

Greater Manchester's Outline Business Case to tackle Nitrogen Dioxide Exceedances at the Roadside

Strategic Case



Oldham
Council



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Table of Contents

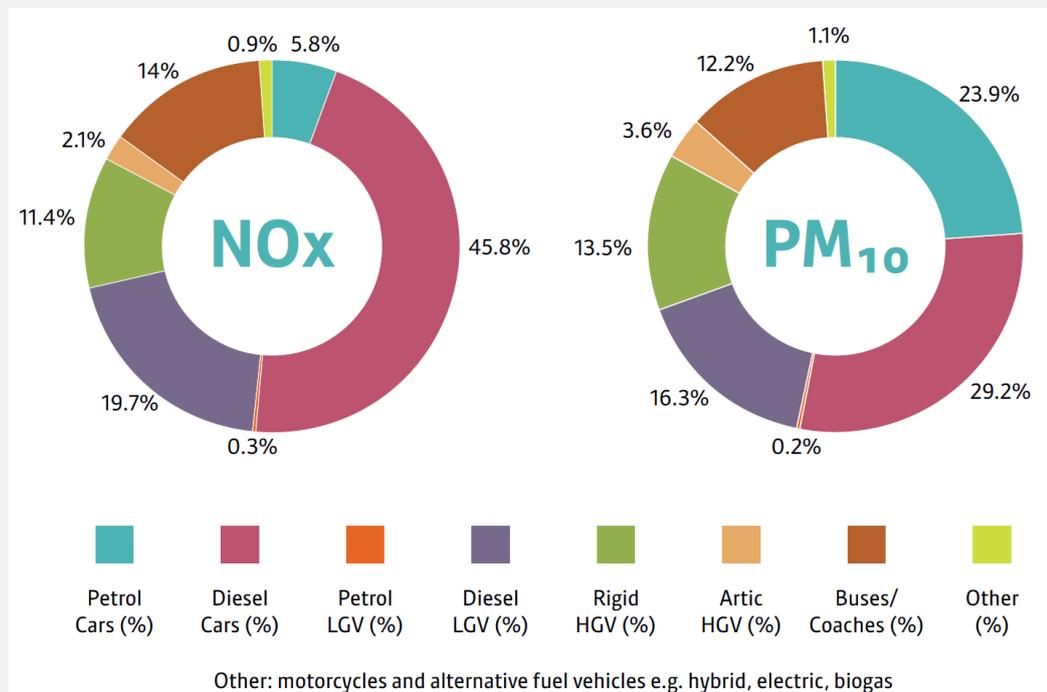
1.1	What is air pollution and why does it matter?	1-1
1.2	Why is Greater Manchester producing a Clean Air Plan?	1-2
1.3	The nature of the air quality problem in Greater Manchester	1-7
1.4	The impacts of air pollution	1-20
1.5	What is Greater Manchester doing about air quality?	1-25
1.6	Development of a Clean Air Plan for Greater Manchester	1-33
1.7	Selecting the preferred option for the proposed GM CAP	1-48
1.8	GM CAP: The Preferred Option	1-66
1.9	Benefit, risk, constraints, and contingencies	1-74

1 Strategic Case

1.1 What is air pollution and why does it matter?

Air pollution affects the health of people living, working and travelling in Greater Manchester. Pollutants such as nitrogen dioxide (NO₂) which is the harmful oxide of nitrogen (NO_x), and particulate matter (PM_{2.5} and PM₁₀) that are not visible to the naked eye are found at dangerous levels in many urban areas and on busy roads. Road transport causes two-thirds of NO_x emissions¹. Diesel vehicles are the main source of road-based NO_x emissions in Greater Manchester, and older vehicles are typically more polluting than newer vehicles. Large vehicles such as lorries are the most polluting from the exhaust pipe, and in general, diesel vehicles contribute the most, as shown in Figure 1- 1.

Figure 1- 1 Vehicles responsible for emissions damaging to health in Greater Manchester²



Breathing in polluted air contributes to the equivalent of 1,200 deaths a year in Greater Manchester³. Both long and short term exposure to air pollution are known to adversely affect health. It affects people's lungs in the short and long term, **worsening respiratory issues such as asthma or bronchitis, as well as cardiovascular problems, and reduces life expectancy**⁴. Health damage caused by air pollution can begin as early as a baby's first few weeks in the womb and exposure over a long time can lead to heart and

¹ <https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf>

² <https://www.cleanairgm.com/what-is-air-pollution>

³ Public Health England – Air Quality in Greater Manchester – from a Public Health Perspective (September 2018)

⁴ Air Quality – A Briefing for Directors of Public Health (2017), <https://www.local.gov.uk/air-quality-briefing-directors-public-health>

lung disease. The most vulnerable in society are hit hardest – children, older people and those already in poor health.

Everyone is at risk. But people who spend more time in areas with a high concentration of air pollution are most affected – which can include drivers. The air you breathe inside your vehicle can be dirtier than the air outside so people who spend a lot of time in their cars, taxis, vans or lorries are particularly at risk.

The people living in places with the dirtiest air are often those least likely to drive, and some of the Greater Manchester’s most deprived communities suffer the worst air pollution as they live close to busy roads. In total, it is estimated that **the health and social care costs of air pollution in England could reach £5.3 billion by 2035⁵** unless action is taken.

Changing the vehicles we drive and how we travel can clean up our air. This will require residents and businesses to take action, with Greater Manchester’s local authorities leading the way. Action is already underway, and this Clean Air Plan will bring forward Measures to bring illegally high roadside NO₂ levels within legal limits as soon as possible.

1.2 Why is Greater Manchester producing a Clean Air Plan?

1.2.1 Greater Manchester is producing a Clean Air Plan first and foremost to protect and promote the health of its population by improving air quality and reducing our impact on the environment. In so doing, the local authorities within Greater Manchester are also complying with the UK Air Quality Plan which requires the creation of the Greater Manchester’s Clean Air Plan (GM CAP) and which sets out clear guidance on how the Plan should be developed.⁶

1.2.2 Since 2010, the UK has been in breach of the European Union (EU) Limit Value regarding levels of annual average NO₂ levels in major urban areas set by the European Ambient Air Quality Directive (2008/50/EC) (the Directive), which incorporates the many World Health Organisation (WHO) air quality standards into European Law. The EU Limit Value for concentrations of major air pollutants that affect human health, including NO₂ and particulates were implemented into UK law by the Air Quality Standards Regulations 2010 (SI. 2010 No. 1001) (the 2010 Regulations). Regulation 26 of the 2010 Regulations requires the Secretary of State to draw up and implement a national Air Quality Plan so as to achieve the relevant EU Limit Value within the “shortest possible time”. The EU has recently re-stated its aim to achieve full compliance with existing air quality standards “by 2020 at the latest”.

⁵ https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf

⁶ DEFRA, DfT ‘UK plan for tackling roadside nitrogen dioxide concentrations’ (July 2017), <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>.

- 1.2.3 By 2015, compliance with the EU Limit Value had still not been achieved. The UK Government was held to be in breach of the Directive and was required to take action by the UK Supreme Court after a successful legal challenge by ClientEarth^{7,8}. ClientEarth further challenged the UK Government in the UK High Court in 2016⁹ and 2018¹⁰, with the UK Government Air Quality Plans being declared unlawful as they did not comply with the Directive to achieve compliance with air quality standards in the “shortest possible time”.
- 1.2.4 The Government’s Air Quality Plans have required local authorities with persistent exceedances to undertake local action to consider the best option to achieve statutory NO₂ limit values in the ‘shortest possible time’. Eight Greater Manchester local authorities¹¹ have been identified by the national Pollution Climate Mapping¹² (PCM) model to have roads which are expected to continue to exceed the EU Limit Value for NO₂ in 2021 and therefore have been directed by Government to undertake feasibility studies to identify Measures for reducing NO₂ concentrations to compliant levels in the ‘shortest possible time’. These studies are required to produce a series of business cases for assessing and implementing the relevant Measures as part of the GM CAP. The Government has allocated £255 million for Implementation Funding and £220 million to a Clean Air Fund to fund such Measures nationally.
- 1.2.5 Following more detailed local modelling, the remaining Greater Manchester local authorities of Wigan and Rochdale were identified as containing roads which are expected to have NO₂ exceedances in 2021, and therefore it was agreed that the GM CAP should also include these local authorities.

⁷ Non-profit environmental organisation

⁸ *R (on the application of ClientEarth) v Secretary of State for the Environment, Food and Rural Affairs* [2015] UKSC 28.

⁹ *R (on the application of ClientEarth) (No 2) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740 (Admin).

¹⁰ *R (on the application of ClientEarth) (No 2) v Secretary of State for the Environment, Food and Rural Affairs* [2018] EWHC 315 (Admin).

¹¹ In 2017, seven authorities were specified in the initial Direction: Bolton Metropolitan Borough Council, Bury Metropolitan Borough Council, Manchester City Council, Salford City Council, Stockport Metropolitan Borough Council, Tameside Metropolitan Borough Council, Trafford Metropolitan Borough Council. In 2018, Oldham Metropolitan Borough Council was specified in the latest Directive to areas identified as containing NO₂ exceedances, This 2018 direction was different to the 2017 direction “To conduct a feasibility study and provide the Secretary of State with a document setting out, for each road-link within the specified authority’s area projected to have a NO₂ exceedance in 2018, 2019 or 2020 in the national PCM model (other than those for which Highways England is the highway authority), the nature of the exceedance and, where they exist, recommended measure(s) that would achieve compliance with the relevant statutory NO₂ EU Limit Value in the shortest possible time.”.

¹² <https://uk-air.defra.gov.uk/research/air-quality-modelling?view=modelling> Pollution Climate Mapping (PCM) model is the UK’s national air quality model and provides outputs of pollutant concentrations in the UK at a 1x1 km resolution and also at roadside locations for around 9,000 urban major roads (A and M class roads).

1.2.6 The ten Greater Manchester local authorities have taken a Greater Manchester-wide approach to producing a Clean Air Plan because it is recognised that air pollution does not respect local authority boundaries and therefore a consistent and co-ordinated approach is required to maximise air quality benefits for all people living and working in Greater Manchester and to minimise the risk of unintended consequences, such as displacing elevated NO₂ concentrations to other locations within Greater Manchester. A co-ordinated approach will also help to ensure, as far as possible, alignment between the GM CAP and other Greater Manchester strategies, including the existing Greater Manchester Air Quality Action Plan¹³ and Greater Manchester Low-Emission Strategy¹⁴. Table 1- 1 below outlines the organisations related to the Clean Air Plan and their respective responsibilities.

Table 1- 1: Organisations related to the Clean Air Plan and their responsibilities

Organisation	Responsibility
European Commission	Issued air quality Directive (2008/50/EC) relating to ambient air quality, including NO ₂ concentrations, that was binding on EU member states, including the UK.
UK Government	Implemented the standards set out in the EU Directive into UK law in the Air Quality Standards Regulations 2010. The Government is responsible for achieving the EU Limit Values by 2020 but has required local authorities to undertake the feasibility studies and identify the local option which will achieve compliance with the EU Limit Value in the shortest possible time in each authority through ministerial directions.
Greater Manchester Combined Authority (GMCA)	The Greater Manchester Combined Authority (GMCA), chaired by the Mayor has concurrent responsibility with the respective GM local authorities for reviewing air quality pursuant to Article 10 of the Greater Manchester Combined Authority Order (2011) (SI 2011 No. 908) and schedule 3 and sections 82-84 Environment Act 1995. Whilst GMCA is not responsible for producing the feasibility study which is required of local authorities under s85 Environment Act 1995, it is assisting in coordinating the approach of the ten GM local authorities and its endorsement may be required in respect of some proposed Measures.
Transport for Greater Manchester (TfGM)	TfGM is coordinating the feasibility study and development of the GM CAP on behalf of the GMCA in collaboration with the ten Greater Manchester local authorities to ensure an integrated and coordinated response which does not lead to displacement of the air quality problem between local authorities.

¹³ <https://www.greatermanchester-ca.gov.uk/media/1272/air-quality-action-plan-2016-21.pdf>

¹⁴ <https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf>

Organisation	Responsibility
Bolton Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Bury Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Manchester City Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Salford City Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Stockport Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Tameside Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.

Organisation	Responsibility
Trafford Metropolitan Borough Council	Due to the UK Government identifying that NO2 concentrations within the local authorities exceeded the EU Limit Value, the Secretary of State issued a Direction to this local authority requiring it to undertake a feasibility study and identify the option which would achieve compliance with the EU Limit Value in the shortest time possible. The direction is one of a series of ministerial directions issued to Greater Manchester local authorities that this Outline Business Case is produced pursuant to.
Oldham Metropolitan Borough Council	Oldham Metropolitan Borough Council (Oldham MBC) was not directed along with the other Greater Manchester local authorities in 2017, however following a court ruling in 2018 ¹⁵ the UK Government was ordered to produce supplements to the UK 2017 Air Quality Plan. Consequently, Oldham MBC was directed to conduct a feasibility study and provide the Secretary of State with a document setting out the Measure(s) that would achieve compliance with the EU Legal Limits in the shortest possible time. In October 2018 the UK Government produced a supplemental plan ¹⁶ , which acknowledged that, as Oldham MBC is part of the Greater Manchester Plan, the Oldham exceedances were being considered as part of the GM CAP.
Wigan Metropolitan Borough Council	No exceedances were identified in Wigan by UK Government analysis but more detailed modelling, produced as part of the target determination process, identified exceedances in Wigan. This modelling process was undertaken whilst the Strategic Outline Case (SOC) was being developed relating to the original direction to the seven local authorities. This new evidence was presented to the GMCA and led to an agreement that the remaining Greater Manchester local authorities (at that point Oldham, Wigan, and Rochdale) should become part of a GM CAP to ensure a comprehensive approach was adopted.
Rochdale Metropolitan Borough Council	No exceedances were identified in Rochdale by UK Government analysis but more detailed modelling, produced as part of the target determination process, identified exceedances in Rochdale. This modelling process was undertaken whilst the SOC was being developed relating to the original direction to the seven local authorities. This new evidence was presented to the GMCA and led to an agreement that the remaining Greater Manchester local authorities (at that point Oldham, Wigan, and Rochdale) should become part of a GM CAP to ensure a comprehensive approach was adopted.
Public Health England	Public Health England will advise and signpost, to enable TfGM to access appropriate technical advice and support.
Greater Manchester Health and Social Care Partnership	In addition to working with its partners to understand the health impacts of air pollution, the NHS Long Plan has stated its commitment to help reduce emissions and to reduce air quality,

¹⁵ Client Earth (No3) v (1) Secretary of State for the Environment, Food & Rural Affairs; (2) The Secretary of State for Transport and (3) Welsh Ministers [2018] EWHC 315

¹⁶ Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations October 2018

Objectives of the Clean Air Plan

- 1.2.7 Greater Manchester is seeking to reduce the health impacts of air pollution. The primary aim of the GM CAP is to reduce NO₂ concentrations in Greater Manchester to below the EU Limit Value in the shortest possible time. In addition to achieving this primary aim, Greater Manchester has also sought to develop GM CAP interventions that align with Greater Manchester's wider strategic goals and do not undermine the GMCA and ten local authorities' other statutory and legal duties. This approach will minimise the risk of significant unintended negative economic, social or environmental consequences resulting from the implementation of the Clean Air Plan.
- 1.2.8 In developing the GM CAP, the assessment has taken account of the need to:
- ensure that compliance is achieved as soon as possible;
 - choose a route to compliance which reduces human exposure as quickly as possible;
 - ensure that compliance with the EU Limit Value is not just possible but likely.
- 1.2.9 It has also considered the feasibility and deliverability of the options under consideration.
- 1.2.10 This Strategic Case which forms part of the Outline Business Case sets out the underlying rationale for the GM CAP, including a robust case for change based upon local modelling that has revealed a much wider current NO₂ problem than initially identified by Government. It predicts a greater spatial distribution of exceedances and higher concentrations of NO₂ than those initially identified by Government. Sections of road with concentrations of NO₂ over the EU Limit Value of 40 µg/m³ which is defined as an exceedance by the Directive, are located in all ten Greater Manchester local authorities, in a similar spatial distribution to the air quality problems identified in the established Air Quality Management Area. The scale of the local challenge has been formally agreed with Government's Joint Air Quality Unit (JAQU) through the Target Determination exercise.
- 1.2.11 This Strategic Case describes the process that has been undertaken to identify and assess the interventions that could be implemented to reduce annual mean NO₂ concentrations. It concludes with a summary of the best performing options and recommends a preferred option for delivery.
- 1.3 The nature of the air quality problem in Greater Manchester

Air quality in Greater Manchester

- 1.3.1 There are 152 stretches of road (road links) or 250 modelled points, where concentrations of NO₂ are forecast to exceed 40 µg/m³ for NO₂ in 2021, across Greater Manchester as a whole. 112 of these roads (or 207 modelled points) coincide with roads included in the national PCM model. Typically, these roads have the greatest car use and heavy freight flows. The remaining 40 road link exceedances (or 43 modelled points) are on shorter stretches of local roads, primarily around town and city centres across Greater Manchester, which are not included in the national model but carry high volumes of traffic, including significant numbers of buses, taxis and Light Goods Vehicles (LGVs).
- 1.3.2 Local modelling of transport and air quality has been undertaken to support the Plan. The detailed methodology and results can be found in the accompanying evidence reports.¹⁷ NO₂ concentrations in Greater Manchester have been measured for 2016 via local monitoring. Modelling has then estimated the concentrations of NO₂ in Greater Manchester in the baseline year 2016, and forecast for 2021, 2023 and 2025. The future forecasts provide an estimate of the position if no additional interventions were carried out beyond the funded plan; these are known as the Do Minimum scenarios. Model outputs have been compared with the results of the monitoring carried out across Greater Manchester to ensure that the predicted concentrations reflect real-world conditions.
- 1.3.3 Modelling of air quality can be presented in two different ways: a point along a road which has a certain concentration of NO₂ or the stretch of road which has a certain concentration of NO₂. Presenting point data provides more specific and detailed information on the air quality problem, as it allows an understanding of how concentrations of NO₂ vary at different locations on the road. The Outline Business Case (OBC) will present concentration and emissions information on the basis of point data.
- 1.3.4 Greater Manchester's Strategic Outline Case¹⁸ (SOC) presented the results of national modelling which identified exceedances in seven out of ten of Greater Manchester's local authorities. As part of the feasibility study process, Greater Manchester was required to produce its own local modelling. Based on Government guidance the following local evidence was used to understand likely NO₂ concentrations in Greater Manchester beyond 2020:
- Detailed Baseline Year (2016) and Future Years (2021, 2023 and 2025) transport model (actual and future demand on the road network);

¹⁷ Local Air Quality Plan Modelling and Methodology Reports and Local Plan Transport Model Validation, Methodology, and Forecasting Reports.

¹⁸ There are three parts to the feasibility study assessing Greater Manchester's Clean Air Plan: SOC, Outline Business Case (OBC) and Full Business Case (FBC). All three develop the proposed Clean Air Plan in terms of level of detail and the assessment of impacts.

- local vehicle fleet profiles (e.g. ages and types of vehicle) using Automatic Number Plate Recognition (ANPR) data;
- vehicle fleet licensing data for bus and taxi fleet;
- local background concentrations of NO_x and NO₂;
- more detailed road network and junction data (e.g. alignment and width);
- representation of “air pollution” canyons (e.g. tall buildings);
- local air quality monitoring data from across Greater Manchester; and
- confirmed future changes to the road network, and expected regional traffic growth and changes to the traffic fleet.

1.3.5 This local modelling was necessary to provide a more comprehensive understanding of the air quality across the entirety of Greater Manchester. The local modelling identified a larger number of locations which are expected to exceed the EU Limit Value, and higher concentrations of NO₂ in specific locations. This meant that all ten local authorities contained locations expected to be in exceedance of EU Limit Value for NO₂ after 2020. This reflected the fact that the local modelling used more detailed sources of data and more refined analytical tools. This resulted in three fundamental differences compared to the national modelling. Firstly, that the vehicle fleet in Greater Manchester is older and more polluting than assumed in the national model. Secondly, that in some areas vehicles are moving more slowly than assumed in the national model. And finally, that the background concentrations from non-road vehicle emissions sources (for example, electricity production, industry, local heating etc.) is higher than expected and needed to be increased in the modelling to reflect real-world conditions.

1.3.6 Greater Manchester submitted the results of its local modelling to JAQU in summer 2018. Following review by JAQU and an Independent Technical Review Panel, the local model process has been accepted as the reference for determining compliance with the EU Limit Value.

1.3.7 Table 1- 2 and Figure 1- 2 show the exceedances identified by local modelling and upon which the proposed GM CAP is based. Exceedances are found in the town and city centres and on major roads, particularly those close to the motorway network. The greatest concentration of sites in exceedance of the EU Limit Value is found in Manchester city centre, and this is also where some of the highest annual mean concentrations are predicted. This reflects higher traffic volumes, congestion, the number of high buildings which create air pollution 'canyons', and high background levels of pollution. The aim of the GM CAP is to deliver Measures that deliver compliance at these locations as soon as possible, and without redistributing the problem to other locations. The geographical spread of NO₂ exceedances throughout Greater Manchester is shown in Figure 1- 2 and clearly highlights the complexity of the air quality issues the Clean Air Plan is trying to address.

- 1.3.8 Table 1- 2 shows the exceedances identified in the national modelling, using the PCM, and in the local modelling. The local modelling encompasses a wider road network than the PCM, including local and strategic roads. The primary spending objective of the GM CAP, as set out by JAQU, is to tackle exceedances identified by the local modelling on roads included within the PCM network. In Greater Manchester, this amounts to 207 exceedances in 2021. The secondary spending objective is to tackle exceedances identified by the local modelling on local roads, an additional 43 locations in Greater Manchester.
- 1.3.9 While the maps and tables show a number of exceedances on local roads that are in close proximity to the Strategic Road Network (SRN), which is managed by Highways England, it should be noted that the mapping and analysis does not include exceedances actually on the SRN as they have not been required to act to reduce NO₂ under the same direction as local authorities. Nevertheless, at local roads close to the SRN, pollution caused by motorway traffic can be as much as 50% greater than that from the local road. Furthermore, there are properties in exceedance situated along the motorway where there is very little local road traffic and 100,000 vehicles passing per day on the SRN.
- 1.3.10 Highways England have eight links predicted to be non-compliant in the PCM network based on national modelling. Highways England is currently assessing sections of the SRN around Greater Manchester to explore potential Measures to reduce air quality impacts. The GM CAP is predicted to provide substantial improvements in air quality on the SRN in Greater Manchester as most of the traffic on that network enters or exits within the region.

Table 1- 2: Predicted NO₂ Exceedances in Greater Manchester in 2021 in PCM and local modelling in 2021

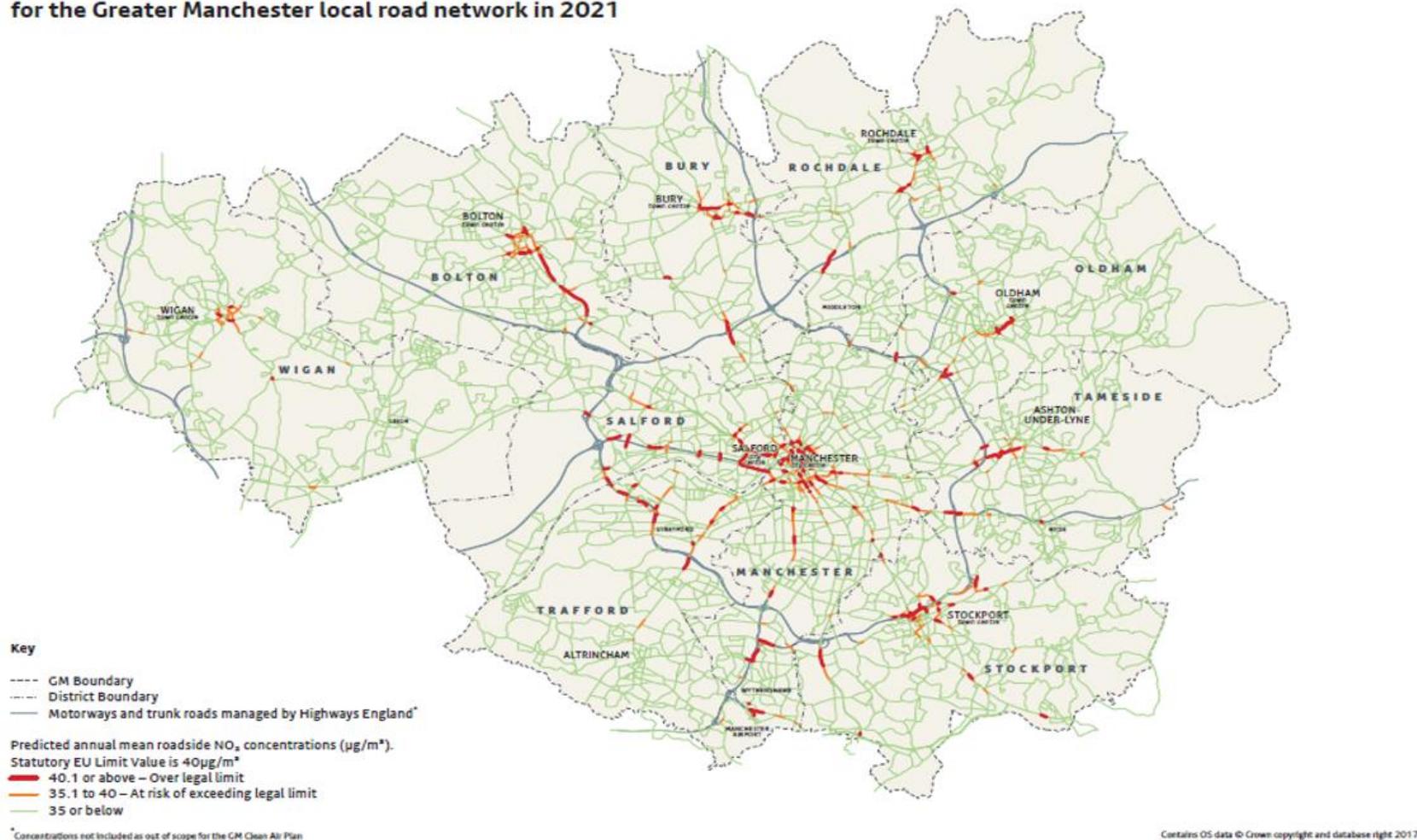
Local authority	National (PCM) Model exceedances links	Local Model point exceedances on PCM links	Additional Local Model point exceedances on minor roads (non-PCM links)*	Total Local Model point exceedances
Bolton Metropolitan Borough Council	1	18	1	19
Bury Metropolitan Borough Council	1	19	4	23
Manchester City Council	4	70	18	88
Oldham Metropolitan Borough Council	0	13	2	15

Local authority	National (PCM) Model exceedances links	Local Model point exceedances on PCM links	Additional Local Model point exceedances on minor roads (non-PCM links)*	Total Local Model point exceedances
Rochdale Metropolitan Borough Council	0	10	0	10
Salford City Council	1	30	6	36
Stockport Metropolitan Borough Council	2	24	6	30
Tameside Metropolitan Borough Council	1	16	0	16
Trafford Metropolitan Borough Council	1	5	5	10
Wigan Metropolitan Borough Council	0	2	1	3
Total	11	207	43	250

**These are road links that are not included in the national PCM model but have been modelled locally.*

Figure 1- 2: Predicted annual mean NO₂ concentrations in Greater Manchester 2021

Predicted annual mean nitrogen dioxide (NO₂) concentrations for the Greater Manchester local road network in 2021



1.3.11 Further modelling has been undertaken to assess what would happen in later years if no further action was taken. This shows that, based on current assumptions around trends in vehicle purchasing patterns and changes in background emission levels, without further action eight sites across Greater Manchester would remain in exceedance of the legal EU Limit Value in 2025, 15 years after the original target date for compliance. The location of sites remaining non-compliant are listed in the table below.

Table 1- 3: Points predicted to remain in exceedance of legal EU Limit Value in 2016, 2021, 2023 and 2025 across Greater Manchester without further action

Local authority	2021	2023	2025
Bolton Metropolitan Borough Council	19	3	0
Bury Metropolitan Borough Council	23	12	4
Manchester City Council	88	29	2
Oldham Metropolitan Borough Council	15	3	1
Rochdale Metropolitan Borough Council	10	2	0
Salford City Council	36	10	1
Stockport Metropolitan Borough Council	30	4	0
Tameside Metropolitan Borough Council	16	5	0
Trafford Metropolitan Borough Council	10	0	0
Wigan Metropolitan Borough Council	3	0	0
Total	250	68	8

1.3.12 Table 1- 4 below shows the distribution of non-compliant sites across Greater Manchester in terms of how close they are to compliance. This shows that, whilst levels of NO₂ are below the EU Limit Value across much of the road network, in 2021 it is anticipated that 250 sites will remain non-compliant, of which 62 are predicted to experience annual mean concentrations between 45 µg/m³ and 50 µg/m³, and 13 to experience annual mean concentrations over 50 µg/m³ and as high as 55 µg/m³. A further 603 sites are compliant but experience annual mean concentrations close to the EU Limit Value and given modelling uncertainties, could be at risk of still exceeding in 2021. By 2025, the transition towards cleaner vehicles that would be expected without further action, as well as a reduction in background emissions, leads to a very substantial reduction in the number

of sites in exceedance of the EU Limit Value, from 250 in 2021 to eight in 2025, and a reduction in the number of sites in compliance but close to EU Limit Value from 150 in 2021 to 12 in 2025. Nevertheless, this suggests that achieving compliance with the EU Limit Value will take more than seven years from today in Greater Manchester without further action. It should be noted that forecasts of improvements in air quality have been shown to be overly optimistic in the past; if this was the case then compliance may take longer to achieve and any intervention would be of greater value. Information on air quality performance for individual local authorities can be found in Appendix A2.

Table 1- 4: Predicted annual mean NO₂ concentrations at points on the Greater Manchester road network, 2021 and 2025 without further action ('Do Minimum')

Road classification ¹⁹	Compliant sites		Non-compliant sites			
	Very compliant (below 35 µg/m ³)	Compliant but marginal (35 to 40 µg/m ³)	Non-compliant (>40 to 45 µg/m ³)	Very non-compliant (>45 to 50 µg/m ³)	Extremely non-compliant (>50 µg/m ³)	Total non-compliant (>40 µg/m ³)
2021						
Inside Manchester-Salford Inner Relief Route	475	73	34	19	5	58
Urban centres	465	66	17	4	0	21
Other locations	15,341	464	124	39	8	171
Total	16,281	603	175	62	13	250
2025						
Inside Manchester-Salford Inner Relief Route	601	4	1	0	0	1
Urban centres	547	5	0	0	0	0
Other locations	15,920	49	7	0	0	7
Total	17,068	58	8	0	0	8

Note that the total number of predicted points and distribution of those points changes between 2021 and 2025 due to planned changes to the road network.

1.3.13 In order to deliver compliance, emissions reductions equivalent to reducing traffic by as much as 40% are required at some locations. This proposed GM CAP has assessed solutions that aim to deliver equivalent reductions in emissions in the shortest possible time and without limiting the ability to travel around the region or preventing successful business operations.

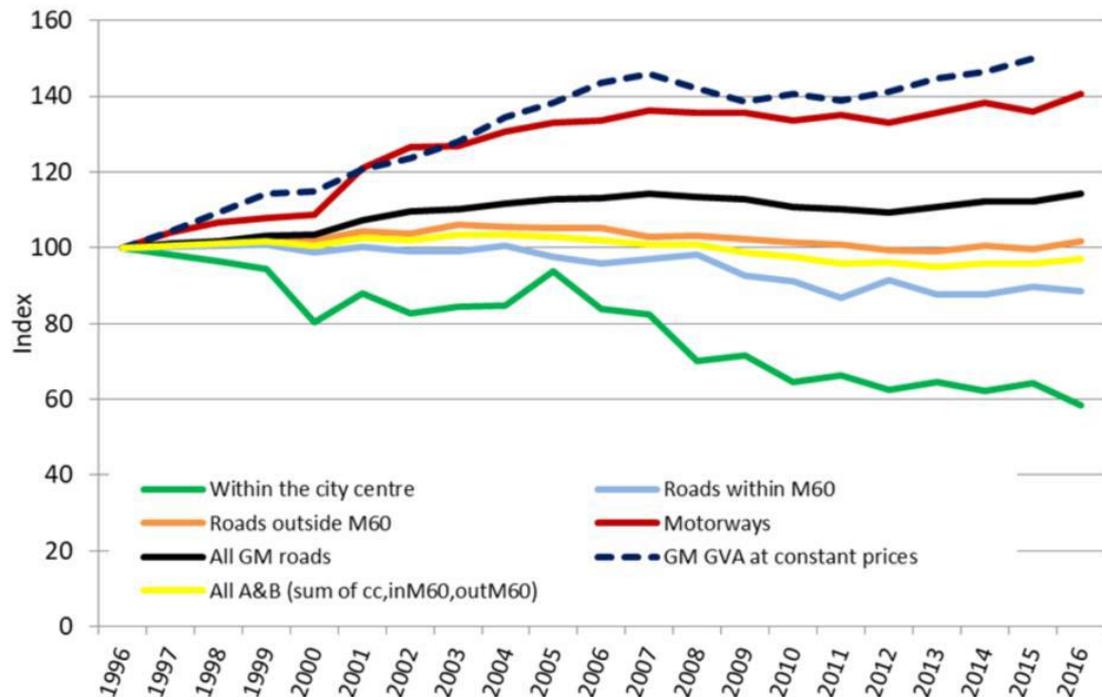
¹⁹ "Inside Inner Relief Route" is the area encircled by the Inner Relief Route. "Urban centres" are areas that met a definition used for the purposes of air quality modelling. "Routes" are roads outside of Urban centres and the Inner Relief Route.

What causes air pollution in Greater Manchester?

- 1.3.14 As demonstrated by the scale of exceedances identified in the Government's PCM, Greater Manchester suffers from some of the worst air quality in the UK and without further action, it will take longer to reach safe levels of NO₂ in Greater Manchester than in most other cities. The reasons for this are complex and multi-faceted.
- 1.3.15 Vehicles travelling on the roads in Greater Manchester traffic are older and more polluting than the national average, and traffic speeds are slower than average.²⁰ This means the options considered in Greater Manchester may have to be bolder.
- 1.3.16 The transport modelling has also been analysed to understand the origins and destinations of traffic, by vehicle type, on these links. This shows that whilst a lot of traffic is associated with accessing the urban centres, there is also a significant use of the local road network to access the motorway for trips spread around Greater Manchester and beyond. The analysis indicates that a range of Measures will be necessary to tackle Greater Manchester's NO₂ concentrations due to the diverse spatial context and differing sources.
- 1.3.17 Vehicle travel in Greater Manchester has been changing over the past 20 years. Traffic volumes on Highways England controlled motorways have been increasing but elsewhere on the local road network traffic levels have been stable or falling.

²⁰ Local Plan Air Quality Modelling Report

Figure 1- 3: Annual Motor Vehicles kilometres (km) in Greater Manchester, indexed to a 1996 base and compared to economic growth (in GVA)²¹



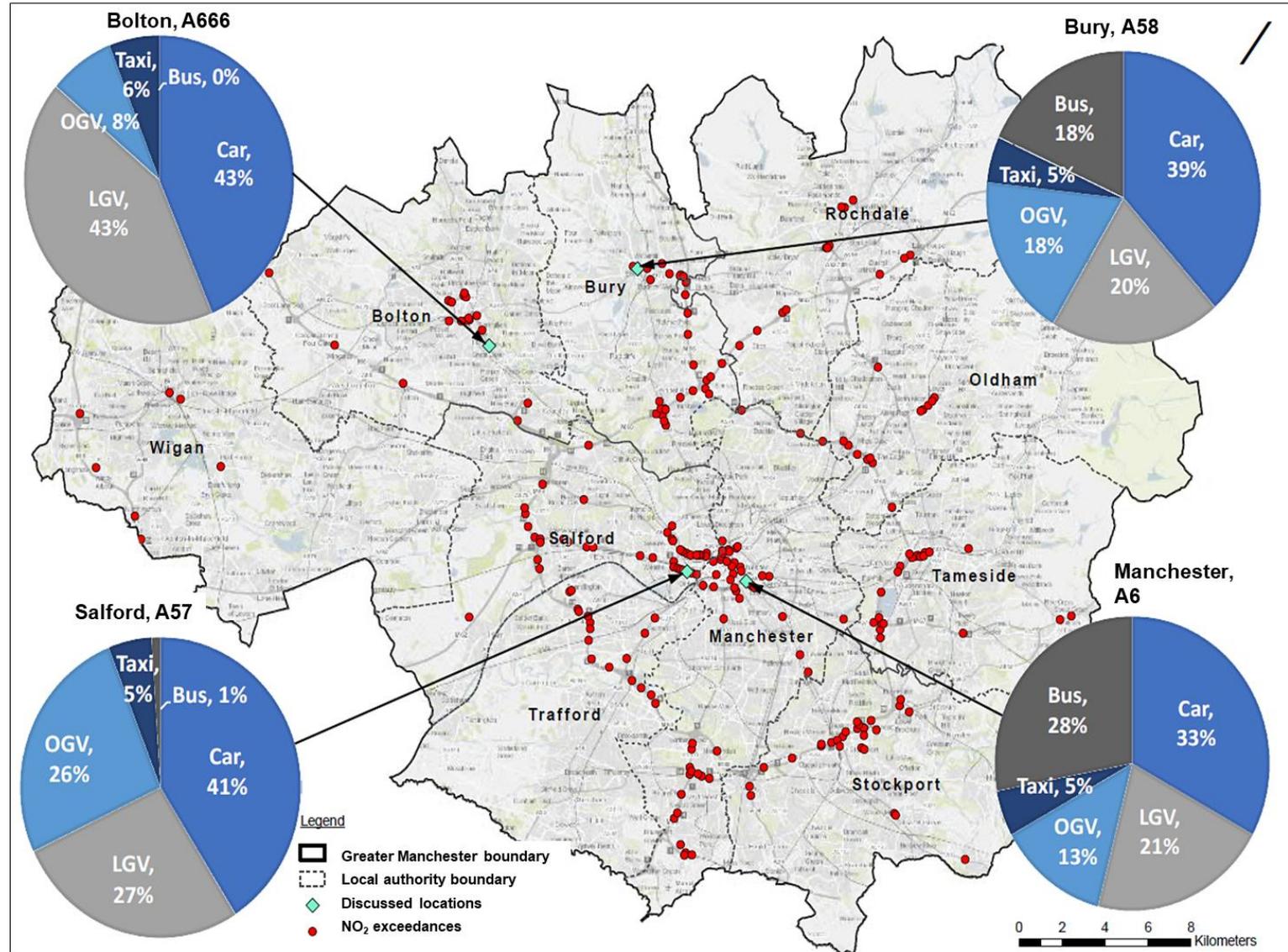
1.3.18 Analysis of the pollution sources at each location of exceedance has been undertaken, and an estimate of the emissions reduction required from vehicle transport has been calculated to enable compliance with the EU Limit Value for NO₂. This was utilised to inform the detail of Measures required by the GM CAP.

1.3.19 The analysis shows that there are very diverse factors affecting vehicle emissions across Greater Manchester, with vehicle types and levels often differing between roads in close proximity to each other (see Figure 1- 4 below). In many locations where there are significant exceedances, such as on roads in a city/town centre, the road network performs a variety of complex transport functions and therefore carries a diverse range of traffic, including cars, vans, Heavy Goods Vehicles (HGVs), buses and taxis.

²¹ TfGM Highways Forecasting and Analytical Services. Note that 'GM roads' includes all roads in GM including the motorway network.

- 1.3.20 The graphs in Figure 1- 4 show how different vehicle types contribute to the total road transport emissions on a given road link. For example, buses are an insignificant fraction on the selected example Bolton and Salford links (but may represent a significant contribution elsewhere in these districts), whereas the selected example sites in Manchester and Bury comprise 18-28% bus emissions. Emissions from goods vehicles at the selected example link in Salford are over 50% of emissions, likely to be associated with accessing Trafford Park. The selected example Bolton link is dominated by cars and vans, whilst the selected example site in Bury has a relatively even distribution of vehicle type sources.
- 1.3.21 Note that the sites shown in Figure 1- 4 are selected examples, and that the sources of emissions at other sites within the same districts and elsewhere will be very different.

Figure 1- 4: Examples of how transport-related sources of NOx vary on different roads in Greater Manchester



National context: why are emissions worse than expected?

1.3.22 Nationally, emissions reductions have been lower than forecast over the past 20 years. This is because there has been larger than forecast growth in diesel vehicles which produce higher levels of NO_x than petrol vehicles. This is linked to the failure of EU emissions standards and manufacturer tests and the growth in diesel vehicle use linked to UK Government tax incentives²² aimed at decreasing CO₂ emissions from vehicles. Policy at the time was more focused on climate change, whilst improvements in air quality have assumed greater relative importance in recent years, particularly within urban areas. Only recently, in April 2018, have tax incentives changed to dissuade the use of diesel vehicles through increased taxation²³. It also reflects the fact that, as stated by the European Environment Agency (EEA), “‘real-world emissions’ of NO₂ particularly from diesel cars and vans, generally exceed the permitted European emission standards, which define the acceptable limits for exhaust emissions of new vehicles sold in the EU Member states”²⁴.

1.4 The impacts of air pollution

Impact of Air Pollution on Public Health

1.4.1 Poor air quality has a real and significant effect on people’s health. Air pollution is the largest environmental risk linked to deaths every year. Pollutants such as NO_x, principally NO₂, and PM (PM_{2.5} and PM₁₀) that are not visible to the naked eye are found at dangerous levels in many urban areas and on busy roads.

1.4.2 Both long and short-term exposure to air pollution are known to adversely affect health. There is strong evidence associating air pollution with increased mortality and ill health, including the exacerbation of asthma, effects on lung function and increases in respiratory and cardiovascular hospital admissions²⁵.

²² CO₂ based tax for cars that was introduced in 2001 (<https://www.bbc.co.uk/news/uk-politics-41985715>).

²³ <https://www.gov.uk/vehicle-tax-rate-tables>

²⁴ <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-air-pollutants-8/transport-emissions-of-air-pollutants-5>

<https://www.epa.gov/sites/production/files/2015-10/documents/vw-nov-cao-09-18-15.pdf>

²⁵ Air Quality – A Briefing for Directors of Public Health (2017), <https://www.local.gov.uk/air-quality-briefing-directors-public-health>

- 1.4.3 It is estimated that long-term exposure to human-made particulate air pollution contributes to the equivalent of 1,200 deaths every year in Greater Manchester²⁶. The Committee on the Medical Effects of Air Pollutants has established that short-term exposure to NO₂, particularly at high concentrations, is a respiratory irritant that can cause inflammation of the airways leading to, for example, coughing, the production of mucus and shortness of breath. Studies have shown association of NO₂ in outdoor air with reduced lung development and respiratory infections in early childhood, and effects on lung function in adulthood.
- 1.4.4 NO₂ also contributes to wider environmental degradation, such as adverse effects on vegetation that can have impacts on human health.
- 1.4.5 In total, it is estimated that the health and social care costs of air pollution in England could reach £5.3 billion by 2035 unless action is taken²⁷.
- 1.4.6 Greater Manchester has a particular imperative to improve health, as the region has one of the lowest life expectancies at birth in England and large inequalities between areas. For example, there is an 18 year gap for men and a 13 year gap for women in healthy life expectancy across Greater Manchester when comparing those areas of highest healthy life expectancy with the lowest. Low income communities are more affected by air pollution.²⁸
- 1.4.7 Conditions caused or exacerbated by air pollution may significantly reduce quality of life and could potentially result in affected people being less able to work, attend education or carry out their normal daily lives, and this in turn could widen the health inequality gap further.
- 1.4.8 In 2012, poor air quality was estimated to cost the economy in England up to £2.7 billion through its impact on productivity²⁹. Achieving a major improvement in air quality across Greater Manchester will not only be important for improving human health but will also help to make Greater Manchester a more attractive place to live, visit and invest. Alongside this, there is a growing body of evidence that relates poor air quality with a secondary set of health impacts arising from spending less time outside, which can lead to more sedentary lifestyles and negative psychological effects on our mental health³⁰.

²⁶ Public Health England – Air Quality in Greater Manchester – from a Public Health Perspective (September 2018)

²⁷ https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf

²⁸ The devolution of health funding.
<https://www.research.manchester.ac.uk/portal/files/56630884/LifeandDevoHealthFundingJunePrePub2017.pdf>

²⁹ https://uk-air.defra.gov.uk/assets/documents/reports/cat19/1511251135_140610_Valuing_the_impacts_of_air_quality_on_productivity_Final_Report_3_0.pdf

³⁰ https://paa.confex.com/paa/2017/mediafile/ExtendedAbstract/Paper13493/IndividualPsychologicalDistress_April7.pdf

- 1.4.9 In addition to reducing the impact on health from air pollution, measures that improve air quality can offer wider public health and well-being co-benefits including an improvement in overall environmental quality, increased physical activity, noise reduction, greater road safety and climate change mitigation. Multiple interventions, each producing a small benefit, can act cumulatively to produce significant overall benefits.³¹

Impact of air pollution on society

- 1.4.10 Around 7% of the Greater Manchester population, nearly 200,000 people, live in areas containing roads close to or in exceedance of the EU Limit Value for NO₂ and many more people will regularly spend time visiting areas or travelling on roads in exceedance of the EU Limit Value.
- 1.4.11 The youngest, the oldest, those living in areas of deprivation, and those with existing heart or lung problems are at greater risk of developing symptoms due to exposure to air pollution^{32,33}. Greater Manchester contains some of the most deprived communities in the country, often living in urban areas with high levels of traffic. Figure X shows selected characteristics of people living in areas affected by poor air quality, defined as Census Output Areas that intersect road links above or close to NO₂ limits. People living in areas impacted by poor air quality are more likely to not be in employment, not own a car/van, and live in rented or overcrowded housing, as shown in Figure 1-5³⁴.

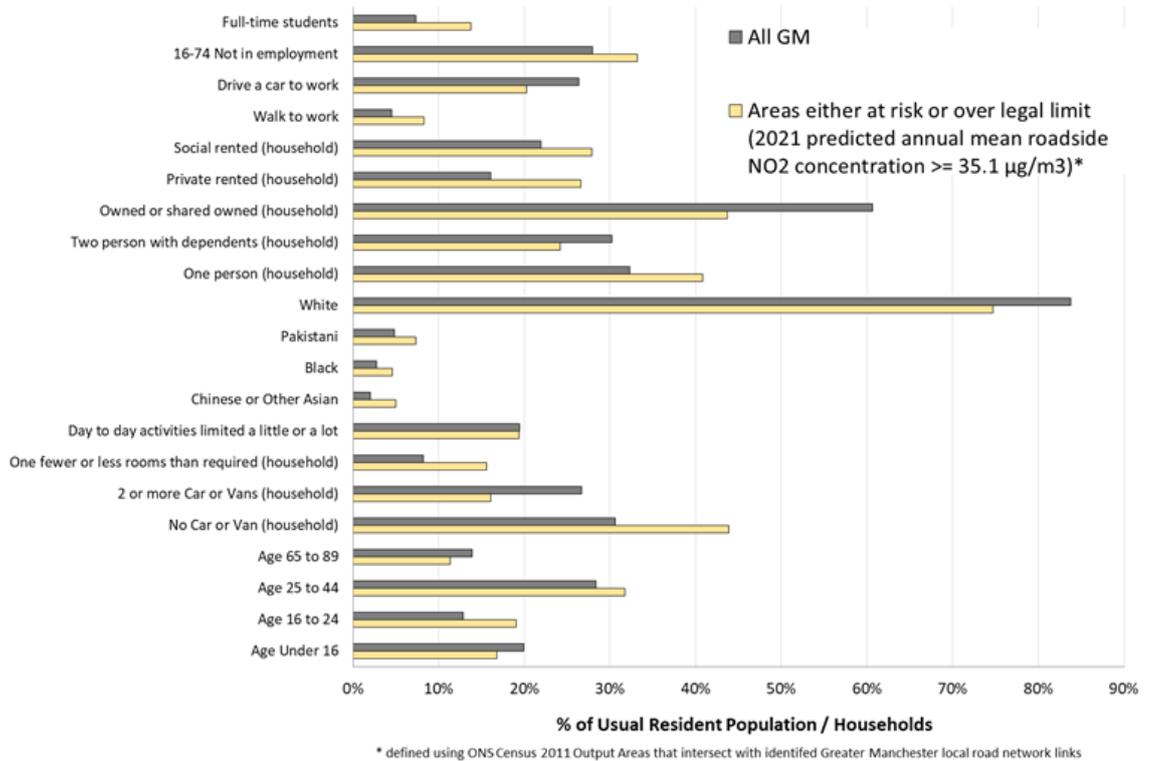
³¹ Air Pollution and Health <https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution>

³² Air Quality – A Briefing for Directors of Public Health (2017), <https://www.local.gov.uk/air-quality-briefing-directors-public-health>

³³ 10. RCP and RCPCH London, Every breath we take lifelong impact of air pollution (2016), <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>

³⁴ TfGM analysis of Acorn 2017 (CACI) data.

Figure 1- 5: Characteristics of Greater Manchester residents living in areas close to points of NO₂ exceedance³⁵



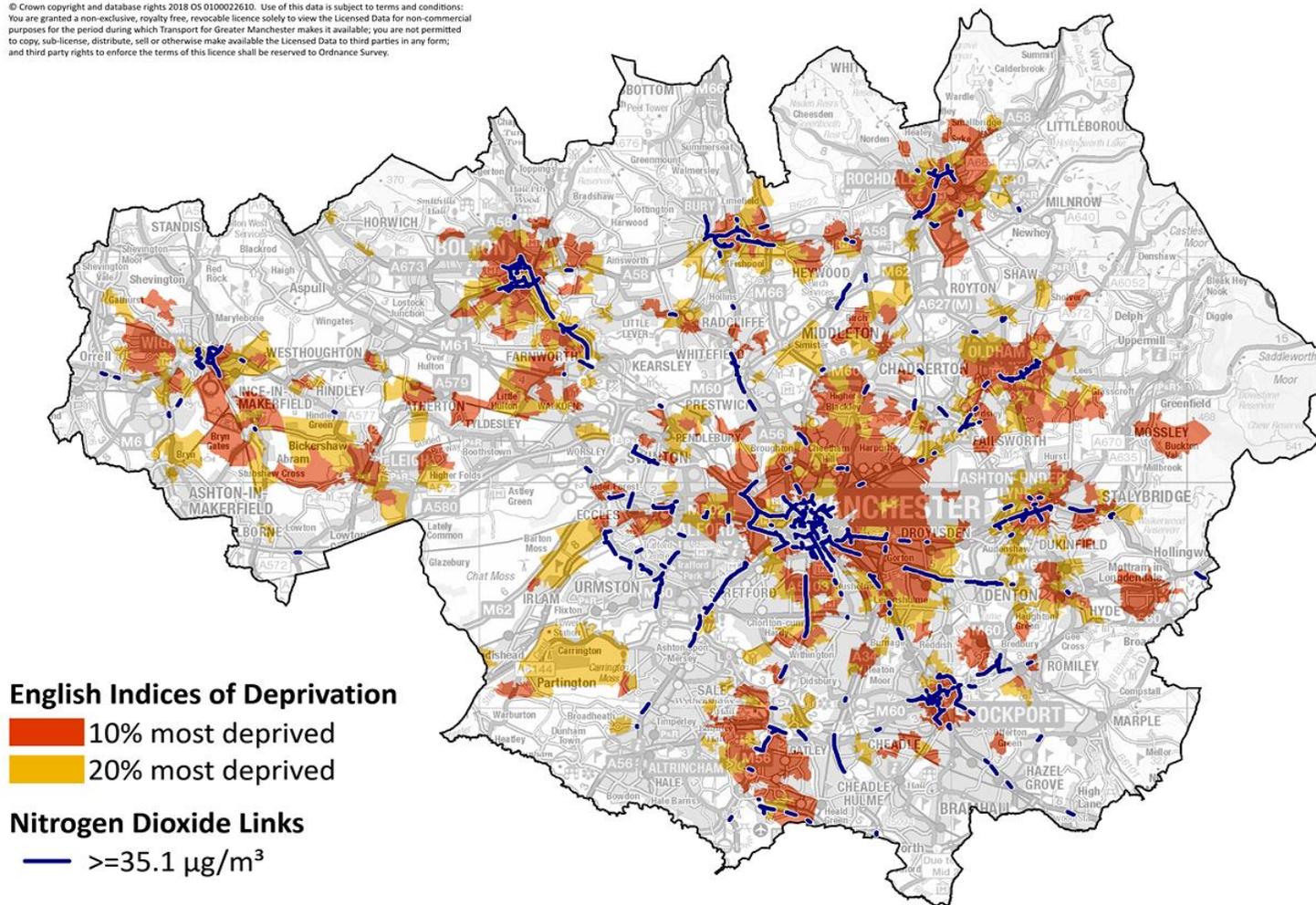
1.4.12 People living in areas suffering from poor air quality are less likely to own a car and to drive regularly.³⁶ This includes those on low-incomes, students and wealthier city dwellers (who are more likely to have chosen a car-free lifestyle). Figure 1- 6 below shows the relationship between locations close to or in exceedance of the EU Limit Value and deprivation.

³⁵ Selected Census 2011 variables available at the 2011 Output Area geography. Note: TfGM’s segmentation dataset informed the choice of Census 2011 variables displayed.

³⁶ TfGM analysis of Acorn 2017 (CACI) data.

Figure 1- 6: Index of multiple deprivation and the links with high levels of NO₂ in Greater Manchester³⁷

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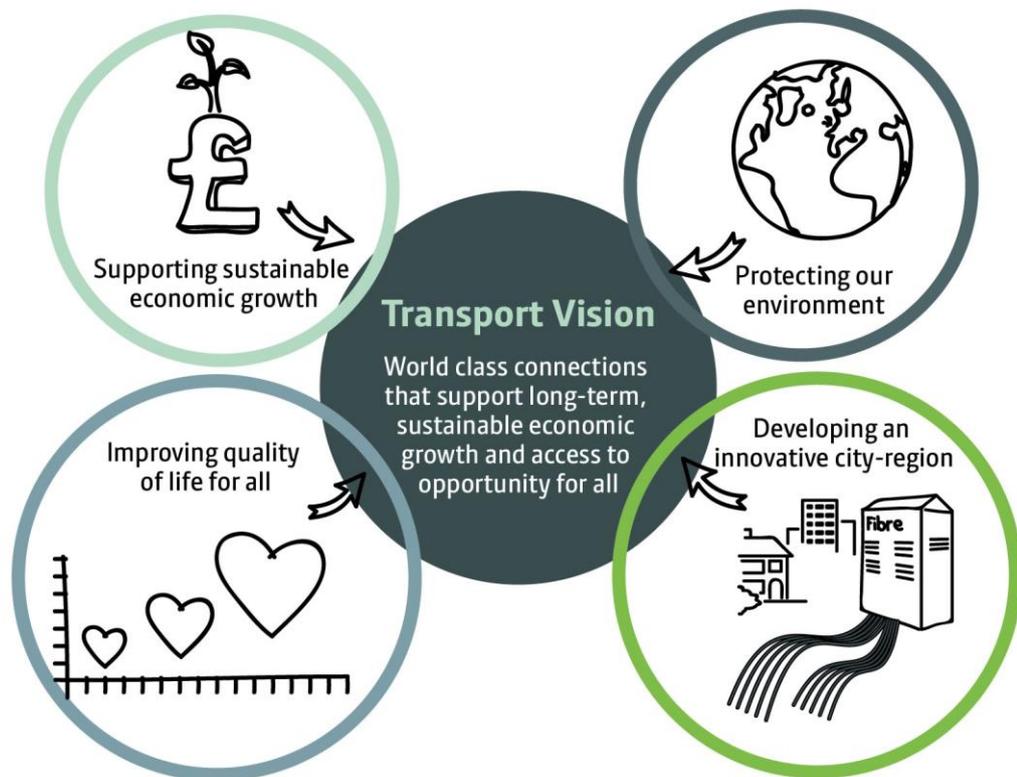
³⁷ English indices of deprivation (2015). Published 30 September 2015. From: Ministry of Housing, Communities & Local Government Available at: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015>

1.5 What is Greater Manchester doing about air quality?

1.5.1 Improving air quality is a key policy priority for Greater Manchester. The Greater Manchester Strategy³⁸ states that Greater Manchester should be ‘a place at the forefront of action on climate change with clean air and a flourishing natural environment’ including by ‘reducing congestion and improving air quality’.

1.5.2 Air Quality is also a key focus of the Greater Manchester Transport Strategy 2040³⁹ (“2040 Strategy”), which is Greater Manchester’s current statutory Local Transport Plan, prepared by TfGM on behalf of the GMCA and the Greater Manchester Local Enterprise Partnership (GMLEP). The four key elements of the 2040 vision are set out below:

Figure 1- 7: Greater Manchester Transport Strategy 2040 Vision⁴⁰



1.5.3 The Strategy highlights the range of negative impacts of motorised transport on our environment and highlights the need to:

- increase the use of sustainable transport modes as realistic alternatives to car use;
- reduce transport emissions that cause air pollution and climate change;

³⁸ <https://www.greatermanchester-ca.gov.uk/ourpeopleourplace> 2017

³⁹ <https://www.tfgm.com/2040>

⁴⁰ Greater Manchester Transport Strategy 2040 (2017), p.3 TfGM <https://www.tfgm.com/2040>

- make best use of existing infrastructure; and
- protect the natural and built environment from the impacts of transport.

1.5.4 The strategy also establishes seven mutually-reinforcing network principles (each with its own ambition statement) which will be applied consistently as we improve Greater Manchester’s transport system (See Figure 1- 8 below):

Figure 1- 8: Greater Manchester Transport Strategy 2040 Network Principles⁴¹



1.5.5 The 2040 Strategy demonstrates Greater Manchester’s commitment to delivering a more sustainable, integrated and healthy transport system, with a particular focus on dramatically reducing transport emissions.

1.5.6 The 2040 Strategy is accompanied by 5-year delivery plans, which set out the city-region’s short-term delivery priorities. In addition to identifying a range of improvements to sustainable transport in Greater Manchester, the current 5-year Delivery Plan (2016/17-2021/22)⁴² includes a commitment to studying the potential for a Clean Air Zone (CAZ).

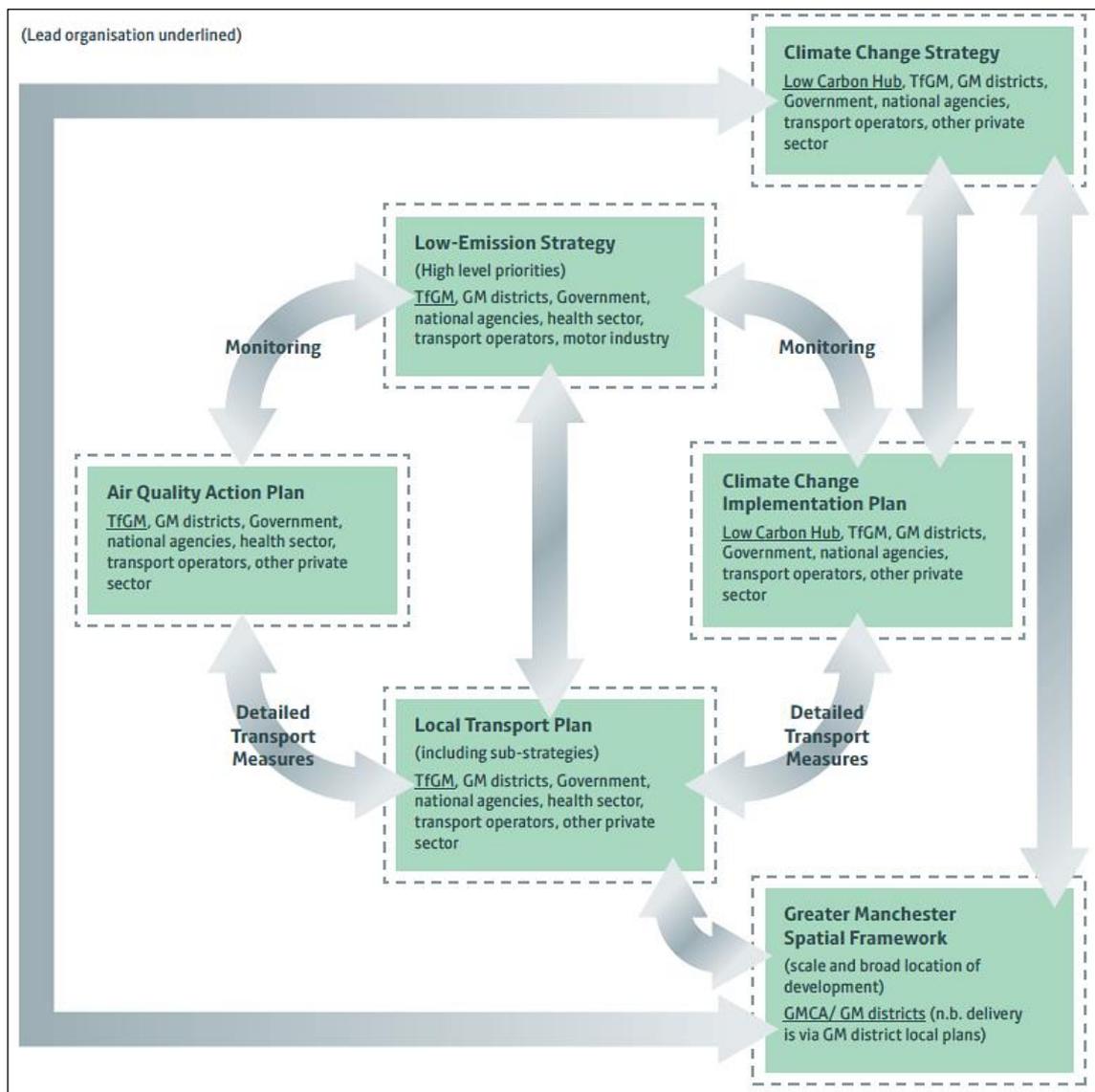
⁴¹ Greater Manchester Transport Strategy 2040: Executive Summary (2017), TfGM p.10

⁴² Greater Manchester Transport Strategy 2040: Delivery Plan 2016/17 – 2020/21 (2017), TfGM

1.5.7 A draft updated 5-year Delivery Plan for 2020 to 2025⁴³ was published in January 2019, and includes a range of recommendations for delivering Greater Manchester’s clean air and carbon reduction ambitions, building on the Air Quality Action Plan (AQAP) 2016-2021 and Low Emission Strategy (LES) (GMCA, 2016). These include investment in the Greater Manchester Electric Vehicle (GMEV) charging network; ambitions to deliver a zero-emission bus fleet by 2040; transformation of cycling and walking infrastructure to reduce car use for shorter trips (including £160m investment in the next few years); and Measures to reduce freight emissions.

1.5.8 Figure 1- 9 below shows the relationship between the various strategies which we already have in place to tackle emissions in Greater Manchester.

Figure 1- 9: Relationship between different Greater Manchester strategies which tackle transport emissions⁴⁴

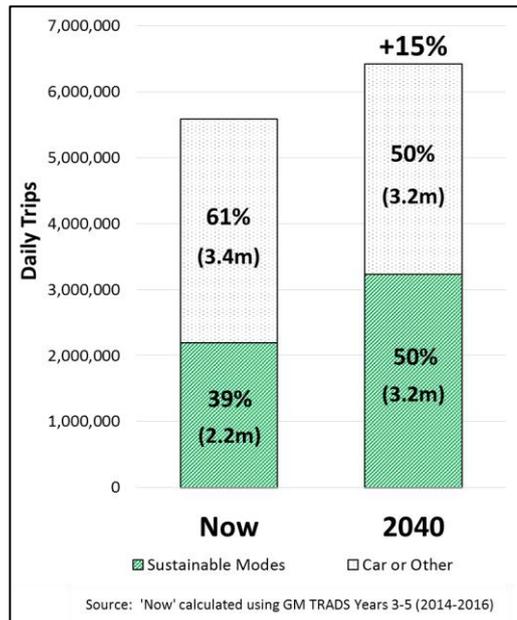


⁴³ Greater Manchester Transport Strategy 2040 Draft Delivery Plan (2020-2025) (2019), TfGM

⁴⁴ Greater Manchester Low Emission Strategy (2016), GMCA p.5 <https://www.greatermanchester-ca.gov.uk/media/1276/low-emission-strategy-dec-2016.pdf>

1.5.9 The 2040 Strategy draft delivery plan for 2020-2025 also sets out a quantified future vision for 2040, as set out below in Figure 1- 10.

Figure 1- 10: Our mode share ambitions for 2040⁴⁵



1.5.10 This demonstrates our vision for an additional one million trips per day to be made by sustainable modes, which will require a significant reduction in the proportion and overall number of trips that are made by car. These ambitions have been derived from a series of carefully considered targets relating to future land use, travel patterns and transport provision, taking into account Office for National Statistics population growth forecasts. They are expected to deliver Greater Manchester’s planned growth (as set out in the draft Greater Manchester Spatial Framework⁴⁶) without an overall increase in total private road-vehicle traffic⁴⁷, which would be an extremely positive outcome for the city-region; and will need partnership working across the ten Greater Manchester local authorities and the GMCA.

1.5.11 Greater Manchester has also set targets for CO₂ emission reduction that exceed national ambitions – a reduction of 48% by 2020 (based upon 1990 levels); and to become carbon neutral by 2038⁴⁸, and Greater Manchester signed up to become a WHO ‘BreatheLife’ city, with the associated aim of achieving WHO air quality targets by 2030.

⁴⁵ Greater Manchester Transport Strategy 2040 Draft Delivery Plan 2020-2025 (2019) TfGM

⁴⁶ <https://www.greatermanchester-ca.gov.uk/what-we-do/housing/greater-manchester-spatial-framework/gmsf-full-plan/>

⁴⁷ The targeted zero increase in private motor-vehicle traffic includes trips by Greater Manchester residents, as well as trips by non-residents and goods vehicle movements, which will also be influenced by our transport and land-use interventions - but less so. We expect zero growth in motor-vehicle traffic to be achieved by a net reduction in residents’ traffic (the great majority of motor vehicle-km in Greater Manchester); an increase in light goods vehicle movements; and – potentially – some net increase in car-trips by non-residents.

⁴⁸ Greater Manchester’s Springboard to a Green City Region (2018) GMAF <https://www.greatermanchester-ca.gov.uk/media/1317/springboard-report.pdf>

1.5.12 A key priority for Greater Manchester is to seek to meet its legal requirements on air quality, whilst also taking a holistic view of what is required to deliver our 2040 Strategy Vision for a “*world class transport system that supports long-term sustainable economic growth and access to opportunity for all*”. This integrated approach and long-term perspective is essential if the benefits of the GM CAP are to be maximised and the risks of unintended consequences minimised.

How Greater Manchester is using all available funding to deliver clean air

1.5.13 Greater Manchester has consistently used its available transport funding to improve public transport and active travel options, thereby encouraging people to leave their car at home and travel more sustainably. Greater Manchester works to maximise all opportunities to access funding for the region to make it easier and more appealing to travel by public transport, bike or on foot. In the long term, reducing the need to travel by car is the best way to reduce emissions from transport and improve air quality. In particular:

- **Greater Manchester Transport Fund 1 (2009-2017):** £1.5 billion local and government investment in clean transport infrastructure, including tripling size of Metrolink network (zero direct emissions), the Leigh-Salford-Manchester guided busway scheme, including low emission fleet, and the transport interchange renewal programme which has been rolled out to most of Greater Manchester’s principal towns.
- **Transforming Cities Fund 1:** Delivering £160m of major walking and cycling improvements across Greater Manchester, supported by an additional £40m Cycle City Ambition Grant, as well as £83m towards 27 new Metrolink trams and supporting infrastructure, which will come into service between 2020 and 2021.
- **Transforming Cities Fund 2:** In the 2018 autumn budget, Greater Manchester was granted an additional £69.5m (to be spent by 2023). The intention is to prioritise this funding (in 2019) to deliver on improving public transport provision for both existing communities, and housing and employment growth areas identified in the Greater Manchester Spatial Framework (GMSF)⁴⁹. Schemes under consideration aim to promote sustainable travel choices and include new stops on the Metrolink, Park and Ride schemes and bus improvements.
- **Growth Deal:** Delivering c.£400m of improvements through schemes such as Stockport Town Centre Accessibility Improvements, Salford Bolton Network Improvements and Tameside interchange.

⁴⁹ [Greater Manchester Spatial Framework Revised Draft \(2019\) GMCA](#)

1.5.14 Greater Manchester has secured £3m of **Early Measures Funding** in advance of submitting its Clean Air Plan. These funds will be used to promote EVs and cleaner choices:

- **Installing EV charging points:** Greater Manchester's Electric Vehicle (GMEV) network is one of the biggest and most modern in the UK, with 318 charging points. The network is currently being re-tendered with the ambition of doubling this provision. Early Measures Funding is being used to install at least 24 dual-headed rapid EV charging posts providing 48 new rapid charging points in total.
- **Promotion of EVs:** Early Measures Funding is also being used to promote the use of EVs and the expanded GMEV network.
- **Communications campaign:** Delivering a communications campaign to support the wider GM CAP by raising awareness of the need to clean up our air and promote alternative travel options.

1.5.15 Greater Manchester also secured £3m from the **Clean Bus Technology Fund** to upgrade the local bus fleet, targeted at air quality hotspots. Greater Manchester has a deregulated bus service and thus operators can make decisions about the routes and services they choose to run and the buses they choose to operate on those services. The Greater Manchester bus fleet is largely made up of Euro IV and V buses (around 1,300 buses), with around 350 older buses still in operation. The Clean Bus Technology Fund will provide support to operators to retrofit their vehicles as follows:

- **Phase 1:** operators are currently retrofitting 111 vehicles at a cost of £1.9m, targeted at routes with locations of non-compliance; and
- **Phase 2:** tendering is underway to retrofit an estimated 60 buses with the remaining funds.

1.5.16 Greater Manchester has been invited to submit a further bid for funding to the Clean Bus Technology Fund and preparation of such a bid is underway.

1.5.17 Greater Manchester has recently been successful in securing further funding to support the delivery of a low emission bus and taxi fleet:

- **Office for Low Emission Vehicles (OLEV):** £1.8m of funding has been secured to deliver 80 dual-headed rapid charging points to be installed across Greater Manchester for primary use by taxis and private hire vehicles, so that they get booking priority. This will be supported by a significant local match-funding requirement of £3.9m.
- **Ultra-Low Emission Bus Scheme:** the Greater Manchester region has secured around £15m funding to support the purchase of 70 ultra-low emission buses by the GMCA, Manchester Community Transport, Stagecoach Manchester and First Bus Manchester.

1.5.18 Greater Manchester uses **revenue funding** (generated principally from a transport levy on council tax from the 10 local authorities, a Greater Manchester Mayoral precept, plus net Metrolink revenues) to fund concessionary fares for children, elderly and disabled people; and to subsidise parts of the bus network that operators consider insufficiently profitable (especially in the evenings and on Sundays) but that are essential to connect people with work and other local services. Greater Manchester also funds and manages the delivery of the Ring and Ride accessible transport service, which provides door-to-door, demand-responsive transport to local residents who find it difficult to use conventional public transport due to disability or limited mobility. Additionally, TfGM supplies flexible transport services under the Local Link brand for journeys in areas where fixed route public transport services are limited. In 2018/19, the budget for these revenue activities totalled nearly £100m.

1.5.19 Local authorities in Greater Manchester are seeking new sources of funding to deliver cleaner air and improve sustainable travel options in the region:

- **Future High Streets Fund:** A new £675m national fund was announced in the Autumn Budget. In 2019 Greater Manchester will be preparing a bid for funding to invest in physical infrastructure in town and city centres (including transport enhancements).
- **Highways England:** Greater Manchester is also exploring opportunities for accessing funds from the £100m Highways England designated fund to tackle air quality challenges in the region related to the SRN.

1.5.20 The goal of this work is to clean up the fleet and improve sustainable travel options across the region, with the ultimate aim of delivering substantial mode shift to public transport and active travel to achieve the ambition that by 2040 half of all journeys are made by sustainable modes. In the longer term, this investment will deliver more sustainable travel patterns and improved air quality. Nevertheless, the imperative of the GM CAP is to act quickly to deliver a step change in air pollution, and this requires significant action.

1.5.21 In this OBC, Greater Manchester has focused its attention on actions that most directly contribute to clean air in the shortest possible time. These actions sit within a wider vision and delivery plan for a vibrant, innovative and successful city region that offers people a sustainable, healthy and good quality way of life.

What help does Greater Manchester need from Government to clean up its air?

1.5.22 Beyond the funding and technical support required to deliver the Measures proposed in this OBC, TfGM, the GMCA and the ten local authorities are united in their call to Government to take action and agree a new deal for the city region to make the transport and air quality plans a reality. Greater Manchester is asking for the creation of a Greater Manchester Transport Fund 2, a fully devolved, long-term infrastructure budget for the region.

1.5.23 In support of, and as a precursor to any future GM CAP, the Greater Manchester Mayor and Authorities have highlighted specific actions needed from central Government. These include:

- clear arrangements and funding to develop workable vehicle renewal scheme/upgrade Measures;
- short-term effective interventions in vehicle and technology manufacturing and distribution, led by central Government with local authorities;
- replacement of non-compliant buses;
- reform of taxi and private hire legislation to enable licensing authorities to enforce minimum standards and manage out-of-area operation;
- powers to act on congestion, including moving traffic offences;
- rail devolution to enable us to improve performance;
- swift action on outstanding rail commitments in relation to the Northern Hub, including investment along the Castlefield corridor to increase capacity at Piccadilly and Oxford Road stations and progress on electrification commitments.

1.5.24 Furthermore, Greater Manchester asks central Government to take action to tackle the impact of the extensive local motorway network on air quality in the region. Greater Manchester contains around 120km of SRN, managed by Highways England and outside of the control of local authorities and the Mayor. At local roads close to the SRN, pollution caused by motorway traffic can be as much as 50% greater than that from the local road; and homes are in close proximity to parts of the SRN in exceedance of legal limits. Some parts of the SRN carry substantial volumes of through-traffic, for example 30-40% of east-west HGV traffic does not enter or exit the SRN in Greater Manchester. It is clear that Highways England will need to take more action, to ensure that local businesses and workers contributing to the Greater Manchester economy do not bear the brunt of action taken on air quality, whilst through-traffic can travel unimpeded.

1.5.25 Nevertheless, Greater Manchester recognises the need to act quickly to comply with the Ministerial Direction and therefore this OBC sets out a plan that can achieve compliance in the shortest possible time, in a manner which is consistent with the Greater Manchester local authorities' legal and statutory duties and is achievable within its current powers.

1.6 Development of a Clean Air Plan for Greater Manchester

Case for change

- 1.6.1 Section 1.3 shows that there are high levels of NO₂ in Greater Manchester that exceed the EU Limit Value whilst section 1.4 underlines the negative impact this has on society and therefore presents a need for intervention. Besides the health and economic reasoning for the intervention, eight of the ten Greater Manchester local authorities have been given a direction under the Environment Act 1995 because modelling by the UK Government shows NO₂ concentrations exceed the EU Limit Value. The final two local authorities, Wigan and Rochdale, have been identified as containing exceedances through more detailed local modelling (as discussed in section 1.2) and it has been agreed to develop a comprehensive plan for the whole of Greater Manchester in recognition that travel and emissions are not confined within district boundaries and to avoid displacement of the problem by taking isolated action in some districts and not others.
- 1.6.2 The interventions needed to reduce NO₂ concentrations in Greater Manchester are proposed within this OBC, with further detail of the expected impact documented in the Economic Case and optioneering appendix A1.

Aim of a Clean Air Plan

- 1.6.3 The primary aim of the GM CAP is to enable Greater Manchester to reduce NO₂ concentrations to below the EU Limit Value in the shortest possible time. This is to be achieved in a manner which is consistent with the Greater Manchester authorities' legal and statutory duties. In doing so it supports delivery of the 'UK plan for tackling roadside nitrogen dioxide concentrations.
- 1.6.4 Furthermore, the project aims to deliver a Plan that is as consistent as possible with the region's wider economic, social and environmental policy objectives.

Approach to delivering Greater Manchester's Clean Air Plan

- 1.6.5 Greater Manchester's ten local authorities have chosen to work together and through the GMCA to produce a region-wide GM CAP. This collaborative approach is essential given the scale and extent of the problem, such that region-wide solutions will be necessary. Working together reduces the risk of displacing air pollution problems between districts and offers a solution that is as simple as possible for those affected to understand and comply with. It will enable more holistic, GM-wide solutions to be developed to tackle air quality issues, ensuring that the proposals are in line with the wider strategic goals of the region. Working together is the only way to deliver compliance in the shortest possible time.
- 1.6.6 TfGM is coordinating the approach between the GMCA and the ten local authorities to undertake the feasibility study and to develop the GM CAP.

- 1.6.7 A GM CAP Senior Leadership Steering Group (Steering Group) is responsible for: guiding the feasibility study, briefing senior officers and elected Members in their respective organisations, and securing local approvals. Representatives include Directors or Assistant Directors from each local authority and senior representatives from Highways England, Public Health England, JAQU, GMCA, Local Partnerships and TfGM.
- 1.6.8 This OBC builds upon the previously submitted SOC and sets out the range of Measures that have been assessed to understand their potential to achieve the aims of the CAP, either as a stand-alone Measure or as part of an option of grouped Measures. It recommends a preferred option for further development as part of the Full Business Case (FBC) to be consulted on with stakeholders, including the public.

What is a Clean Air Zone

- 1.6.9 Government guidance sets out charging Clean Air Zones (CAZ) as the measure most likely to achieve EU Limit Value for NO₂ in towns and cities in the shortest possible time. A charging CAZ places a penalty on the most polluting vehicles if they travel into, within or through a designated area. Government specifies four classes of CAZ that apply penalties to different types of vehicle that are classified as non-compliant because they fall below particular euro emission standards. Cleaner vehicles are unaffected.

Category A: Buses, coaches, taxis and private hire vehicles (PHVs)

Category B: Buses, coaches, HGVs, taxis and PHVs.

Category C: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and PHVs

Category D: Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and PHVs, cars, motorcycles/mopeds

- 1.6.10 The associated emissions standards are as follows:

Euro 3 for motorcycles, mopeds, motorised tricycles and quadricycles.
Applied since 2007

Euro 4 for petrol cars, vans, minibuses and other specialist vehicles. Applied since 2006

Euro 6 for diesel cars, vans and minibuses and other specialist vehicles.
Applied since 2015 (for cars) and 2016 (for vans)

Euro VI for lorries, buses and coaches and other specialist heavy vehicles.
Applied since 2013

A vehicle's Euro emission standard is shown in the vehicle registration document – also known as a V5C.

- 1.6.11 The approach that Greater Manchester has taken in considering what vehicles should be included in potential CAZs follows the Government framework. In general vehicles, such as lorries and buses, or high frequency users such as taxis and private hire vehicles (PHVs) emit higher levels of pollution on a per vehicle basis.⁵⁰ Analysis carried out by DEFRA demonstrated that tackling buses, heavy goods vehicles and LGVs in that order was the most cost effective approach to the UK.⁵¹
- 1.6.12 Whilst car traffic is the greatest contributor to NOx emissions, individually, cars are used much less intensively. Analysis by the RAC Foundation (which is backed up by local evidence on Greater Manchester car usage) suggested that the average car in the UK is parked for more than 95% of the time.⁵² In comparison, commercial and passenger transport vehicles are used much more intensively, and are often operating in the most densely populated areas, so the benefit of cleaning up each vehicle is significantly greater than for cars.
- 1.6.13 CAZs differ from Congestion Charging systems because of their very different objectives and time-spans. A CAZ does not seek to reduce the number of vehicles on roads but to clean up the fleet. Only the more polluting vehicles are required to pay, those driving cleaner vehicles can travel without charge. This also means that as vehicles are upgraded the number of penalties levied reduces, with ultimately all or nearly all vehicles becoming compliant and being able to travel without penalty. Under a Congestion Charge, the requirement to pay applies to all vehicles, is enduring, and creates a long-term revenue stream. Over time, the revenue provided by a CAZ will reduce as fewer vehicles are required to pay the penalty.

Assessing the options for action

- 1.6.14 The first output of the Greater Manchester feasibility study was the Strategic Outline Case (SOC) that was approved by the ten Greater Manchester local authorities and submitted to Government in March 2018. In this document, a long-list of 96 options was presented and sifted to a shortlist of 17 based on the Government's Primary Success Criteria (reduction of NO₂ concentrations in the "shortest possible time"). These shortlisted Measures are shown in Table 1- 5 below.

⁵⁰ 'Clean Air Zone Framework: Principles for setting up Clean Air Zones in England', DEFRA/DfT May 2017

⁵¹ 'The abatement cost guidance for valuing changes in air quality' DEFRA May 2013

⁵² <https://www.racfoundation.org/research/mobility/spaced-out-perspectives-on-parking>

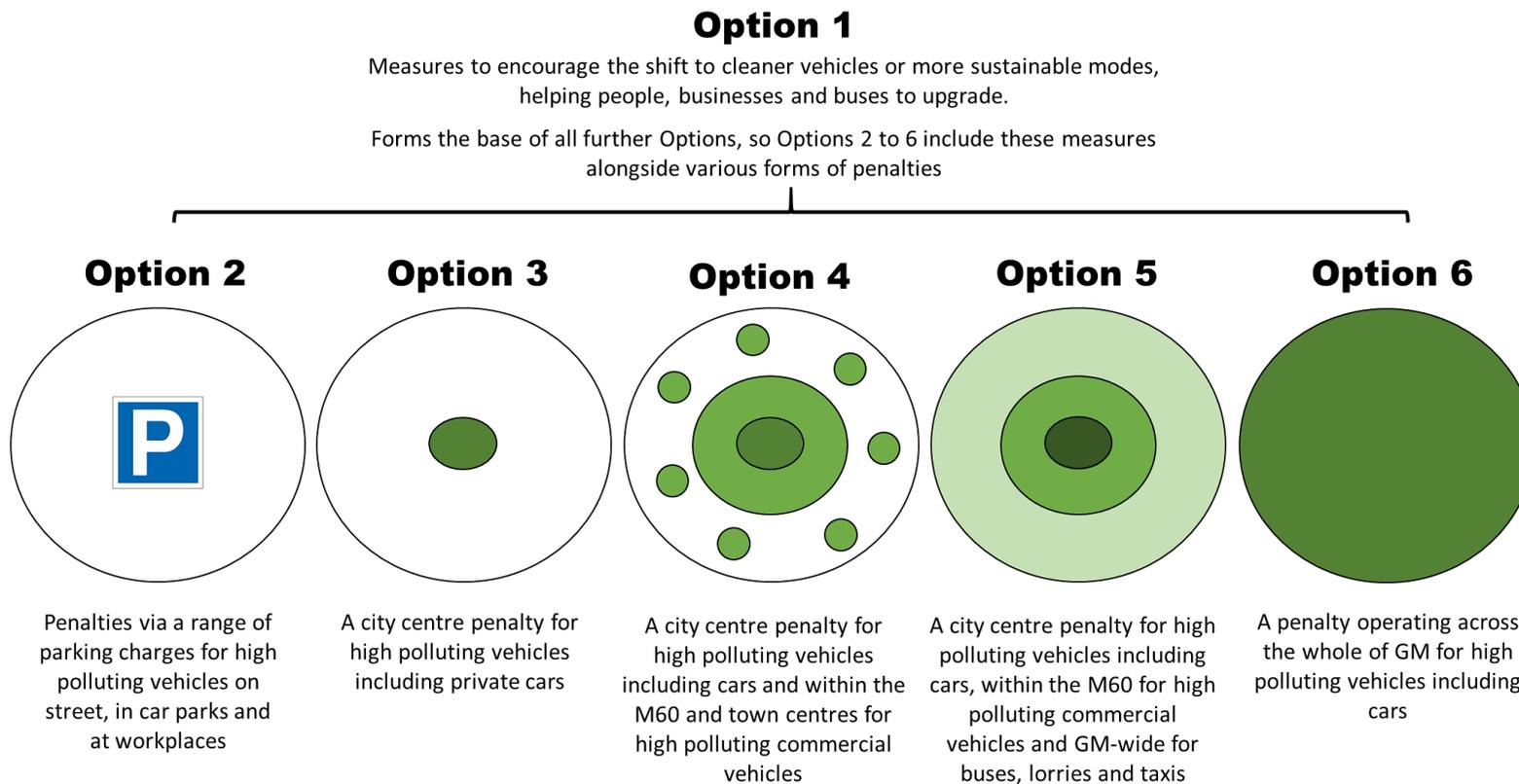
Table 1- 5: Measures shortlisted in the SOC

Shortlisted Measure	Details
Clean Air Zone – Category B, C or D	Different classifications/time restriction and geographical areas to be modelled for their impact on NO ₂ and timescale of any impact.
Differential parking charges	E.g. different charges for times of day, vehicle type, car-sharers and could include a workplace parking levy.
Retrofit/upgrade public transport fleet	Retrofit or upgrade vehicles to a higher Euro standard.
Retrofit/upgrade local authority fleets	Retrofit or upgrade to a higher Euro standard (procurement).
Increase public transport capacity	Identify specific routes where most impact will be made.
Switch Bus/HGV/LGV/GM fleet to Gas to Liquid	Using cleaner alternative fuels
Electric vehicle (EV) incentivisation	Increase EV uptake through expanding the charging network or financial incentives.
Congestion Deal – increase capacity	Review existing junction improvement plans – assess impact and identify opportunities to accelerate.
Congestion Deal – encouraging alternatives	Encouraging alternative travel choices through road space reallocation.
Congestion Deal – network management	Changing traffic signal timing to optimise flows, reducing congestion.
Private hire and taxi alternative fuels	Incentivise shift to EV/Ultra-Low-Emission vehicles; increase EV infrastructure for taxis; and retrofitting and increasing Liquid Petroleum Gas (LPG) refuelling infrastructure for taxis.
Communications campaigns	Increase awareness of health and cost benefits for public and of different modes of transport or around particular communities/schools.
Sustainable travel engagement	Work with employers and individuals to encourage sustainable travel choices.
Active travel programme – infrastructure	Expand and improve cycling and walking infrastructure.

1.6.15 As previously described, local modelling has revealed the problem to be bigger than that initially identified by Government. Local modelling predicts a greater spatial distribution of NO₂ exceedances across roads in Greater Manchester and generally higher concentrations of NO₂ in specific locations.

- 1.6.16 The SOC described the complex causes of exceedances across Greater Manchester, relating to high volumes of traffic, slow traffic speeds, the composition and age of the fleet, the urban geography (particularly canyons caused by high buildings). The profile at each site is different, but the scale of the challenge means that the solutions are inter-related. Localised solutions such as re-routing traffic or tackling local pinch points will clearly be insufficient to tackle the region-wide problem, and risk simply moving the problem elsewhere. This meant that any effective proposals needed to involve a package of Measures able to tackle the problem holistically and beyond authority boundaries, to avoid unintended consequences of action in one authority on the problem in another. It became clear that working together was imperative. As the scale of the proposed Measures increases, the feasibility of delivery in a short timescale becomes increasingly complex and challenging. Nevertheless, the scale of the problem means that large scale interventions will inevitably be required.
- 1.6.17 A series of six options, containing packages of Measures including CAZ schemes at different categories and a range of geographies, were developed in response to the problem as revealed by local modelling. These Measures have been further refined from the shortlist in Table 1- 5, involving the development and assessment of more detailed proposals for each type of Measure. This process is described in more detail in Appendix A1 [Optioneering report].
- 1.6.18 Concurrently, an exercise was undertaken to further refine the Measures from the shortlist in Table 1- 5, involving the development and assessment of more detailed proposals for each type of Measure. As a result of this process, some Measures were rejected as being ineffective or not deliverable within the timescales and with existing powers. This process is described in more detail in Appendix A1.

Figure 1- 11: Summary of six Options for initial appraisal



1.6.19 The six options have been assessed against the UK Government's Primary Success Criteria:

- **Reduction in NO₂ emissions:** the likelihood that the Measure/option will contribute significantly to a reduction in NO₂ concentrations, enough to achieve compliance with the EU Limit Values.
- **Feasibility:** the likelihood of the Measure being implemented in the shortest possible time to deliver the desired NO₂ reduction and achieve compliance. This should consider real-life factors that could delay implementation such as the ease of putting governance systems in place to facilitate local government cooperation and the local authorities having the jurisdiction to implement such Measures/options. It should also consider the likelihood of the Measure being effective.

1.6.20 The Options have been further assessed against a series of Secondary Success Criteria as set out in the SOC and agreed with JAQU, as follows:

- **Strategic fit with local strategies and plans:** ensuring the alignment of the option with longer-term economic, social and environmental goals and that the risk of unintended consequences is minimised.
- **Value for money:** a high-level indication of the costs and benefits of each option, noting that a more detailed cost benefit analysis is presented for the best performing options in the Economic Case, which will be further refined for the preferred option in the FBC.
- **Distributional impact:** in order to understand the potential impacts, both positive and negative on different groups within society, with a particular focus on the most vulnerable. It is of vital importance that the Plan does not result in disproportionately negative economic or social impacts for the region or those living, working or doing business within it.
- **Deliverability** of the options, in terms of the **affordability** of the cost of implementation, the **supply-side capacity and capability** to deliver the Measures outlined in the options, and the **achievability** of delivering the option, considering potential issues such as obtaining the resources to implement and operate a Measure/option.

1.6.21 Note that no weighting has been applied to these criteria, beyond the requirement that the Options should deliver compliance in the shortest possible time (the determining criteria) and be feasible.

1.6.22 The assessment process involved further modelling and analysis of the effectiveness of Measures individually and as a package; engagement with stakeholders and professional experts, and the use of a Multi-Criteria Analysis (MCA) tool to assess the performance of each option against the success factors and relative to each other. This process is described in more detail in Appendix A1.

1.6.23 Engagement with stakeholders has helped to shape the options being considered within the GM CAP and has been used to raise awareness of the GM CAP. A range of workshops and meetings were conducted to help stakeholders understand the scale of the problem, involving local authorities, Highways England and Greater Manchester health bodies. These identified a range of Measures and interventions for further analysis over the course of four half-day sessions between 30 January and 5 February 2018.

1.6.24 Industry engagement has also been central to informing stakeholders and providing insight on the feasibility of proposed interventions:

- **Freight:** TfGM has updated the freight and logistics industry via presentations at two separate meetings of the Greater Manchester Freight Forum each attended by around 70 stakeholders in October 2017 and March 2018. This included updates on the problem, the proportion of the issue which is HGV/LGV-related and then outlined the shortlisted Measures. The most recent forum was 8 March 2018; this event should occur every six months but feedback indicated stakeholders wanted confirmed information which was not possible until the formulation of the OBC. One of the shortlisted Measures that has not been taken forward to the OBC is a development of Gas to Liquid alternatives; this was rejected following a survey of Greater Manchester Freight Forum members in which they expressed concern over cost and the potential effects on the warranty of vehicles. Updates have been provided on a regular basis to freight representative bodies, to share with their members.
- **Bus:** TfGM's mechanism for interacting with bus operators is via the regular OneBus forum, who represent 18 bus operators across Greater Manchester, and which has been used to update members regularly on relevant issues. As well as this, updates have been provided at the regular Regional Centre Bus Partnership meetings, chaired by Manchester City Council. During summer 2018 fleet data was provided to TfGM by bus operators to understand more about the GM-wide fleet, to inform measures development. On 8 November 2018, TfGM updated a wider group of bus operators and, following an update on Target Determination began to focus on the feasibility of retrofitting different ages/types of vehicles as well as upgrades. Feedback from this meeting showed there were concerns around the capacity for the potential demand of retrofitting, within GM and more widely, the supply of greener vehicles, funding to support these changes and timescales for implementation. The Clean Air Plan links with the Clean Bus Technology Fund and Greater Manchester aspirations for a zero carbon bus network. This has fed into the detail of the interventions for bus fleet enhancement.

- **Taxi and Private Hire:** TfGM conducted three workshops with taxi and private hire trade bodies from a number of areas in Greater Manchester between 13 and 21 August. The primary purpose of these preliminary workshops was to gauge opinion on a range of potential Measures such as electric vehicles and retrofitting with LPG. This process informed the development of a range of options for Private Hire and taxi trade in Greater Manchester. The taxi and Private Hire trade told us that subsidies and low interest rate loans would be beneficial as would other incentives through licensing and traffic flow. EV charging infrastructure was key to take up, but there's a limited choice for electric taxis. They also had concerns around the timescales for implementation.
- **The Local Enterprise Partnership and GM-wide representative bodies:** The Greater Manchester Local Enterprise Partnership has been updated throughout development of the OBC, allowing the business community to input comments throughout the process. Updates have been provided to GM-wide representative business bodies, providing them with an opportunity to share information with their members, present their national positions on Clean Air and express any concerns around the GM Clean Air Plan process. Certainty around the emissions standards and the timescales for implementation were two of the issues raised.

1.6.25 A brief summary of the outcomes of the initial appraisal of these Options is presented in Figure 1- 12 below and more detail is provided in Appendix A1.

Figure 1- 12: Outcome of initial appraisal of six Options

Option	Evaluation	Outcome
<p>Option 1: Measures to encourage the shift to cleaner vehicles or more sustainable modes, helping people, businesses and buses to upgrade.</p> 	<p>Assessment of a range of measures suggests that:</p> <ol style="list-style-type: none"> 1. Some are not likely to be effective in tackling air quality, such as conversion from Gas to Liquid fuels or junction improvement schemes; 2. Some could be effective but are not deliverable within the timescale, such as new public transport capacity; and 3. Some could be effective with measures to deter the use of dirtier vehicles, such as incentives to upgrade & scrap vehicles, promotion of electric vehicles, and measures to promote sustainable travel choices. 	<p>On its own, does not deliver compliance in the shortest possible time. Effective and feasible measures have been incorporated into the Best Performing Options for full evaluation.</p>
<p>Option 2: Penalties via a range of parking charges for high polluting vehicles on street, in car parks and at workplaces</p> 	<p>Parking measures have limited effect on the heaviest and dirtiest vehicles such as HGVs and buses and only affect those cars and vans that need to park in public places – so those with private off-street parking are not affected regardless of how dirty their vehicle is. In practice, would be expensive and slow to deliver due to existing contract restrictions.</p>	<p>Does not deliver compliance in the shortest possible time. Will not be progressed.</p>
<p>Option 3: A city centre penalty for high polluting vehicles including private cars</p> 	<p>A city centre penalty for high polluting vehicles would be effective in the city centre and have some effect on approach roads but would leave around 200 sites non-compliant across the remainder of GM, with non-compliance remaining in the city centre at some sites. Does not deliver compliance in the shortest possible time.</p>	<p>Does not deliver compliance in the shortest possible time. Will not be progressed.</p>
<p>Option 4: A city centre penalty for high polluting vehicles including cars and within the M60 and town centres for high polluting commercial vehicles</p> 	<p>Option 4 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about whether customers would be able to understand and therefore respond to such a complex set of boundaries, and about the economic impact on town centres and deprived areas within the M60.</p>	<p>Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.</p>
<p>Option 5: A city centre penalty for high polluting vehicles including cars, within the M60 for high polluting commercial vehicles and GM-wide for buses, lorries and taxis</p> 	<p>Option 5 would reduce the number of non-compliant sites by around 80% in 2021. Concerns remain about the appropriateness of a boundary at the M60, given the distribution and cause of AQ hotspots in the area and the level of deprivation. Concerns also remain about the viability & effectiveness of applying penalties to vans on a large scale given the limited availability/high cost of compliant vans in 2021.</p>	<p>Initial evaluation suggests this Option may deliver compliance in the shortest possible time. A revised version of this Option, reflecting lessons learned, will be subject to a full evaluation as a Best Performing Option.</p>
<p>Option 6: A penalty operating across the whole of GM for high polluting vehicles including cars</p> 	<p>A GM-wide penalty for high polluting vehicles does not deliver compliance in 2021, with more than 20 sites remaining non-compliant despite significant trips per day being subjected to a penalty. Furthermore, the modelling results are not considered credible as the method is not appropriate for a region-wide scheme for car drivers, and it is likely that behavioural responses have been over-estimated. Delivery of a scheme on this scale would be slow, complex and risky, and very considerable social and economic impacts would be likely and need mitigating.</p>	<p>Does not deliver compliance in the shortest possible time and risk that contravenes GM's wider statutory duties. Will not be progressed.</p>

1.6.26 For a more in-depth discussion of how the six options performed against the critical success factors, and why they were progressed or rejected, please see Appendix A1. This includes an explanation of why Option 6, despite appearing to provide the best outcome in emissions terms, is actually not considered likely to deliver compliance in the shortest possible time.

Best performing options identified for appraisal from high level assessment process

1.6.27 Following the initial appraisal of the six options, three options were developed as the 'best performing' options to be subject to a detailed appraisal process. These options are derived from Options 4 and 5 but have been adapted to reflect a deeper level of understanding of the issues that emerged throughout the initial options appraisal process. As such, they are considered more likely to deliver effective reductions in NOx emissions and greater compliance than the options as initially specified. The three developed options are Option 4, Option 5(i) and Option 5(ii) and are summarised below. In particular, the following changes have been made:

- A revised package of non-CAZ Measures, developed from Option 1, has been developed and incorporated into the three new options; Options 4, 5(i) and 5(ii)⁵³. This includes those Measures found in the initial assessment to be effective, and removes Measures found to be ineffective or not deliverable.
- The initial appraisal suggested that the second-hand van market would not be sufficiently mature by 2021 to support a large-scale CAZ for vans – a lack of available affordable compliant vehicles could result in a higher than predicted proportion of vehicles 'staying and paying' rather than upgrading, and could create substantial risk of economic damage. Therefore, implementation of the city region schemes has been divided into two phases:
 - Phase 1, in 2021, would be a CAZ B encompassing buses, taxis and PHVs, HGVs and coaches
 - Phase 2, in 2023, would be a CAZ C including LGVs and minibuses
- Finally, and related to the decision above, the M60 boundary in Option 5 has been abandoned, with the schemes reviewed for possible application within the Inner Relief Route (IRR) and would extend to Greater Manchester-wide instead. Applying an additional boundary adds cost and complexity to the scheme, and risks customer confusion. Further analysis showed that the M60 boundary does not reflect where the outstanding locations of non-compliance remain post-2021, many of which are outside this zone. Therefore, a CAZ C at the M60 boundary is not likely to deliver compliance in "the shortest possible time. More work is planned to develop a better understanding of where non-compliance remains post-2021 and the sources of these emissions and it is anticipated that refinements may be made to the later phase proposals to better reflect the

⁵³ 5 (i) and 5 (ii) are variations of the original option 5. Detail on them is presented below.

nature of the remaining problem and ensure compliance is delivered in the shortest possible time, and at the least cost to Greater Manchester.

1.6.28 The Options that were progressed for full appraisal in autumn 2018 are described below:

- **Option 4:** A CAZ Category D within the Inner Relief Route (IRR) to be delivered in Phase 1 (in 2021) alongside a CAZ Category B within the M60 and satellite towns. In Phase 2 (in 2023), the CAZ within the M60 and satellite towns extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 5(i):** A CAZ Category D within the IRR to be delivered in Phase 1 (in 2021) alongside a CAZ Category B across Greater Manchester. In Phase 2 (in 2023), the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.
- **Option 5(ii):** An enhanced CAZ Category D within the IRR such that all diesel cars and private hire vehicles would be subject to a penalty as well as non-compliant petrol vehicles and larger diesel vehicles older than Euro 6, reflecting that even compliant diesel cars have higher emissions affecting air quality than their petrol equivalents. To be delivered in Phase 1 (in 2021) alongside a CAZ Category B across Greater Manchester. In Phase 2 (in 2023), the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help people, businesses and bus operators upgrade.

1.6.29 Modelling has indicated that Option 4 is predicted to deliver compliance (so that all sites have concentrations below the limit value) by 2025, and the remaining Options 5(i) and 5(ii) are all predicted to deliver compliance one year earlier, in 2024. Option 4 is therefore ruled out of further consideration. Results of the modelling conducted for Option 4 can be found in Appendix AQ2.

Additional options identified after initial appraisal process

1.6.30 Following an initial evaluation in December 2018 by the ten local authorities of the appraisal results of the three options set out above, concerns were raised that there was insufficient information to allow a decision to be made. In particular:

- that the risk of unintended socio-economic consequences was not sufficiently understood; and

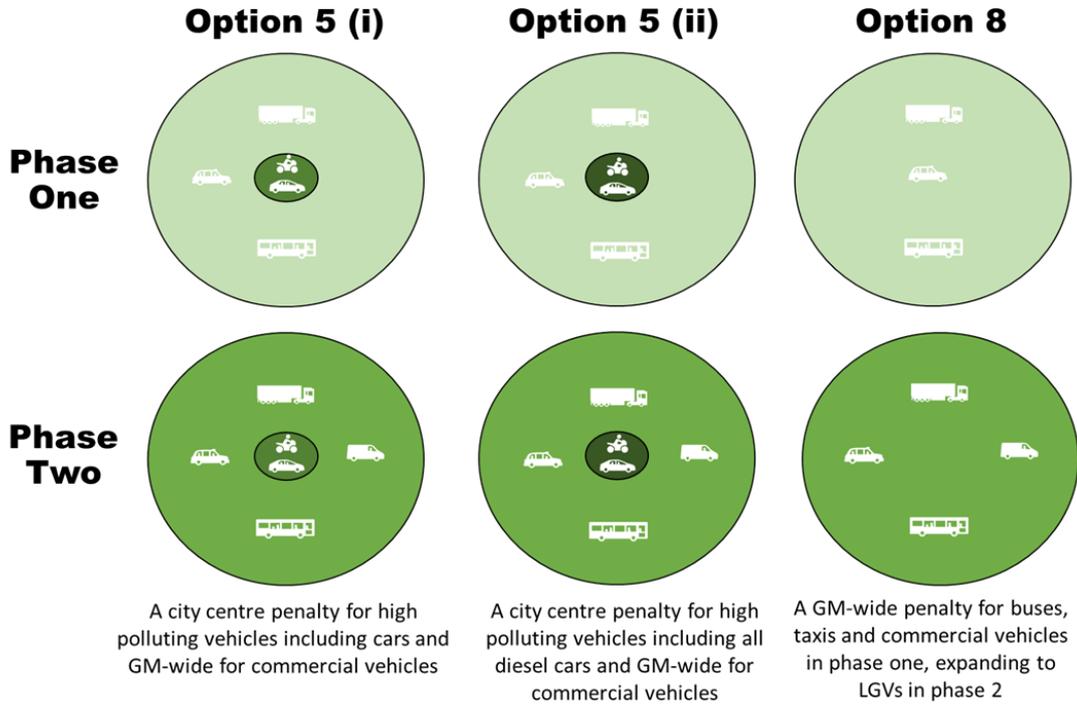
- that other options had not been explored in sufficient depth to be ruled out, in that it was not clear if other options could also deliver compliance in the shortest possible time with less potential socioeconomic impact.
- 1.6.31 Further analysis was undertaken to better understand the risk of unintended socio-economic consequences. Initial outputs are described in the Economic Case and will continue as part of the FBC development process.
- 1.6.32 As a result, a decision was made to explore the potential effectiveness and impacts of two further options not previously considered. The options were assessed using the same process as applied to the six options considered in the high-level assessment stage.
- 1.6.33 The two additional options considered were:
- **Option 7:** A CAZ Category B across Greater Manchester to be implemented in a single phase. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help businesses and bus operators upgrade.
 - **Option 8:** A CAZ Category B across Greater Manchester implemented as Phase 1. In Phase 2, the CAZ across Greater Manchester extends to a Category C. The CAZ proposals incorporate required Measures to communicate the message, promote cleaner vehicles and help businesses and bus operators upgrade.
- 1.6.34 Modelling indicated that Option 7 was not likely to be sufficient, delivering lower emissions benefits in each year than Options 5(i), 5(ii) and 8 and reaching compliance two years later. Therefore, this option was not progressed to full appraisal.
- 1.6.35 Modelling indicated that Option 8 could deliver compliance in the same year as Options 5(i) and 5(ii). It was therefore subjected to a full appraisal using the same methodology as applied to those options.

Summary of best performing options progressed to full appraisal

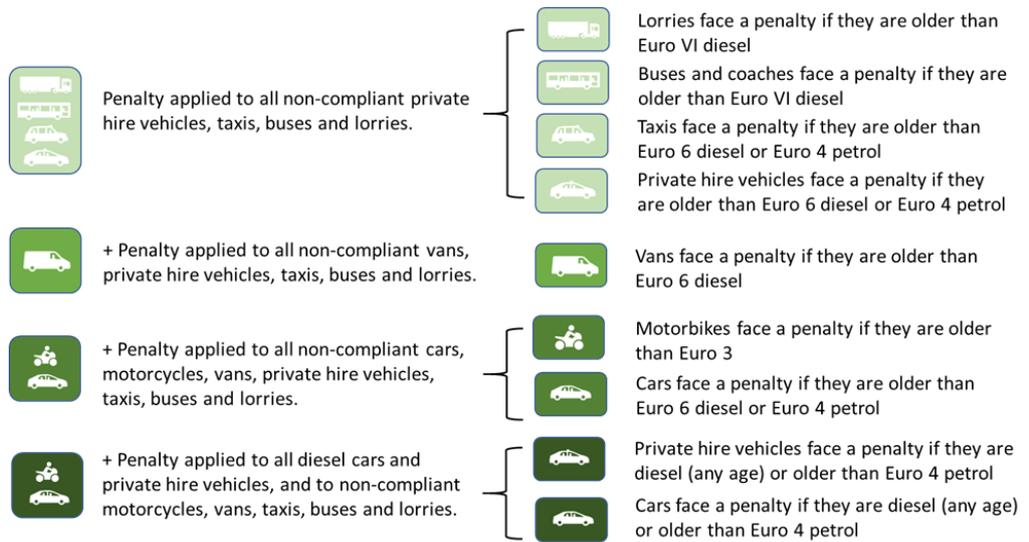
- 1.6.36 A full economic appraisal has been carried out for the three ‘best performing options’ that deliver compliance by 2024, the shortest possible time, encompassing Options 5(i) and 5(ii) that emerged from the high level assessment process in summer 2018, and the additional option (8) identified in January 2019. These are illustrated in Figure 1- 13 below.

Figure 1- 13: Best performing options included in full economic appraisal process

Best Performing Options (revised)

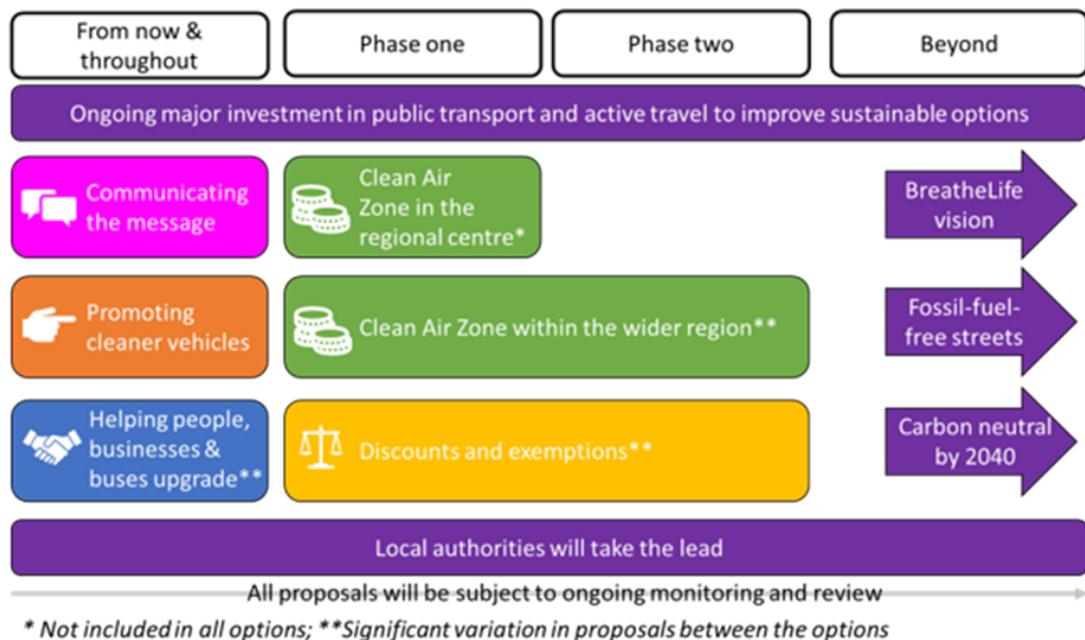


Key to penalty scheme options



1.6.37 Each of the best performing options has been designed as a package of Measures, building on existing activity, so that action to deliver the GM CAP can commence as soon as possible with the aim of delivering real air quality benefits quickly, and readying Greater Manchester for the proposed implementation of CAZ scheme in 2021. The Measures, shown in Figure 1-14 below, are aligned with Greater Manchester’s existing programme of ongoing major investment in public transport and active travel, and action on congestion. They will be supported by action within each local authority – this will mean upgrading local authority vehicle fleets to the cleanest vehicles, ensuring all policy and procurement is in line with the GM CAP goals, and taking local action to deliver cleaner air and a healthier living environment for residents, visitors and workers. The Measures proposed in the GM CAP are part of Greater Manchester’s long-term strategy and trajectory as a BreatheLife city, delivering fossil-fuel-free streets and aiming to become carbon neutral by 2038.

Figure 1- 14: Best performing options: package of Measures



1.6.38 Table 1- 6 describes what Measures are proposed for each of the best performing options

Table 1- 6: Best performing options: Measures included in each option

	Measure	Option 5(i)	Option 5(ii)	Option 8
Communicating the message	Communications	✓	✓	✓
	Sustainable Journeys programme	✓	✓	✓
Promoting cleaner vehicles	Provision of 300 dual-headed Electric Vehicle (EV) charging points GM-wide	✓	✓	✓
	Promotion of EV	✓	✓	✓
Helping business and buses upgrade	Clean Air Funds Upgrade Car	✓	✓	
	Clean Air Funds Upgrade Freight / Commercial vehicles	✓	✓	✓
	Clean Air Funds Upgrade taxis and private hire vehicles (PHV)	✓	✓	✓
	Clean Air Funds Upgrade Buses	✓	✓	✓
	Loan Finance	✓	✓	✓
Clean Air Zones	City Centre CAZ D	✓		
	City Centre CAZ D+		✓	
	CAZ B/C across GM	✓	✓	✓
	Discounts and exemptions for CAZ	✓	✓	✓

1.6.39 The next section summarises the results and conclusions of the appraisal in terms of identifying the preferred option, and detailed results of the economic appraisal are presented in the Economic Case.

1.7 Selecting the preferred option for the proposed GM CAP

How we have selected the preferred option

1.7.1 Greater Manchester has identified a preferred option, becoming the proposed GM CAP, based on which of the best performing options delivers compliance in the shortest possible time. This takes into account:

- the results of traffic and air quality modelling, which predict the response to a range of Measures;
- an off-model assessment of the possible impacts of Measures that cannot be modelled;
- an assessment of how realistic these predicted impacts are and how likely they are to be achieved; and
- assessments carried out in the economic, management, commercial and financial cases which appraise the options against the success factors outlined below in Table 1- 7.

1.7.2 Critically, Greater Manchester has considered the risks in terms of when and how the Measures will be delivered. It is considered that taking account of the risk of non-delivery in this way supports the preferred option in delivering compliance in the shortest possible time, minimising human exposure over the lifetime of the Plan and being 'likely not just possible' to achieve its goals.

1.7.3 Greater Manchester has taken account of its wider responsibilities to its people and businesses, and has sought to develop proposals that bring the most benefit, with the least detrimental impact. In particular, evidence suggests that some of Greater Manchester's most vulnerable residents are most likely to suffer the effects of poor air quality, and Greater Manchester has aimed to bring forward a plan that improves air quality for those residents without damaging their quality of life in other ways.

Table 1- 7: Success factors against which the best performing Options have been appraised

Factor and description	Code	Criteria
Determining success factor		
Compliance in the shortest possible time	C1	Which option reduces to zero the number of locations in GM predicted to be in exceedance of the legal limits of NO ₂ concentrations in the shortest time?
Primary success factors		
Reduction in NO ₂ emissions The likelihood that the Measure/option will contribute significantly to a reduction in NO ₂ concentrations, enough to achieve compliance with the EU Limit Values and reduce human exposure as quickly as possible.	N1	Which option delivers the greatest reduction in the number of locations in Greater Manchester in exceedance (presumed to represent human exposure) in each year prior to compliance being achieved?
	N2	Which option delivers the greatest reduction in NO ₂ concentrations at the roadside across Greater Manchester in each year prior to compliance being achieved, and upon compliance?
	N3	Does the option deliver compliance without putting other sites in Greater Manchester closer to exceedance (defined as concentrations of 38-40µg/m ³) than without action?
Feasibility The likelihood of the Measure being implemented in time to deliver the desired NO ₂ reduction, ensuring that compliance is 'not just possible but likely'.	F1	Are the Measures proposed within the legal powers of the Greater Manchester local authorities?
	F2	Can a governance route be developed to enable timely local government joint working as required for delivery?
	F3	What is the likelihood of the Measures being effective?
	F4	Is delivery of the option subject to significant risks that make achieving compliance in the shortest possible time, less likely?
Secondary (local) success factors		
Strategic fit with local strategies and plans	S1	Air quality and climate change: The Greater Manchester Strategy (Oct 2017) states that Greater Manchester should be "a place at the forefront of action on climate change with clean air and a flourishing natural environment" including by "reducing congestion and improving air quality".

Factor and description	Code	Criteria
<p>The alignment of this Measure/option with policy/strategic aims at a local and regional level. Ensuring that the proposals set out in the option are aligned with the following vision for Greater Manchester as set out in key strategies and plans.</p>	S2	Transport: The Greater Manchester Transport Strategy 2040 states a vision for “world class connections that support long-term sustainable economic growth and access to opportunity for all”.
	S3	Growth: The Greater Manchester Strategy sets out “plans to build more than 10,000 more homes every year from now until 2035”.
	S4	Economy: The Greater Manchester Strategy sets out a vision for “a thriving and productive economy in all parts of Greater Manchester” offering “good jobs, with opportunities for people to progress and develop”.
<p>Value for money</p> <p>A high-level indication of the costs and benefits of each Option.</p>	V1	Estimated value for money of the option, compared to the risk of inaction
<p>Distributional impact</p> <p>The potential impacts, both positive and negative on different groups within society, with a particular focus on protecting the most vulnerable. Overarching imperative to ensure that the Plan does not result in overly detrimental economic or social impacts for the region or those living, working or doing business within it.</p>	Q1	Health benefits
	Q2	Accessibility (in terms of journey time and connectivity to opportunities and services)
	Q3	Affordability (for users)
	Q4	Impact on the local economy – considering low income workers, small businesses, town centres and key sectors
	Q5	Impact on the quality of life of local residents and on equalities
<p>Deliverability</p> <p>Whether the Measures can be delivered within the time and funding available, and with the knowledge, skills and resources available in the delivery bodies and the wider market.</p>	D1	The Affordability of the cost of implementation (for the public sector)
	D2	The Supply-side capacity and capability to deliver the Measures outlined in the option
	D3	The Achievability of delivering the option, considering potential blockers that exist such as difficulty with scale or obtaining resources (such as staff) to implement and operate a Measure/option

Identifying which option delivers compliance in the “shortest possible time”

- 1.7.4 Greater Manchester is completing its feasibility study according to Government guidelines. Government guidance sets out a charging CAZ as the Measure most likely to achieve EU Limit Values for NO₂ in towns and cities in the shortest possible time. A charging CAZ places a penalty on the most polluting vehicles if they enter a designated area. Government guidance specifies that local authorities must consider a CAZ as their Benchmark Measure in the feasibility study process as well as any alternative Measures that are at least as effective at reducing NO₂ and deliver compliance as quickly.
- 1.7.5 Modelling carried out during the initial options assessment process identified that none of the options tested, including the most extreme CAZ possible, could achieve compliance by 2021. As a result, new modelling tools were developed forecasting to 2023 and 2025. Those options that delivered the greatest air quality benefits in 2021 were progressed to appraisal stage and modelling was carried out to explore how effective they could be in 2021, 2023 and 2025. From these results, it is possible to interpolate a likely year of compliance.
- 1.7.6 Table 1- 8 shows the number of sites remaining in exceedance of legal limits in 2021, 2023 and 2025 under the Do Minimum scenario and with each of the three Options by local authority. The results show:
- without action, there are predicted to be 250 non-compliant sites across Greater Manchester in 2021, 68 in 2023 and eight remaining in 2025, with compliance forecast to be achieved by 2027;
 - with action, two authorities (Wigan and Trafford) are forecast to become compliant in 2021, with between 49 and 71 points of non-compliance remaining across the rest of the region depending upon which Option is taken; and
 - with action, by 2023 nine authorities are forecast to be compliant, with between one and three non-compliant sites remaining in the City of Manchester (depending on which Option is taken).
- 1.7.7 With action, compliance is expected to be achieved in all authorities across Greater Manchester by 2024.

Table 1- 8: Number of sites remaining in exceedance of legal limits for NO₂ concentrations by year, Greater Manchester, by local authority with action in the shortest possible time

	2021				2023				2025			
	Do Min	5(i)	5(ii)	8	Do Min	5(i)	5(ii)	8	Do Min	5(i)	5(ii)	8
Bolton	19	6	6	6	3	0	0	0	0	0	0	0
Bury	23	7	7	9	12	0	0	0	4	0	0	0
Manchester	88	18	12	28	29	2	1	3	2	0	0	0
Oldham	15	5	4	4	3	0	0	0	1	0	0	0
Rochdale	10	2	2	2	2	0	0	0	0	0	0	0
Salford	36	10	10	11	10	0	0	0	1	0	0	0
Stockport	30	7	3	5	4	0	0	0	0	0	0	0
Tameside	16	6	5	6	5	0	0	0	0	0	0	0
Trafford	10	1	0	0	0	0	0	0	0	0	0	0
Wigan	3	0	0	0	0	0	0	0	0	0	0	0
GM Total	250	55	49	71	68	2	1	3	8	0	0	0

1.7.8 Greater Manchester aims to deliver compliance in the shortest possible time in a way that takes into account the need to minimise human exposure. Table 1- 9 demonstrates the benefits being delivered in each year in terms of reduced concentrations even at sites remaining in exceedance in that year. This also shows that the number of sites close to exceedance reduces considerably in each year as a result of the Plan. Health benefits continue to be delivered by reductions in NO₂ concentrations even below the EU Limit Values. In particular:

- All Options reduce to zero the number of sites that are extremely non-compliant (with concentrations over 50 µg/m³) in the first year; and reduce the number that are very non-compliant (with concentrations between 45-50 µg/m³) by at least 85% in the same year. Thus, exposure to very high concentrations across Greater Manchester is almost eliminated with all Options.
- By 2023, all sites are at or close to compliance across Greater Manchester with all Options. Two sites are predicted to remain non-compliant in Option 5(i), one in Option 5(ii) and three in Option 8 but in all cases the predicted concentrations are close to 40 µg/m³.
- With action, compliance is achieved in all local authorities across Greater Manchester by 2024 and the vast majority of sites across the region are predicted to have concentrations less than 35 µg/m³.

Table 1- 9: Number of sites by scale of exceedance by year, Greater Manchester, best performing options

Scheme Options	Compliant		Non-compliant		
	Very compliant (below 35 µg/m3)	Compliant but marginal (35 to 40 µg/m3)	Non-compliant (>40 to 45 µg/m3)	Very non-compliant (>45 to 50 µg/m3)	Extremely non-compliant (>50 µg/m3)
2021					
Do Minimum	16,281	603	175	62	13
Option 5(i)	16,879	200	50	5	0
Option 5(ii)	16,892	193	44	5	0
Option 8	16,836	227	62	9	0
2023					
Do Minimum	16,856	210	58	10	0
Option 5(i)	17,081	51	2	0	0
Option 5(ii)	17,087	46	1	0	0
Option 8	17,072	59	3	0	0
2025					
Do Minimum	17,068	58	8	0	0
Option 5(i)	17,117	17	0	0	0
Option 5(ii)	17,121	13	0	0	0
Option 8	17,112	22	0	0	0

1.7.9 Table 1- 10 shows the concentrations at the highest point of exceedance with each option in each year. This shows that, by 2023, the highest exceedances in all 'Do Something' options are below 42, whereas in the Do Minimum the highest exceedance is near 50 (at 49.0).

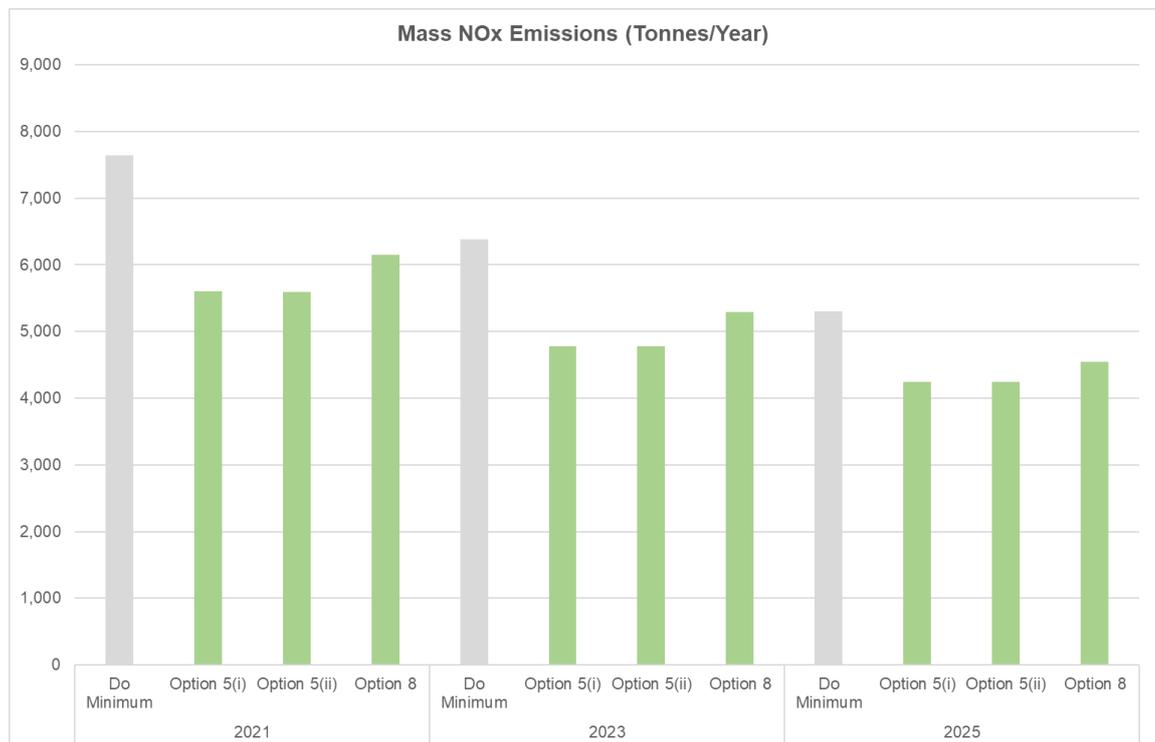
Table 1- 10: Highest NO2 concentration as forecast in each year, in µg/m³

	2021	2023	2025
Do Minimum	54.8	49.0	43.2
Option 5(i)	47.4	40.9	38.6
Option 5(ii)	47.4	40.8	37.9
Option 8	48.0	41.7	38.8

1.7.10 Figure 1- 15 shows the total reduction in NO_x emissions across Greater Manchester by year. All parts of Greater Manchester will experience improved air quality; how these benefits are distributed is described in more detail in the Economic Case and Appendix AQ2.

1.7.11 The collaborative and regional approach taken in the GM CAP will avoid unintended consequences in terms of the redistribution of emissions and exceedances. The Greater Manchester-wide approach delivers benefits everywhere and avoids re-distributional impacts. The anticipated impacts are not significantly different between the three options.

Figure 1- 15 – Total reduction in NO_x emissions across Greater Manchester by year



- 1.7.12 Comparing the three Options 5(i), 5(ii) and 8 shows that in 2021, all Options reduce the number of exceedances by between 70% to 80%, with Option 5(i) delivering the greatest emissions benefit in the first year. By 2023, all sites are near compliance with all Options, with a maximum of three non-compliant sites predicted, and the three Options are all forecast to deliver compliance in the same year, 2024. The impact on human exposure over the lifetime of the Plan is similar with all Options; and all deliver emissions reductions and reductions in concentrations region-wide and avoid the risk of redistributing concentrations.
- 1.7.13 Options 5(i) and 5(ii) include a CAZ Category D within the Inner Relief Route bringing cars into scope for the scheme. This was considered because the city centre contains the highest density of sites in exceedance and many of the sites with the highest concentrations. As such it was thought that such a scheme would be necessary to deliver compliance in the shortest possible time. However, the analysis suggests that the last sites to become compliant sit on or just outside the Inner Relief Route and therefore that compliance is not ultimately determined by concentrations in the city centre. Consequently, although Options 5(i) and 5(ii) would bring greater benefits in terms of emissions reductions, particularly in the opening year, these are not as distinct as anticipated. Fundamentally, the analysis suggests that a city centre CAZ D does not bring forward the year of compliance despite bringing more people in scope for a penalty including private car drivers going to work or to visit the retail and leisure destinations in the city centre.

Conclusion

- 1.7.14 Options 5(i), 5(ii) and 8, as the most promising options, have been considered in terms of their performance against the Determining, Primary and Secondary Success Factors. Tables summarising this assessment are included in Appendix A1 and a summary of the results is shown as Table 1-11 below.
- 1.7.15 Each of the Options also includes a package of supporting Measures, designed to ensure local people and businesses understand clean air and know what they can do to reduce their impact; to encourage the uptake of the cleanest vehicles; and most significantly, to support local businesses to upgrade their fleets as quickly as possible. In addition, all three Options propose a region-wide CAZ, starting at Category B from 2021 and expanding to a Category C in a later phase, assumed to be 2023. As described below, this large-scale scheme is challenging to implement, in terms of the need for substantial funding and support from Government, as well as the need for considerable collaboration between the ten districts; and the demand for major capacity from a range of suppliers. Nevertheless, it is clear from the analysis carried out to date that a smaller-scale scheme would not be sufficient to deliver compliance in the shortest possible time.

- 1.7.16 The full implementation of the CAZ C is proposed for 2023 rather than 2021. Crucially, this reduces the risk of socio-economic damage but does not delay the year of compliance. A GM-wide CAZ C cannot deliver compliance in 2021 or earlier than 2024 regardless of when it is implemented. This is because it is only with the wider improvements delivered by 2024 that a CAZ C achieves compliance.
- 1.7.17 The reason it is necessary to support local businesses, residents and operators to upgrade their vehicles is because Greater Manchester has an older than average fleet and an economy dominated by small business. There is a risk that without these supporting Measures, the CAZ will be ineffective – because people cannot afford to upgrade – or will cause unacceptable economic damage.
- 1.7.18 Furthermore, there is a risk that a CAZ implemented without support could damage the public and accessible transport offer in the region. Most buses and nearly all hackney carriages in the region are non-compliant, with the oldest vehicles typically owned by small local businesses or sole traders. There is a risk that without support, bus operators may choose to reduce bus services rather than upgrade their fleets, and that hackney carriage drivers and operators may choose to switch to driving a (less accessible) private hire vehicle or choose to stop operating.
- 1.7.19 Therefore, this supporting package is an essential, common component in achieving compliance, but adds to the cost and complexity of delivery, and creates significant supply-side challenges.
- 1.7.20 Options 5(i) and 5(ii) require support to help private car drivers upgrade their vehicle. This is considered particularly risky as a viable, value-for-money model for car scrappage-type schemes has not yet been developed and tested. Option 8 carries less risk in this regard.

Differentiators

- 1.7.21 The key question in terms of differentiating Option 8 from Options 5(i) and 5(ii) is whether it is necessary to implement a further scheme in the city centre. Fundamentally, neither version of the city centre schemes proposed in Options 5(i) and 5(ii) brings forward the year of compliance.
- 1.7.22 The city centre schemes proposed in Options 5(i) and 5(ii) do deliver benefits in the early years of the programme, achieving the greatest reduction in NO₂ concentrations at the roadside and in the number of locations in exceedance in the first year. All Options deliver compliance without putting other sites closer to exceedance, and in fact deliver benefits to air quality region-wide.

- 1.7.23 It would be reasonable to conclude from the modelling carried out that there is greater certainty in the estimated year of compliance for Options 5(i) and particularly 5(ii), as they consistently deliver lower concentrations in the modelled years. However, this must be considered against the risk that delivery is subject to significant risks that make achieving compliance in the shortest possible time less likely. Options 5(i) and 5(ii) involve implementing an additional CAZ that involves private cars, alongside the region-wide CAZ proposed in all three Options. This creates a challenge of feasibility, in terms of obtaining approvals and managing risks, and of deliverability, in terms of the achievability of delivering proposals of this scale, and of obtaining the necessary human and financial resources.
- 1.7.24 Option 5(ii) carries additional risk of failure due to its innovative nature. Due to a lack of evidence on the effectiveness and impacts of such a proposal, the forecasts for this option should be considered particularly uncertain.
- 1.7.25 Option 8 can be delivered at a lower cost to the public sector and is thus more affordable. As the Option that delivers compliance in the shortest possible time, and at the lowest cost, Option 8 is also considered the 'benchmark CAZ' for the purposes of comparison.
- 1.7.26 Option 8 presents many delivery challenges, but is more feasible and achievable than Options 5(i) and 5(ii) and thus offers greater confidence that compliance can be achieved in the shortest possible time.
- 1.7.27 It is considered that Options 5(i) and 5(ii) may cause unacceptable and significant unintended consequences to distributional impacts, particularly in terms of the impact on the affordability for residents, the impact on the local economy, and the impact on the quality of life of local residents. There are particular concerns in terms of the potential impacts on low income car-dependent workers, small businesses, and city centre retail. Option 8 delivers compliance in the same year without the same potential risk of damaging economic impacts.
- 1.7.28 On balance, therefore, it is considered that Option 8, whilst remaining a substantial and complex undertaking, is the surest way of delivering compliance in the shortest possible time, providing considerable health benefits at the lowest cost to society and the economy, of the three Options.
- 1.7.29 Proceeding with Option 8 will mean that private cars are not in scope for a Clean Air Zone. Nevertheless, the GM CAP does aim to deliver benefits in terms of encouraging residents to consider their use of cars, and to switch to cleaner fuels or more sustainable modes of travel.

- 1.7.30 Option 7, a GM-wide CAZ B, delivers compliance two years later than Option 8 and was therefore rejected. In 2023, twelve sites remain non-compliant with Option 7, compared to three with Option 8. Therefore, as part of the FBC process, further work will be undertaken to understand the conditions at these twelve locations and to establish whether it would be possible to identify Measures other than a CAZ C that could deliver compliance in the shortest possible time (i.e. by 2024). However, at this stage it is presumed that expansion to a CAZ C will be necessary in 2023.
- 1.7.31 The comparison of shortlisted CAP Options against the Primary and Secondary critical success factors is summarised in Table 1- 11 below.

Table 1- 11: Comparison of the performance of Options 5(i), 5(ii) and 8 against the Critical and Secondary Success Factors

Success Factor	Code	Option 5(i)	Option 5(ii)	Option 8	Summary
	See Table 1- 7 for more details	2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, 2023: CAZ C GM-wide	
Determining Success Factor					
Compliance in the shortest possible time Which option reduces to zero the number of locations predicted to be in exceedance of the legal limits of NO2 concentrations in the shortest time?	C1	Yes	Yes	Yes	All Options deliver compliance in 2024, considered to be the shortest possible time for achieving compliance in GM.
Critical Success Factors					
Reduction in NO2 emissions Which option delivers... The greatest reduction in the number of locations in exceedance (presumed to represent human exposure) in each year?	N1				All Options deliver significant reductions in the number of locations in exceedance of 70-80% in 2021, with Option 5(ii) predicted to marginally deliver the greatest reductions in each year prior to compliance being achieved.
The greatest reduction in NO2 concentrations at the roadside in each year prior to compliance being achieved?	N2				All Options deliver reductions in mass emissions across GM of between 20-30% in 2021, with the greatest reductions forecast to be delivered by Option 5(ii).

Success Factor	Code	Option 5(i)	Option 5(ii)	Option 8	Summary
	See Table 1- 7 for more details	2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, 2023: CAZ C GM-wide	
Compliance without putting other sites closer to exceedance (defined as concentrations of 38-40 µg/m3) than without action?	N3				All Options are forecast to deliver compliance without putting other sites closer to exceedance. Risk that Option 5(ii) leads to more re-routing than forecast.
Feasibility Are the Measures proposed within the legal powers of the Greater Manchester Local Authorities?	F1				The Measures proposed in all Options are within the legal powers of the authorities.
Can a governance route be developed to enable timely local government joint working as required for delivery?	F2				GM has proposed a governance route that facilitates the local government co-operation required for delivery. The complex vehicle change requirements of Option 5(ii) are likely to make approvals more difficult.
What is the likelihood of the Measures being effective?	F3				Clean Air Zones are presumed to be effective, but there is considerable uncertainty about how drivers will respond within the local context and to a scheme on a region-wide scale. Option 5(ii) is more complex and thus more uncertain.

Success Factor	Code See Table 1- 7 for more details	Option 5(i) 2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	Option 5(ii) 2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	Option 8 2021: CAZ B GM-wide, 2023: CAZ C GM-wide	Summary
Is delivery of the option subject to significant risks that make achieving compliance in the shortest possible time less likely?	F4				If the full CAP cannot be delivered or funded, compliance may be delayed e.g. if there is not sufficient time or funds to achieve a clean hackney carriage or bus fleet. The Plan is subject to risks in terms of the need for multiple approvals from different bodies; the political sensitivity of the proposals; and the need to run activities in parallel. Option 5(ii) carries greater risk as it is out with the standard guidance, approved signage and so on. Option 8 involves one rather than two CAZ schemes so is subject to less risk.
Secondary Success Factors					
Strategic fit with local strategies and plans Air quality and climate change	S1				All Options deliver improvements in NO2 concentrations, and also reduce PM and greenhouse gas emissions.
Transport	S2				All options act to promote sustainable travel and will deliver a cleaner, newer bus and taxi fleet for GM passengers.

Success Factor	Code	Option 5(i)	Option 5(ii)	Option 8	Summary
	See Table 1- 7 for more details	2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, 2023: CAZ C GM-wide	
Growth	S3				Risk that the city centre CAZ schemes deter housing and employment development; which could impact on the delivery of the Greater Manchester Spatial Framework. Option 8 delivers clean air without this risk.
Economy	S4				Risk that the city centre CAZ schemes affect economic performance. Option 8 delivers clean air without this risk. In all Options, CAZs will impose costs on local businesses.
Value for money Estimated value for money of the option compared to the risk of inaction	V1				It would be more cost effective to deliver the changes more slowly; however this is a public health emergency so action is vital. Option 8 delivers compliance at the lowest imposed cost.
Distributional impact Health benefits	Q1				All groups will experience health benefits. Those living in areas with the worst air quality and those most vulnerable to the effects of poor air quality will benefit the most.

Success Factor	Code	Option 5(i)	Option 5(ii)	Option 8	Summary
	See Table 1- 7 for more details	2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, 2023: CAZ C GM-wide	
Accessibility (in terms of journey time and connectivity to opportunities and services)	Q2				The scheme brings improved accessibility in terms of small reductions in journey times for road traffic. Option 8 does not impose costs on private cars.
Affordability (for users)	Q3				Options 5(i/ii) impose costs affecting low income car drivers, with more vehicles in scope for charges in Option 5(ii). Option 8 delivers clean air without this risk but still imposes costs on small businesses and sole traders.
Impact on the local economy – considering low income workers, small businesses, town centres and key sectors	Q4				All Options impose costs on small businesses and low income professional drivers; proposals to support fleet upgrades mitigate this somewhat. Options 5(i/ii) risk impacts on the city centre economy avoided in Option 8.
Impact on the quality of life of local residents and on equalities	Q5				Options 5(i/ii) may affect the quality of life of low income car drivers. Low income residents driving a non-compliant commercial vehicle will be affected by all Options.

Success Factor	Code	Option 5(i)	Option 5(ii)	Option 8	Summary
	See Table 1- 7 for more details	2021: CAZ B GM-wide, CAZ D in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, CAZ D & all diesel cars charged in IRR 2023: CAZ C GM-wide	2021: CAZ B GM-wide, 2023: CAZ C GM-wide	
Deliverability The Affordability of the cost of implementation (for the public sector)	D1				Option 8 is the lowest cost option and is thus the most affordable for the public sector.
The Supply-side capacity and capability to deliver the Measures outlined in the option	D2				There are concerns about supply side capacity e.g. the availability of specialist compliant vehicles such as hackney carriages, and retrofitting capacity and risks of delays.
The Achievability of delivering the option, considering issues such as difficulty with scale or obtaining resources to implement and operate a Measure/option	D3				The scale of the region-wide CAZ, supporting programme and associated cost, and the need for cross-district collaboration, creates delivery risk. This risk is even greater for a city centre CAZ D scheme.

1.8 GM CAP: The Preferred Option

1.8.1 As described in Section 1.7, the optioneering has identified Option 8 as the preferred option to deliver compliance in the shortest possible time, becoming the proposed GM CAP. Figure 1- 16 illustrates the Measures included in Option 8 and this Section describes in more detail what Measures are proposed in the GM CAP preferred option. For more detail on each of the Measures in the preferred option see Appendices.

Figure 1- 16: Measures included in the GM CAP (preferred option)



Proposed Measures: Communicating the message

1.8.2 Crucial to the success of the GM CAP will be ongoing communications activity to help the residents and businesses of Greater Manchester understand the nature of the air quality challenge and what action they can take to reduce emissions. Evidence suggests that awareness of air quality issues is growing, but people are still confused as to what poor air quality means, where pollution comes from and what solutions would be effective.

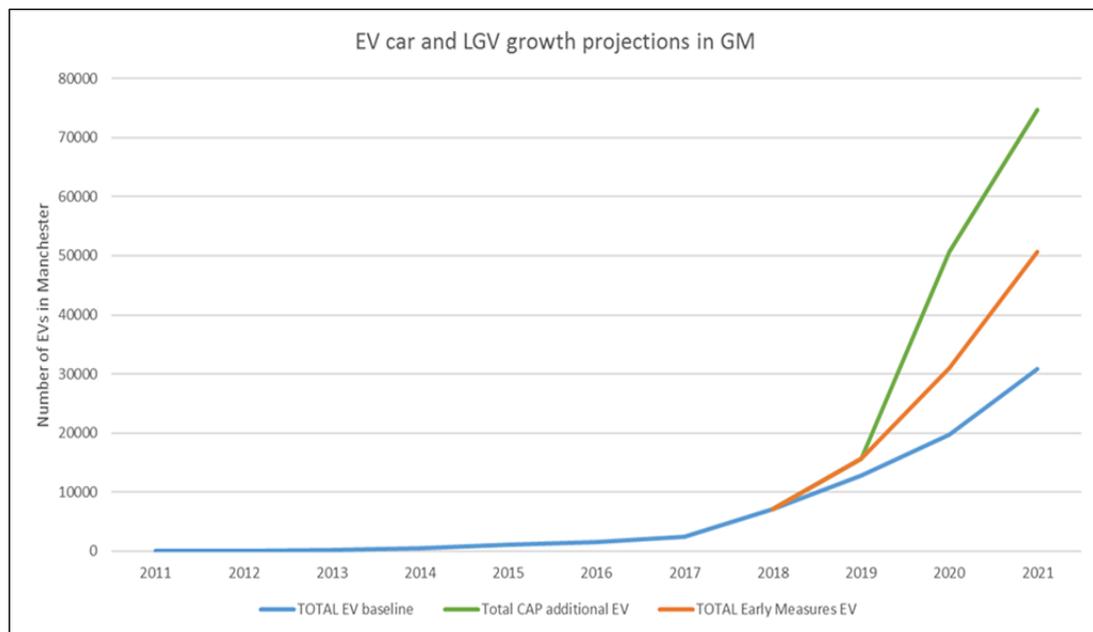
1.8.3 Initial research was carried out in summer/autumn 2018 around perceptions of air pollution in Greater Manchester. This included focus groups and an on-street survey – supported by a literature review to understand the wider perceptions around air quality in the UK.

- 1.8.4 In summary, most people were aware that air quality differs across Greater Manchester, for example that it is worse in the city centre than the suburbs. However, both the focus groups and the survey highlighted a lack of understanding of the scale of the Greater Manchester air quality issue. Accordingly, the level of concern about the Greater Manchester air pollution issue was 'moderate', and there was little understanding of the impact of air pollution on health. Furthermore, while it was understood that road traffic plays a part in air pollution, factors other than transport featured strongly in people's understanding of the causes – e.g. industry.
- 1.8.5 The outputs from this research highlighted the need to raise awareness and understanding of air pollution as a health issue through public campaign activity. An initial phase of activity was delivered during autumn 2018. As the GM CAP is implemented, it will also be necessary to communicate effectively with those most affected by the Measures to ensure they know what choices they have available, what support they can access, and that they are able to make the best decisions for them and their business.
- 1.8.6 Further opportunities to track levels of awareness and understanding will be taken during the FBC development, implementation and post-implementation phases, to monitor the effectiveness of activity, ensure ongoing improvements to messaging, and to help develop future strategies for communications and engagement.
- 1.8.7 The GM CAP proposes a programme of sustainable travel in order to help people and businesses understand how they will be affected by the GM CAP and how best they can adapt:
- Personal travel planning is a demonstrably effective technique for residents and employees to encourage sustainable travel choices and vehicle purchasing decisions. This will be targeted at residents and businesses in air quality hotspots, and include bespoke information and incentives relating to their particular journeys and preferences.
 - Through the Business Travel Advice service, expert advice, toolkits and incentives will be made available for workplaces to offer travel planning interventions to encourage and enable sustainable travel choices, inform vehicle purchasing decisions, purchasing, consolidation and freight practices. This will include grants to help businesses improve their sustainable travel offer, for example by providing cycle parking.
 - Travel planning, events, classroom activities including mapping, challenges, air quality monitoring and other engagement activities will also be targeted at schools and families in areas of poor air quality and with high car use on the journey to school, to help increase awareness of air quality impacts, increase the use of sustainable travel (particularly walking and cycling) for students, parents and staff on their journeys to and from school, and reduce exposure for children.

Proposed Measures: Promoting cleaner vehicles

- 1.8.8 Electric Vehicles (EVs) are the least polluting, but at present many potential purchasers are put off by concerns about the practicality of charging an electric vehicle, amongst other factors. The EV Infrastructure and Promotion initiative proposes 300 additional rapid charging points (dual headed) across the ten local authorities of Greater Manchester, including some for taxis/PHVs only.
- 1.8.9 A supporting communications programme will deliver events such as experience days that will showcase the benefits of electric vehicles and highlight the support available. They will allow people to compare EVs from a range of suppliers, and 'try before you buy'.
- 1.8.10 Greater Manchester already has ongoing initiatives to support the introduction of EVs (not included as part of this initiative). Figure 1- 17 shows how these 'Early Measures' are expected to increase the uptake of EVs in Greater Manchester. This is based on already planned increases in infrastructure and EV incentives under the Early Measures project. The Measures outlined here as part of the GM CAP are expected to further accelerate the uptake as shown by the green line in Figure 1- 17 (source: adapted by TfGM from Climate Change commission (CCC) forecasts).

Figure 1- 17: Projections of growth in Electric Vehicle fleet in Greater Manchester, with Early Measures and CAP funding



Proposed Measures: Helping people and businesses upgrade

- 1.8.11 A CAZ category affecting buses, taxis, HGVs, coaches, minibuses and LGVs across the region will provide a financial incentive to the owners of commercial vehicles to invest in cleaner vehicles. This process can be made more effective in terms of reducing emissions and fairer in terms of minimising socio-economic damage if it is supported by schemes offering financial support to businesses and self-employed workers based in Greater Manchester to help them upgrade their vehicles.
- 1.8.12 Note that private cars are not included in the proposals (other than cars used as private hire vehicles and taxis) as they are exempt from the CAZ. The funds will be targeted at those most affected and in need of support to help them upgrade and comply.
- 1.8.13 Vehicle renewal schemes such as those proposed here offer a range of benefits:
- They bring forward emissions reductions prior to the introduction of a CAZ: CAZs take time to introduce and are not programmed to go live until 2021 in Greater Manchester, with the GM-wide scheme for LGVs not expected to go live until 2023. Vehicle renewal schemes targeted at those least likely to upgrade without support have the potential to bring forward some of the benefits of the CAZ in terms of reducing human exposure to harmful pollutants.
 - They ready the fleet for a CAZ, reducing the risk of unintended consequences and allowing earlier implementation: there is a risk that if vehicle upgrade is unaffordable, unintended consequences emerge that may be damaging in terms of vehicle emissions, accessibility or socio-economic impact. For example, without financial support, there is a risk that licensed hackney carriage drivers cannot afford to upgrade and therefore cease trading or 'trade down' to a minicab licence, thus reducing the availability of accessible travel for disabled people and reducing general access to well-informed drivers offering a hail-and-ride service. Similarly, low-income van drivers affected by the GM-wide scheme may swap their van for a diesel estate car (out of scope for the scheme). In some instances, this allows for earlier implementation of a CAZ, where unintended consequences would push back the possible date of implementation and therefore potentially when compliance could be achieved.
 - They mitigate the risk of damaging socio-economic impacts imposed by CAZs: small businesses operating to tight margins and low-income sole traders may struggle to afford to upgrade their vehicle or pay the charge. Vehicle renewal schemes can support these groups upgrading to compliant vehicles and thereby avoiding the charge.

- 1.8.14 The proposed vehicle renewal schemes will be delivered via Clean Air Funds, offering support to in-scope businesses and residents. Businesses and self-employed residents of Greater Manchester who own an HGV or LGV, hackney carriage or car licensed as a private hire vehicle with one of the ten local authorities: small and micro businesses based in Greater Manchester would have access to Measures offering a financial incentive to scrap or de-license non-compliant vehicles (HGV or LGV, hackney carriage or car registered as a private hire vehicle licensed with one of the ten Greater Manchester local authorities) and to replace them with a compliant vehicle, or to retrofit their vehicle to make it compliant.
- 1.8.15 For both businesses and residents, it is expected that the schemes would be subject to a competitive application process, with funds allocated on the basis of a series of criteria and prioritised in terms of the likely air quality benefit and socio-economic impact. In principle, it is proposed that priority will be given to upgrading the oldest and dirtiest vehicles, that are most likely to travel in areas suffering from poor air quality, and owned by those least able to upgrade them without support.
- 1.8.16 The vehicle renewal scheme delivered through the Clean Air Funds will offer owners of older non-compliant vehicles registered within Greater Manchester an incentive to renew their vehicles. The Fund will be split into three sub-groups covering LGVs and minibuses; HGVs and coaches; and taxis (hackney carriages and PHVs).

Proposed Measures: Helping buses upgrade

- 1.8.17 Buses are an essential component of the public transport offer, and in many parts of the region are the only public transport available. It is vital that action to clean up the bus fleet does not have the unintended consequence of reducing the number or frequency of bus services in the region.
- 1.8.18 At present, around 1,800 of the approximately 2,000 buses operating in Greater Manchester do not comply with the Clean Air Zone minimum emissions standards set by the Clean Air Zone Framework⁵⁴. Greater Manchester successfully bid for funds to retrofit around 170 buses, and delivery of this activity is underway.

⁵⁴ Defra, Dft, 'Clean Air Zone Framework: Principles for setting up Clean Air Zones in England' (May 2017), Annex A.

- 1.8.19 Retrofit of buses is a relatively inexpensive way to deliver compliance quickly, however, it does not fit with the Greater Manchester longer term strategy or ambition to have a zero-emission bus fleet. Greater Manchester believes that investing more in a cleaner bus fleet would both reduce emissions and improve the appeal of bus travel in Greater Manchester. Improving the quality of public transport can reduce car travel and thus emissions through mode shift. In support of this vision, the Greater Manchester region has secured funding from the Ultra-Low Emission Bus Fund bid for around £15 million to support the purchase of 70 ultra-low emission buses.
- 1.8.20 Nevertheless, in response to the imperative to act quickly to clean up the bus fleet, and to do so without damaging service provision, a Clean Bus Fund is proposed, providing financial support towards retrofitting or potentially replacing existing Euro IV and V buses and leaving the market to identify a solution for the 365 buses older than this.
- 1.8.21 It has been assumed that the Clean Bus Fund supported by market action could deliver a fully compliant bus fleet by end 2021, although this assumption will be investigated further at FBC. This facilitates the introduction of a CAZ for buses over that time frame. Without funding for retrofit and upgrade of buses, it would not be possible to implement a GM-wide CAZ for buses in 2021 as the age and turnover of the existing fleet means that a high proportion of buses would be non-compliant and the risk of a substantial reduction in bus services would be high. Bus services in Greater Manchester are commercially operated and operators are able to reduce services provided if they are not sufficiently profitable. Consequently, the Clean Bus Fund is an integral part of the package required to deliver compliance in the shortest possible time.

Proposed Measures: Clean Air Zone across Greater Manchester

- 1.8.22 Modelling has shown that a Clean Air Zone for commercial vehicles is required to deliver compliance in the shortest possible time in Greater Manchester.
- 1.8.23 The GM CAP proposes a Clean Air Zone to be implemented across the region in two phases as follows:
- **Phase 1 (assumed to be 2021):** a **Clean Air Zone category B** across the region, placing a daily penalty on the most polluting buses, taxis (hackney carriages and private hire vehicles), HGVs and coaches if they travel into, within or through Greater Manchester.
 - **Phase 2 (assumed to be 2023):** expansion to a **Clean Air Zone category C** across the region, placing a daily penalty on the most polluting light goods vehicles and minibuses if they travel into, within or through Greater Manchester, in addition to those vehicles placed in scope under Phase 1.
- 1.8.24 No private cars would be affected by this proposal.

1.8.25 Vehicles travelling exclusively on the Highways England SRN and passing through the region without entering the local road network in Greater Manchester, would also be unaffected by this proposal. This is because Greater Manchester’s Authorities do not have the power to impose a scheme on the SRN. This is an aspect of the CAZ definition that we would like to explore further with Government and Highways England.

1.8.26 Figure 1- 18 illustrates those vehicles in and out of scope for a penalty.

Figure 1- 18: Vehicles by whether they are in scope for an emissions penalty across GM

GM-wide Clean Air Zone		
	More polluting vehicles in scope for a penalty	Cleaner vehicles unaffected & uncharged
Phase 1	<ul style="list-style-type: none"> Buses Euro V and older Diesel Hackney cabs Euro 5 and older Petrol Hackney cabs Euro 3 and older Diesel PHVs Euro 5 and older Petrol PHVs Euro 3 and older HGVs Euro V and older Coaches Euro V and older 	<ul style="list-style-type: none"> Buses Euro VI Diesel Hackney cabs Euro 6 Petrol Hackney cabs Euro 4 and newer Diesel PHVs Euro 6 Petrol PHVs Euro 4 and newer HGVs Euro VI Coaches Euro VI All light goods vehicles and minibuses All private cars All motorbikes and mopeds
Phase 2	<ul style="list-style-type: none"> Buses Euro V and older Diesel Hackney cabs Euro 5 and older Petrol Hackney cabs Euro 3 and older Diesel PHVs Euro 5 and older Petrol PHVs Euro 3 and older HGVs Euro V and older Coaches Euro V and older Light goods vehicles Euro 5 and older Minibuses Euro 5 and older 	<ul style="list-style-type: none"> Buses Euro VI Diesel Hackney cabs Euro 6 Petrol Hackney cabs Euro 4 and newer Petrol PHVs Euro 4 and newer Diesel PHVs Euro 6 HGVs Euro VI Coaches Euro VI Light goods vehicles Euro 6 Minibuses Euro 6 All private cars All motorbikes and mopeds

1.8.27 The boundary of the proposed CAZ is subject to further technical review as part of the scheme development work to support the FBC, however at present it is considered to be the authority boundary of Greater Manchester.

1.8.28 It is proposed that the CAZ will operate 24 hours a day, seven days a week, and will apply to all trips made by in-scope vehicles into, within and through Greater Manchester (excluding trips made wholly on the SRN).

- 1.8.29 The level of the penalty will be confirmed subject to public and stakeholder engagement, statutory consultation and further technical work. The indicative penalty levels that have been assumed for the purposes of modelling the impacts of the scheme are £7.50 per day for vans and minibuses; hackney carriages and PHVs; and £100 per day for HGVs, coaches and buses.
- 1.8.30 If the penalty charge is not paid within the required time a penalty charge notice would be incurred.
- 1.8.31 Vehicles will never be required to pay more than once per day regardless of how many trips they make within the CAZ boundary. However, if a vehicle enters the GM CAZ and also enters a CAZ or Low Emission Zone elsewhere in the UK they will be required to pay the local penalty charges for each CAZ. So, for example, if a non-compliant in-scope vehicle travelled from London to Greater Manchester on the same day, they would be required to pay charges incurred in both regions (however, the effect of this has not been captured in the assessment process at this stage).
- 1.8.32 As part of the detailed scheme design phase, Greater Manchester will be considering payment options that would be more beneficial and efficient to customers without undermining the principles of the scheme, such as offering taxi and private hire drivers the option of a periodic (perhaps quarterly or annual) permit or Clean Air Levy rather than a daily charge. Further work will be required as part of the engagement and consultation process with stakeholders, including Government who are designing and building a single Payment Portal for all Clean Air Charging Zones, to understand their needs and subsequent options.

Proposed Measures: Discounts and exemptions to the Clean Air Zone

- 1.8.33 Imposing a penalty on non-compliant vehicles is an effective way of encouraging drivers to upgrade their vehicle. Clearly, however, there is a risk that for micro businesses or sole traders on tight margins, a CAZ scheme may impose costs that cannot be absorbed, with a risk of consequent damage to the local economy and people's livelihoods. An initial assessment of the economic impacts of the proposed GM CAP is contained in the Economic Case, and more work is required to inform the FBC, including a full economic impact assessment, research and data analysis, and stakeholder engagement. It is assumed that where unacceptable unintended consequences are identified, solutions will be sought to refine the scheme or provide other support (in addition to the incentive Measures) to mitigate these as much as possible.
- 1.8.34 One way of protecting the most vulnerable from the negative economic impacts of a CAZ is to offer temporary or permanent discounts and exemptions to the scheme. These reduce the risk of unintended consequences for those in scope for a penalty charge, but reduce the effectiveness of the scheme in terms of reducing emissions and therefore the relative merits must be considered from both perspectives. Discounts and exemptions are not likely to be considered acceptable if they unreasonably delay the date when compliance could otherwise be achieved.

1.8.35 The nature and extent of the discounts and exemptions required to support GM CAP will be developed through public and stakeholder engagement as part of the FBC process. Some options are outlined below:

- Exemptions and discounts to limit the impact on **disabled people** and those with accessibility needs – for example, for specially adapted in-scope vehicles (such as minibuses or private hire vehicles)
- ‘Sunset periods’ (time-limited discounts) to limit the impact on any or all of: **local small/micro businesses/sole traders, not-for-profit organisations, charities and schools**
- Bespoke time-limited discounts for those with **outstanding lease or Personal Contract Purchase (PCP) contracts**
- Collaborative working with **bus companies and taxi operators** to help them comply and avoid unnecessary charges, and the offer of paying an annual Clean Air Levy for non-compliant GM-registered hackney carriages or PHVs.

GM CAP: Summary of proposed Measures and further development

1.8.36 The proposed GM CAP consists of a region-wide Clean Air Zone for buses and coaches, taxis and heavy goods vehicles in the first instance, expanding to include light goods vehicles and minibuses at a later date. The proposed Clean Air Zone will be supported by discounts and exemptions to protect the most vulnerable, as well as Measures to communicate the message and help people understand how to comply; Measures to promote the cleanest vehicles; and a series of schemes to help vehicle owners who might otherwise have struggled to do so, to upgrade their vehicles and comply with the scheme.

1.8.37 More work is required as part of the FBC to fully define these Measures. In particular, this work will focus on better understanding what support is required by businesses and workers to enable them to comply with the scheme. Work will also be carried out to look in more detail at the last remaining points of non-compliance in the region, to test the validity of the modelling and also to assess whether local action at these locations could remove or delay the need for the Phase 2 scheme (which brings light goods vehicles and minibuses in scope for the CAZ).

1.9 Benefit, risk, constraints, and contingencies

- 1.9.1 Whilst the impact of air quality on health and the environment has long been recognised, the evidence on direct health impacts and the related costs is strengthening constantly. Greater Manchester has the opportunity to drive forward a change in the approach to improving its local environment using the current political and public awareness of the critical nature of the issue. As a result of this there is access to major sources of funding which have not previously been available, that can be used to reduce air pollution and bring forward Measures from wider Greater Manchester strategies that lead to improvements in air quality. A well-designed package of Measures as set out in this OBC has the potential to provide an investment legacy opportunity that enables economic growth whilst reducing congestion and environmental impacts, as well as protecting and improving the health of our population.
- 1.9.2 There is now a recognition, across Europe and globally, that reducing harmful emissions is an imperative but highly complex issue. The types of Measures required to address poor air quality could have been viewed as politically and economically impracticable in the recent past. However, because many cities are now required to act simultaneously, the risk of not taking action could lead to Greater Manchester gaining a reputation for not protecting its citizens. Secondly, because other cities in the UK will be taking steps which will likely displace older more polluting fleets, weak regulation in Greater Manchester could lead to these dirtier fleets being re-deployed in Greater Manchester.
- 1.9.3 There is a risk that Measures implemented as part of a GM CAP could have unintended consequences, such as increasing carbon emissions or congestion, thereby resulting in damage to the local environment and economy. A detailed and robust process to developing the supporting evidence is critical.
- 1.9.4 It is also recognised that trends in NO₂ concentrations have not to-date seen the decreases predicted by Government toolkits, and therefore appropriate sensitivity testing in the modelling, alongside air quality monitoring needs to be implemented, to enable the CAP Measures to be evaluated and adapted as appropriate over time. The assessment process will be developed so that it can be responsive to emerging evidence as it becomes available throughout the programme.
- 1.9.5 The GM CAP requires a multi-faceted cross-disciplinary approach, and is therefore dependent on a wide range of stakeholders. For example, the Greater Manchester Congestion Plan will be reviewed as it develops, and the impacts upon and from the motorway network will be incorporated in conjunction with Highways England.
- 1.9.6 As part of the feasibility study, it is necessary to recognise the benefits, risks, dependencies and constraints that may arise with the GM CAP. This is due to the influence these factors have on the success of Measures in achieving the aim and therefore the choice of preferred option. The SOC presented a summary of benefits, risks, dependencies and constraints whilst this OBC presents a more informed understanding of the current situation and detail of options proposed.

Benefits

1.9.7 Figure 1- 19 presents a logic map for how the Measures in the GM CAP deliver real-world impacts. This also shows the inter-dependencies between the Measures within the GM CAP and that delivery of these benefits is contingent on delivery of the full package of Measures.

1.9.8 The logic map demonstrates the key first order benefits, which are:

- reduction in NO_x emissions from road traffic and an associated reduction in NO₂ concentrations at the roadside. By 2024, this delivers compliance with NO₂ limit values across Greater Manchester;
- improved human health and associated benefits to quality of life, productivity and savings in health and social care costs. These cannot currently be quantified but could be expected to be substantial;
- reduced PM emissions and associated concentrations, delivering further health benefits. The air quality benefits are quantified in the Economic Case; and
- the GM CAP brings positive distributional impacts to residents of disadvantaged areas and may help reduce health inequalities.

1.9.9 The GM CAP brings wider benefits beyond those to air quality and health. These include the following benefits, all further described and quantified in the Economic Case:

- reduced Greenhouse Gas Emissions, quantified in the Economic Case;
- a more physically active population, driven by mode shift from LGVs and also by investment in a sustainable journeys programme;
- slightly faster journeys across the road network, from small scale but widespread reductions in traffic; and
- a newer vehicle fleet of private and public vehicles, including greater uptake of the cleanest vehicles.

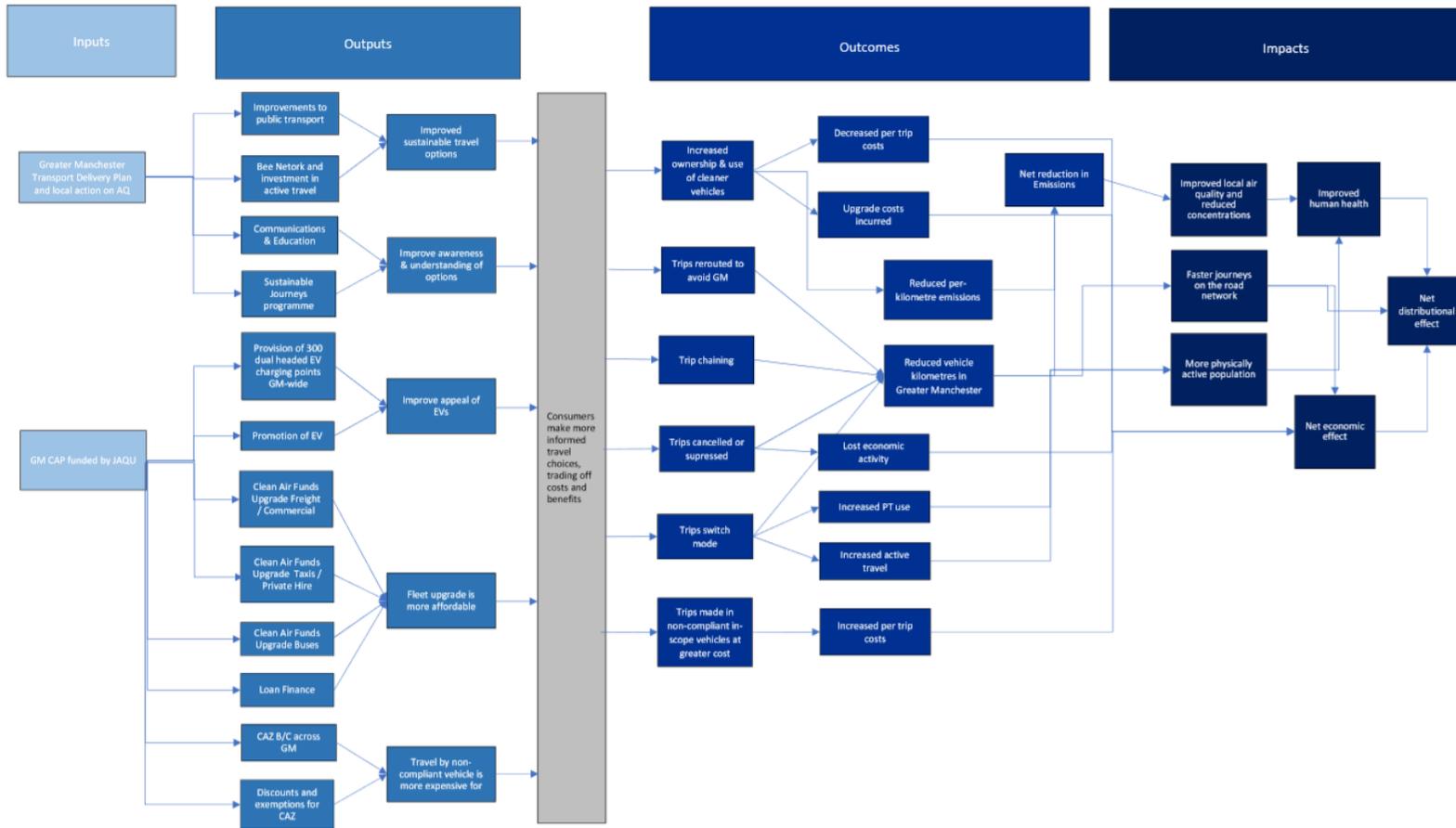
Risks and Uncertainty

1.9.10 A comprehensive risk register has been developed, and is described in the Management Case. Key risks include:

- uncertainty around costs and the ability to obtain necessary funds;
- that ten districts with differing constitutional arrangements need to approve each stage of the process;
- the risk of delay to the process, particularly given the need to carry out many complex activities in parallel; and
- that assumed behavioural responses do not materialise or do not prove possible, for example, if market capacity for retrofit or the provision of compliant vehicles proves inadequate.

- 1.9.11 The recommendations presented in this OBC are based on modelling that has been developed in line with Government guidance, using the best available data and underpinned by a series of assumptions and trends. This is consistent with the approach for development of OBC options used by other LAs directed to take actions (e.g. Leeds, Birmingham).
- 1.9.12 Nevertheless, much further work is required to test and develop these assumptions for the FBC, including work to ensure that the support measures are likely to be effective. This will include direct engagement with impacted groups.
- 1.9.13 The current set of working assumptions may be optimistic on some issues (such as the scale of bus and taxi compliance), and refinements could impact roads differentially. The current modelling is considered appropriate for evidencing decisions at OBC stage, but updates may alter the effective dates of compliance between districts.

Figure 1- 19: Logic map for GM CAP



Appendices

- A1. Option Appraisal Report
- A2. Air Quality Maps