute a lower proportion of emissions and make up a small proportion of total traffic, services are concentrated on congested urban routes, particularly radials into the main centres where there is high population exposure. This means that there could be a significant benefit in tackling bus emissions in these areas.
- 4.15 The conclusion is that, **while the sheer volume of car traffic means that these emissions must be tackled over the long-term, the greatest short-term impact of measures would be felt by focusing on heavy goods vehicles and on buses on key routes into town and city centres.**

Figure 6: Contribution of Vehicle Types to Emissions



5 THE STRATEGY

- 5.1 Based on the analysis in section 4, we have identified the types of measure that we believe will have the biggest impact on emissions. More work will need to be done to assess the likely scale of emissions reduction from individual measures and to develop programmes of investment for inclusion in action plans.
- 5.2 Delivery of the measures will require commitment from a range of organisations: TfGM, the Greater Manchester district councils, the health sector, Highways England, public transport and fleet operators, the Government, motor manufacturers and other private sector organisations. Given the current financial challenges facing public authorities, the level of investment that will be available is uncertain and there will need to be a sound business case for schemes before they can go forward.
- 5.3 Priority areas for future investment are as described below.

Stimulating the uptake of Ultra-Low-Emission Vehicles

- 5.4 The greatest impact on emissions will be from accelerating the replacement of older vehicles, either by offering incentives such as scrappage schemes or restricting access to sensitive areas unless vehicles comply with particular standards (see Clean Air Zones below). However, the scale of funding that would be needed to compensate vehicle owners and operators would require a central government programme. We will need to work with other city regions to make a case to government for action in this area.
- 5.5 One barrier to buying low or ultra-low-emission vehicles is their cost, and this can only be addressed by vehicle manufacturers and the government. However, further barriers are 'range anxiety' for electric vehicles, i.e. concern about the distance that can be covered in between charging, unfamiliarity with a new product and lack of fuelling infrastructure for LPG and hydrogen.
- 5.6 We can help to address this in a number of ways. Firstly, we need a major increase in the number of electric vehicle charging points. There are currently 200 publicly available points in the conurbation but a study of Lyon, which is similar in terms of size and population density, suggests that a network of some 700 publicly available points would be effective. The number of charging points in homes and businesses can also be increased through planning conditions (see below).
- 5.7 Secondly, we can increase the number of ultra-low-emission vehicles (ULEVs) in fleets where the public sector has some control. This means using joint-procurement to reduce the cost of introducing them to public sector fleets and also specifying ULEVs when car clubs are established (or existing contracts are renewed). Setting higher emission standards for hackney carriages would also be beneficial. These measures will increase the number of vehicles seen out on the street and therefore increase familiarity with them. If integrated with public transport and cycle hubs and supported by a single smart payment system, low-emission car clubs could offer an attractive alternative to car use for many people.
- 5.8 Discussions with major developers and planning condition requirements could be used to develop an alternative fuelling infrastructure network. This would be integrated with work with vehicle manufacturers and fuel suppliers to ensure both vehicle supply and fuel are available.

5.9 We will:

- Make the case to central Government for national funding to accelerate the uptake of ULEVs and submit bids where funding is available
- Work with local authorities to set stricter emission standards for taxis

- Specify low-emission vehicles in all future car club contracts
- Investigate the potential to introduce joint procurement for low-emission vehicles in the public sector
- Work with national agencies, vehicle manufacturers, fuel suppliers and developers to promote and facilitate the use of lower-emission and alternatively-fuelled vehicles.

Reducing Emissions from Heavy Goods Vehicles

- 5.10 Shifting freight from road to rail or water will reduce emissions at the national or Greater Manchester-wide level, but the final leg of the journey from the distribution centre is likely to rely heavily on the road network. However, journeys could be by ULEV. Multi-modal distribution centres may therefore increase emissions locally despite their overall benefits.
- 5.11 Fleet recognition schemes can offer an incentive to operators to improve both safety and environmental standards (through vehicle quality or through 'eco driving' training). Operators can benefit both through enhanced reputation and potentially through reduced fuel consumption. There are currently two different schemes in operation in different parts of the UK, and there is a need to evaluate these and agree a common approach with neighbouring areas, given the cross-boundary nature of most fleet movements.
- 5.12 Urban Distribution Centres (UDCs) are large-scale warehouses located at the edge of the urban area. One centre would be used by several suppliers and customers. They are used to intercept HGVs on the edge of an urban area and allow loads to be broken down for final delivery by low-emission vehicles. UDCs will not be suitable for all deliveries, as many large retail businesses, such as supermarkets, use their own lorries to deliver in bulk to stores from their national or regional distribution centres. A smaller-scale alternative is the Urban Consolidation Centre (UCC). Construction or office supplies consolidation models can be more realistic to develop whilst delivering real changes. The Oxford Road corridor in Manchester offers potential for consolidation, as it houses a concentration of higher education and medical facilities in close proximity to one another. This area has one of the highest concentrations of NO₂ and exposure of population, so the potential benefits of reducing emissions here are significant.
- 5.13 Planning conditions can be used to specify minimum standards for freight vehicles serving major new developments (see below). They can also specify the requirement for delivery and servicing plans for any new development as well as construction logistics plans to minimise impact during the construction period.
- 5.14 Given that freight is carried across local authority boundaries, it will be important to agree joint policies with neighbouring areas. For example, the M62 in Greater Manchester carries freight between Liverpool and Hull and many of the vehicles are based outside the area.

5.15 We will:

- Investigate the potential benefits of a fleet recognition scheme
- Support new rail or canal-served distribution centres subject to planning conditions
- Identify and promote the development of consolidation models at various spatial levels
- Seek to develop a common approach to freight emissions with neighbouring authorities
- Work with the industry and customers to raise awareness and actively promote sustainable distribution
- Develop toolkits and guidance to assist businesses in improving the activities of their supply chain with the aim of reducing emissions
- Work closely with other agencies such as the Driver and Vehicle Standards Agency (DVSA), the EU, universities and the Police to develop interventions which encourage safe and sustainable distribution
- Reduce congestion and improve journey-time reliability on the Key Route Network.

Reducing Emissions from Buses on Key Urban Corridors

- 5.16 As with HGVs, the greatest impact will be from replacing older buses (particularly those with Euro III or older engines) with newer vehicles, but since the lowest-emission buses are more expensive, the benefits to operators in terms of fuel savings may not be sufficient to justify the cost. Government funding support (e.g. grants through the Low-Emission Bus Scheme) is therefore required.
- 5.17 Local authorities can only fund socially necessary bus services where these would not be commercially viable. In Greater Manchester, around 19% of bus mileage is wholly or partly subsidised in this way, with services operated under contract. The service specifications include a maximum age for vehicles, which ensures that they are at least Euro III standard.
- 5.18 In addition, TfGM has introduced a voluntary bus operators' code of conduct, which all the major operators have signed and which includes targets for improving engine emission standards. This, in conjunction with previous central Government vehicle funding competitions, has contributed to a significant improvement in the fleet age profile over recent years.
- 5.19 Where bus infrastructure has improved and therefore benefits bus operators, Statutory Quality Partnerships can be agreed whereby they commit to make improvements in return. The Quality Partnership for the bus A6 corridor between Manchester and Hazel Grove set a standard for the 192 service to be Euro V and above by 1 Jan 2014. In 2013-14, 93% of observed vehicles were hybrid electric diesels, with an average age of 1.8 years. Partly as a result of all these measures, 72% of buses observed in Greater Manchester in 2013-14 were Euro IV and above, with the major operators (who run 84% of mileage) having 45% of their fleets Euro VI or hybrid.
- 5.20 However, Statutory Quality Partnerships are limited in their ability to create consistent improvements across the bus network as they are typically dependent upon the provision of new bus infrastructure and in turn a commitment from bus operators to abide by specific requirements relating to frequencies, timings, fares and quality standards which include set emissions criteria. Such improvements are often difficult to agree upon on multiple corridors, which would be required to generate the maximum benefits which can lead to uneven and inconsistent quality standards across the Greater Manchester network. The Government has published the Bus Services Bill 2016 which is currently passing through Parliament. This legislation will increase the options available to Greater Manchester to assist with the integration and harmonisation of standards across the bus network. The new legislative options include the ability for mayoral combined authorities to implement bus franchising, which would provide the potential for Greater Manchester to enforce minimum standards across the bus network.

5.21 We will:

- Continue to specify minimum standards for bus vehicles used on TfGM contracts
- Set minimum standards for bus vehicles using the Cross-city Bus infrastructure and future bus priority schemes
- Utilise the Government's forthcoming bus legislation to establish minimum standards across Greater Manchester
- Identify cost-effective ways of accelerating the replacement of pre-Euro IV buses.

Changing Travel Behaviour

- 5.22 Changing travel behaviour includes both moving away from car use (particularly ‘driver only’ trips and travel to work) and reducing the number and length of journeys made by car.
- 5.23 For people to move away from car use, they need to have access to realistic alternatives. This means public transport that is integrated, affordable and takes them to where they want to go at the time they need to travel. It also means safe routes for walking and cycling, and secure cycle parking facilities at major destinations. Where there is no realistic alternative, people need to be encouraged to car share where possible.
- 5.24 There has been major investment in public transport since 2011 (as shown in Table 5) and improvements to bus, tram and rail networks will continue. However, for many people a significant barrier to using public transport is the lack of integration, with buses, trams and trains operating as independent networks. As well as having services that provide a timely connection with other modes, we need to create a network that can be understood and used as a single facility. This will enable people to reach a wider range of destinations more easily by public transport.
- 5.25 A simple, integrated cashless payment system that can be used across all modes and will automatically calculate the best value fare for the journey will be an essential part of this. The ‘get me there’ smartphone app and smart card have been launched, initially for Metrolink and multi-operator bus respectively. Get me there smart ticketing solutions will continue to be developed to provide cashless payment across all three modes. The Bus Services Bill provides new tools that provide opportunities to enable much simpler, integrated and smart ticketing.
- 5.26 Making information available, not only when planning a journey but during the journey itself, is also crucial and real-time information is being made available via smartphone apps. Knowing when a service is likely to arrive and when it is approaching the required destination will help to build people’s confidence in using public transport.
- 5.27 Walking and cycling are alternative travel choices for short journeys, or parts of longer journeys. Cycling in particular is increasing in popularity, but safety concerns and lack of provision deters many people. Significant investment is being made in high quality cycle infrastructure, such as routes and parking, as part of the ‘Cycle City’ programme – as well as a package of practical support, such as cycle training, for those wishing to cycle more or start cycling. This will need to continue into the future in order to make cycling a natural choice for local journeys or as the first part of a longer public transport journey.
- 5.28 Homeworking is one way of reducing the number of commuter journeys made and becomes more feasible as broadband connections improve. Many employers allow some homeworking as a way of using office space more efficiently, as well as reducing carbon emissions, and local authorities can take a lead in this. Planning policies can reduce the need to travel, e.g. by ensuring that new housing is within easy reach of facilities like shops, schools, surgeries and employment.
- 5.29 There is also scope to reduce the number of deliveries, through businesses having better procurement strategies and creating parcel collection points e.g. at local shops to reduce the number of failed deliveries to households.
- 5.30 Once the alternatives are in place, ‘Travel Choices’ promotional measures have been shown to be effective in persuading people to change their travel behaviour. The programme, currently funded by central government until 2017, includes:
- Travel Choices for businesses (a tailored travel advice service, travel planning and access to grants and incentives such as loan bikes, cycle training and an online car sharing service);
 - Travel Choices for jobseekers (travel advice, free and discounted travel to interviews and to the new workplace, access to free refurbished bikes and equipment); and
 - Travel Choices for residents (information about travel options, targeted in areas where infrastructure has been improved).
- 5.31 This important work needs to be continued, with increased emphasis placed on servicing and delivery plans for businesses.

5.32 We will:

- Continue to improve public transport and facilities for cycling and walking
- Introduce smart ticketing across all modes, compatible across the north of England
- Explore new legislative opportunities for introducing integrated fares systems across all modes in Greater Manchester
- Continue to offer an extensive Travel Choices programme, to encourage people to switch more of their journeys to sustainable transport and businesses to better manage deliveries.

Investigation of Clean Air Zones

- 5.33 Clean Air Zones (CAZs) are seen by central Government as a key measure to improve air quality in major urban areas. A CAZ includes a wide range of measures and may include a charging zone, where vehicles that do not meet specified minimum emissions standards are charged for entering the area. This can be targeted at the types of vehicle that are seen as the major problem, such as buses and HGVs. The charge for non-compliant vehicles provides an incentive for operators to upgrade their fleets.
- 5.34 The most suitable location for a CAZ would be one based around the centre of the conurbation, but because there are both pros and cons, careful investigation is required of the impact this may have on behaviours and the wider area. If the measure was found to be beneficial, it could potentially be extended to other areas.
- 5.35 A major concern about introducing a CAZ is the impact on the economy, i.e. whether it would drive business and visitors away from the city. It would certainly be necessary to offer support to fleet operators by giving either grants to help them upgrade their vehicles or a period of several years notice to give them time to comply. The other side of the argument is that there would be economic advantages in Greater Manchester being seen to take a progressive stance on environmental issues and offering a clean environment to residents, workers and visitors.
- 5.36 Emissions within the CAZ would be reduced but a study will need to assess whether this reduction will be great enough to justify the cost of implementing and operating the CAZ, given that natural fleet replacement will reduce emissions to some extent without any further action. A CAZ would be unlikely to generate excess revenue, as its income will reduce over time as more and more vehicles comply with standards.
- 5.37 A further issue is that introducing a CAZ in one area may mean that older vehicles will be displaced to other parts of Greater Manchester, or elsewhere. However, Manchester is the hub of the bus network, so setting a standard for the city centre would also raise standards in the areas served by the services that start/terminate there. For goods vehicles the risk of displacement would be greater.

5.38 We will:

- Carry out a technical feasibility study into the potential impact of a Clean Air Zone in the conurbation.

New Development

- 5.39 The location and design of new development can help to reduce the problem of transport emissions in two ways: by maximising the use of sustainable travel modes to/from the development and by minimising people's exposure to those emissions.

5.40 The National Planning Policy Framework (NPPF) supports the need to reduce emissions. It makes clear that:

“To support the move to a low carbon future, local planning authorities should plan for new development in locations and ways which reduce greenhouse gas emissions.”

It also makes clear that:

“Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas.”

5.41 However, planning authorities are also obliged to make provision for sufficient new residential and commercial development to meet future needs. Meeting these needs in Greater Manchester is challenging, with more than 11,000 new homes needed each year up to 2035. From a carbon perspective, locating development within urban areas where there is good access to public transport, and where a range of facilities is available within walking distance, is the most sustainable option. However, where the available urban land is close to major highways, exposure to air pollution will be increased. The challenge for the Greater Manchester Spatial Framework and the Local Transport Plan will be to locate development where sustainable travel can be maximised and to put in place measures to encourage a mode shift away from car travel.

5.42 The NPPF contains the presumption that planning permission will be granted for sustainable development, but the interpretation of what constitutes ‘sustainable’ is left to individual planning authorities. This leads to an inconsistent approach to the mitigation required for similar types of development in different areas and may mean that more could be achieved in some instances.

5.43 We need to agree common guidance across the 10 planning authorities of Greater Manchester and/or develop a toolkit to help them assess development proposals and identify the mitigation needed. This would include, for example: the appropriate number of charging points for electric vehicles; sufficient cycle parking; access to public transport; detailed delivery and servicing plans which encourage activities outside of peak times; travel plan incentives to encourage the use of low-emission vehicles and sustainable transport; and guidance on setting back or screening residential development from major highways where air quality is an issue.

5.44 We will:

- Develop Greater Manchester-wide guidance on reducing emissions from new development
- Develop a toolkit to assist planning officers in identifying requirements for mitigating the impact of emissions in new development.

Focus Areas

5.45 While emissions need to be reduced universally to meet carbon targets, we will achieve the greatest impact on air quality and health by focusing some actions geographically. To meet EU limits for NO₂ we need to focus on the Air Quality Management Area. However, more widely we will secure the greatest health benefits by concentrating on areas where people are most exposed to pollution, because they live or work close to affected routes. We have therefore identified a number of focus areas which we can use to test the effectiveness of measures before rolling them out more widely. These are described below.

Manchester city centre

5.46 The regional centre, which includes part of Salford, has the greatest concentration of economic activity in Greater Manchester and is the hub of the public transport network. This concentration of activity makes it a major source of transport emissions. A growing number of people are choosing to live in the centre, with plans for 40,000 new homes by 2025 proposed in the GMSF. This resident population, combined with the workers and visitors, means that a large number of people are being exposed to poor air quality.

Focus Area	Key Measures
Manchester city centre	<ul style="list-style-type: none"> Mode shift to sustainable transport Bus vehicle renewal/retrofit Taxi standards Low-emission car club vehicles Electric vehicle charging points Urban Consolidation initiatives Clean Air Zone study Provision of high-quality walking and cycling infrastructure

M60/M62 corridor

5.47 Motorways are a major source of emissions, and the whole network in Greater Manchester falls within the Air Quality Management Area. Parts of the network are already congested, and forecast growth in Greater Manchester means that it will need to carry more traffic in future. Highways England had planned to introduce a Smart Motorway scheme, including all-lane running (i.e. using the hard shoulder) between J8 of the M60 and J20 of the M62 to increase capacity. This was found to have a significant negative impact on air quality and could not therefore proceed. Instead a ‘controlled motorway’ scheme, which manages traffic flow but does not involve an additional lane, is being introduced on the M60 J8 to the M62 J18, with just a short section of all-lane running on the M62 J18-20. The original scheme, and the extra capacity it would bring, will not be able to proceed unless emissions can be reduced. TfGM is working with Highways England through the Highways Strategy Board (HSB) to identify joint projects which will deliver real air quality benefits.

5.48 Since there are a number of key development areas close to the north-western part of the motorway network, reducing congestion in this area is seen as crucial to Greater Manchester’s growth ambitions. The M60/M62 corridor is therefore an important initial focus area for emissions reduction. Any initiatives will, however, be more effective if brought forward jointly with neighbouring areas, as much of the traffic is long-distance.

Focus Area	Key Measures
M60/M62 corridor	<ul style="list-style-type: none"> Agreeing a common approach with neighbouring authorities to reducing freight emissions HGV vehicle renewal Freight Operator Recognition scheme Mitigation measures for new developments close to motorway Urban Distribution Centre Mode shift to sustainable transport

Major routes into town centres

- 5.49 The major non-motorway roads in Greater Manchester radiate from the main town and city centres and carry heavy volumes of traffic into and through those centres, with significant environmental impact. These roads often pass through areas of inner urban housing, exposing residents to air pollution.
- 5.50 Our key town centres of Altrincham, Ashton, Bolton, Bury, Oldham, Rochdale, Stockport and Wigan have been suffering from the impact of changing shopping habits, particularly e-commerce, and all have plans to introduce new non-retail uses and to increase the attractiveness of their 'offer'. Reducing the impact of traffic is an important element of this.

Focus Area	Key Measures
Radial routes	<ul style="list-style-type: none"> Mode shift to sustainable transport Bus vehicle renewal/retrofit Traffic management Provision of high quality walking and cycling infrastructure

Major new developments

- 5.51 Major new developments need to be a focus for two reasons: because they generate additional traffic and because they can provide an opportunity to change travel behaviour if suitable alternatives to the car are provided. The Greater Manchester Spatial Framework is currently in development, and will set the scale and distribution of housing and employment growth across Greater Manchester to support delivery of significant levels of growth over the next 20 years. The draft GMSF suggests that in the period to 2035, Greater Manchester will need at least 227,200 new homes, at least 4,000,000m² of additional office space and at least 2,450,000m² of additional industrial and warehousing space.

Focus Area	Key Measures
Major new developments	<ul style="list-style-type: none"> GM low-emission guidance and toolkit Vehicle standards for major freight-generating developments Measures to encourage use of sustainable transport Provision of high-quality walking and cycling infrastructure

6 MONITORING AND REVIEW

- 6.1 This strategy sets a framework for the strategies and action plans shown in Figure 1, which will include detailed measures. It is important that the impact of the measures introduced (either through the LTP, Air Quality Action Plan or Climate Change Implementation Plan) is monitored and the results used to inform a future review of this strategy. This should be done at least every five years.
- 6.2 A number of relevant indicators are already monitored and reported to the GM Combined Authority on an annual basis through the LTP Report or the Network Performance Report, namely:
- CO₂ emissions from vehicles on major roads
 - Emission of NO_x from road traffic
 - Mode split for travel to work
 - Cycling levels
 - Walk trips
 - Bus fleet emission standards.
- 6.3 This monitoring will continue, but we will also need to include further indicators as follows:
- Background PM_{2.5} levels
 - Fraction of mortality attributable to particulate air pollution
- 6.4 More detailed monitoring of the impacts of particular schemes will be via the Air Quality Action Plan and the Climate Change Implementation Plan, but will also need to be fed back to this strategy. The carbon benefits of major transport schemes are routinely assessed, but air quality impacts are not always quantified. This will now need to be done for all major schemes where an impact is likely.

7 CONCLUSION

- 7.1 There is scientific evidence that the effects of emissions on our health and environment, as well as the economic impacts, are significant. Without radical intervention, predicted population growth and increased levels of activity will exacerbate this problem.
- 7.2 The UK as a whole, and specifically urban areas such as Greater Manchester, have challenging targets both in terms of greenhouse gas emission reductions and air quality improvements. Demonstrable progress has already been made; however, prioritised investment and radical actions are required if we are going to deliver on these targets.
- 7.3 Whilst all sources and types of emissions must be considered for a fully-integrated approach, NO₂ emissions from transport sources are currently the biggest challenge for the region.
- 7.4 Quite simply, a significant reduction in the number and length of journeys made by diesel and petrol-fuelled vehicles (especially those with EURO V or older engines), within Greater Manchester is required in order to achieve the necessary reductions in emissions.
- 7.5 The package of interventions is set out in the Air Quality Action Plan and GM Climate Change Implementation Plan. A consistent Greater Manchester-wide approach is required and it is vital that all policies and actions are aligned with the strategy and plans, especially on the priority routes identified in the AQMA.

