

West Midlands Combined Authority Regional Air Quality Review and Action Plan

West Midlands Combined Authority

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Quality information

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Table of Contents

.....	1
1. Introduction	9
Scope	9
Report Structure.....	10
2. Legislation, Policy and Planning	11
European Air Quality Directives	11
National Air Quality Legislation	11
Air Quality Standards Regulations (2010) (as amended)	11
Environment Act (1995).....	11
UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations	12
2019 Clean Air Strategy	12
Other Relevant Policy	12
Brexit and Air Quality.....	14
Local Air Quality Management	14
Pollutants of Concern.....	14
Nitrogen Dioxide.....	14
Particulate Matter	15
Greenhouse Gas Emissions	16
3. WMCA Regional Strategies	18
4. Local Plans and Action Plans	21
Local Plans.....	21
Air Quality Action Planning.....	24
Clean Air Zones.....	29
Birmingham CAZ.....	29
Air Quality Local Plans	30
Targeted Feasibility Studies	30
5. Baseline Air Quality	31
Local Air Quality Management	31
Monitoring.....	31
Nitrogen Dioxide Monitoring.....	31
Particulate Matter	35
Monitoring Summary	35
PCM Links	35
Source Apportionment.....	37
Emission Sources	37
Transport Sources.....	38
Regional Emissions.....	39
Economic Damage Costs.....	39
Health Costs.....	41
6. Identification of Key Priority Areas	43
West Midlands Transport Model.....	43
Emission Factor Toolkit	43
Screening Tool.....	44
Health and Wellbeing	52
Ecosystems	57
Key Priority Areas.....	59
7. Identifying Interventions	61
Consultation Workshop	61

Appraisal Scoring	62
Responsibilities and Resources	63
8. Interventions	64
9. Buses	65
Bus upgrades to Euro VI and ultra-low emission buses	66
Refuelling infrastructure for zero emission buses	67
Assignment of buses to routes	67
10. Travel Choices	70
Cycling & Walking	71
Mobility as a Service	71
On-demand Buses	71
Ride Hailing	72
Commercial MaaS	72
e-Bikes	73
Park & Ride	73
Ticketing	74
Car Clubs	75
Electric Vehicles	75
Travel Plans	76
11. Highway Planning & Coordination	81
Key Route Network (KRN) Upgrades	81
Redistribution Effects	82
Changing Travel Behaviour	82
Commonwealth Games	83
Roadworks	83
Traveller Information	84
12. Freight	86
Freight Emissions	86
M6 Toll	86
Urban Logistics Management	87
Freight Technology	88
Freight Optimisation	88
Platooning	89
Electric Freight	90
Freight Consolidation	91
Last Mile Delivery	92
Land allocations, spatial planning and fuelling strategies	92
Rail Freight Interchange	93
13. Planning Guidance	96
Planning Coordination	96
Financial Contribution	97
Damage Cost	97
Taxi licensing	98
School Planning	98
Parking Regulation	99
Vehicle Idling	101
14. Healthy Streets	106
Place-making	106
Shared Space	107
Green Infrastructure	108

Local Planting.....	109
Regional Planting	110
15. Data Technical Practice Network.....	113
Technical Support.....	113
Training & Data Handling	113
Air Quality Monitoring.....	113
Emissions Inventory	114
Discrete Emission Sources	115
Domestic Solid Fuel Stoves	115
Generator Sets & Small Static Diesel Engines	115
16. Technology & Innovation	118
Adapting to Fuel and Energy	118
Autonomy	120
Connected Intelligent Transport Systems	121
17. Public Engagement	123
Public Health	124
Public Notifications	125
Health Contingency Planning.....	127
Monitoring and Validation	127
18. Funding	130
Funding Coordination.....	130
Funding the Strategic Vision	130
Lobbying.....	131
19. Summary	133
Prioritised Interventions.....	133
Measuring Success	136
Appendix A : National Policies	137
Clean Air Zone framework for England	137
Clean Growth Strategy.....	137
The National Planning Policy Framework	137
Planning Practice Guidance (2014)	138
HGV Road User Levy.....	138
Appendix B : Mortality Rates associated with Particulate Matter	139
Appendix C : West Midlands Combined Authority Region Strategies	140
WMCA Strategic Economic Plan.....	140
Movement for Growth – Strategic Transport Plan.....	140
Movement for Growth: 2026 Delivery Plan for Transport.....	141
WMCA Annual Plan 2018/2019.....	142
West Midlands Industrial Strategy.....	142
West Midlands Freight Strategy	143
TfWM Strategic Vision for Bus	143
West Midlands Low Emission Bus Delivery Plan.....	144
WMCA/TfWM Transport Plan 2017/18.....	144
TfWM Congestion Management Plan	145
West Midland Key Route Evidence Report	145
Proposed West Midlands Low Emissions Vehicle Strategy	146
Black Country Ultra Low Emissions Strategy.....	146
Appendix D : Local Authority Local Plans	148
Appendix E : Local Authority Air Quality Action Plans	149

Appendix F : Local Air Quality Management	150
Air Quality Management Areas	150
Nitrogen Dioxide Monitoring	152
Particulate Matter Monitoring	154

Figures

Figure 1: Annual mean NO ₂ concentrations recorded at continuous monitors located in the WMCA 3 LEP geographies (NB red line indicates annual mean NO ₂ objective of 40 µg/m ³)	32
Figure 2: Air Quality Management Areas in the WMCA 3 LEP Geography	33
Figure 3 Local Air Quality Monitoring in the West Midlands	34
Figure 4: PCM Annual Mean NO ₂ concentrations in 2017 in the WMCA 3 LEP Geography	36
Figure 5: Contribution of emission source to total NO _x and PM ₁₀ Concentrations	37
Figure 6: Contribution of Road-source NO _x , PM & CO ₂ Emissions	38
Figure 7: Contribution of CO ₂ equivalent GHG Emissions	39
Figure 8: Annual Air Quality Damage Costs per District (medium range)	41
Figure 9: Screening Outputs, Annual Mean NO ₂ Concentrations in 2016	46
Figure 10: Screening Outputs, Annual Mean PM ₁₀ Concentrations in 2016	47
Figure 11: Screening Output, Annual Mean PM _{2.5} Concentrations in 2016	48
Figure 12: Screening Outputs: Percentage NO _x Emissions in 2016 from Cars	49
Figure 13: Screening Output, Percentage NO _x Emissions in 2016 from LGVs	50
Figure 14: Screening Output, Percentage NO _x Emissions in 2016 from HGVs	51
Figure 15: Indices of Multiple Deprivation: IMD 2015	54
Figure 16: Indices of Multiple Deprivation: IMD 2015 as Health Index Score	55
Figure 17: Indices of Multiple Deprivation: IMD 2015 as Income Index Score	56
Figure 18: SSSIs within the WMCA 3 LEP Geography	58
Figure 19: Key Priority Areas	60
Figure 20: West Midlands Bus Fleet Breakdown in 2015 (EURO class and bus type)	65
Figure 21: Example of HGV Euro VI Speed vs Emissions Profile	89
Figure 22: Emissions from Cold Starts	102
Figure 23 Examples of the Potential Dispersion Effects of Green Infrastructure	109
Figure 24 EFT v8.0.1 Fleet Fuel Composition Projections	119
Figure 25 Projected Fleet Fuel Composition	119
Figure 26 Types of Autonomy	120
Figure 27 Alert Response	126
Figure 28: Fraction of male mortality associated with particulate matter in the West Midlands	139
Figure 29: Fraction of male mortality associated with particulate matter in the West Midlands	139

Tables

Table 1: Summary of Relevant Policy	13
Table 2: Comparison of WHO Guidelines and UK Objectives	16
Table 3: Summary of WMCA Strategies	18
Table 4: Local Plan Summary	21
Table 5: Air Quality Action Plan Progress	24
Table 6: West Midlands Regional Damage Cost from Road Emissions, 2018 values	40
Table 7: Fraction of mortality attributable to particulate air pollution (MPP)	41
Table 8: Best and worst performing LAs	42
Table 9: West Midlands Bus Fleet Composition	44
Table 10: Appraisal Scoring Criteria	63
Table 11: Bus Emission Standards Damage Costs	65
Table 12: Appraisal Scoring – Bus Upgrade	69
Table 13: Appraisal Scoring – Travel Choices	80
Table 14: Appraisal Scoring – Highway Planning and Coordination	85

Table 15: HGV Emission Standards Damage Costs.....	86
Table 16: Annual Average Daily HGV Flow M6 J5-J8	87
Table 17: Appraisal Scoring – Freight Coordination.....	95
Table 18: Taxi Emission Standards Damage Costs	98
Table 19: Appraisal Scoring – Planning Guidance.....	104
Table 20: Appraisal Scoring – Healthy Streets.....	112
Table 21: Appraisal Scoring – Technical Practice Network	117
Table 22: Appraisal Scoring – Technology and Innovation	122
Table 23: Appraisal Scoring – Public Engagement	129
Table 24: Appraisal Scoring – Funding Coordination.....	132
Table 25: Intervention Scoring and Prioritisation	134
Table 26: Examples of policy themes in the West Midlands Local Authorities' Local Plans	148
Table 27: Examples of action themes within each local authority's action plans.....	149
Table 28: AQMAs within the West Midlands	150
Table 29: NO ₂ Continuous Monitoring Station Data for 2016 in the WMCA	152
Table 30: Summary of NO ₂ Diffusion Tube Data for 2016 in the WMCA.....	153
Table 31: PM ₁₀ Continuous Monitoring Station Data for 2016 in the WMCA.....	154
Table 32: PM _{2.5} Continuous Monitoring Station Data for 2016 in the WMCA.....	154

1. Introduction

- 1.1 Local and regional air quality is an increasingly significant concern, and so this Regional Air Quality Review and Action Plan identifies effective and feasible regional level actions to improve air quality in the West Midlands region. The objective will be to achieve real improvements to public health and quality of life whilst supporting economic growth aspirations.
- 1.2 This document has been developed with the overriding aim of improving the health of the population whilst also satisfying legislative requirements and taking into account the diverse social and economic characteristics of local authorities within the West Midlands. The aim is to go beyond current legislation and to aim for an overall long-term reduction of harmful pollutants and their impact on our health and environment. Interventions outlined within the document support the major local interventions, such as the potential Clean Air Zone (CAZ) in Birmingham, to ensure that local air quality management for the region is coordinated.
- 1.3 The focus of the Regional Air Quality Review and Action Plan are health, wellbeing and socio-economic benefits that may be achieved by using local air quality improvements as a core indicator. In doing so the impact on reducing greenhouse gases has also been considered to ensure the proposed measures make a positive contribution. It incorporates multidisciplinary considerations and measures to ensure that the interventions can be implemented within the framework of existing and future baseline conditions, legislation and best practice.

Scope

- 1.4 The Regional Air Quality Review and Action Plan was commissioned by the WMCA Board in July 2018, overseen by the WMCA Environment Board, and led by the WMCA Environment team.
- 1.5 The overall objectives and outcomes were:
 - **Support for local action** - joint action between local authorities, the WMCA and other stakeholders to accelerate existing agreed local plans to tackle air quality and greenhouse gas emissions.
 - **Social, economic, and environment outcomes** – accelerated activity will result in improved health, such as reduction in premature deaths and health inequalities, economic productivity, such as reduced congestion and attraction of new business, and an improved natural environment.
 - **Attract investors** - help to scale up opportunities to attract investors to fund innovation, manufacturing and deployment of solutions both locally and for export. Underpin the UK's first 'clean, inclusive, and resilient growth' local industrial strategy and inform relevant bids such as future Industrial Strategy 'grand challenges'.
- 1.6 The geographic area encompassed the WMCA 3 Local Enterprise Partnership (LEP) areas, which cover 19 unitary and district local authorities:
 - **Black County LEP** - Dudley, Sandwell, Walsall, Wolverhampton;
 - **Coventry and Warwickshire LEP** - Coventry, North Warwickshire, Nuneaton and Bedworth, Rugby, Stratford-on-Avon, Warwick; and
 - **Greater Birmingham and Solihull LEP** – Birmingham, Bromsgrove, Cannock Chase, East Staffordshire, Lichfield, Redditch, Solihull, Tamworth, Wyre Forest.
- 1.7 The detailed focus of this Review was on the seven unitary councils within the metropolitan area: Birmingham, Wolverhampton, Coventry, Dudley, Sandwell, Solihull and Walsall.
- 1.8 Thank you to the valuable contributions from the steering group who included Transport for West Midlands (TfWM), local authority air quality officers representing the 3 LEP Areas, University of Birmingham's WM-Air, Centre for Low Carbon Vehicles (Cenex), and Public Health

England. Contributions from TfWM data team, the WMCA Scrutiny Committee and Air Quality Champion, the participants at the March 2019 workshop from public health, planning, transport, environment, the WMCA, and many other various groups and individuals that have all helped during the process.

Report Structure

- 1.9 This document includes two components; a Review and an Action Plan.
- 1.10 The Review identifies key priority areas where interventions to improve air quality should be focused. These areas are identified based on pollutant concentrations, determined using a screening assessment and consideration of the social-demographic characteristics in the region. A source apportionment study has been conducted to determine the main contributors to the pollutant concentrations to enable intervention to be targeted appropriately.
- 1.11 The Action Plan defines discrete and coordinated interventions that will achieve the aspirations outlined in the Review and inform how they will be implemented.
- 1.12 The report is structured as follows:
 - The Review:
 - Section 2: describes the European and National legislation and policy framework
 - Section 3: describes the West Midlands regional policy framework
 - Section 4: describes the Local Authorities policies for improving air quality, namely local plans and air quality action plans
 - Section 5: identification of baseline conditions and source apportionment
 - Section 6: identification of key priority areas
 - Action Plan:
 - Section 7: procedure to identify long-list of interventions
 - Sections 8 - 18: long-list of interventions
 - Section 19: summary
- 1.13 The modelling carried out for this research has also been provided to the TfWM data team to allow further use and access by WMCA partners and local authorities within the 3 LEP geography.

2. Legislation, Policy and Planning

European Air Quality Directives

- 2.1 The Air Quality Framework Directive (96/62/EC) on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment. Ambient concentration limit values for the specific pollutants are set through a series of Daughter Directives.
- 2.2 Following the Daughter Directives, Council Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force in 2008 and was transposed into national legislation in 2010 (The Air Quality Standards Regulations 2010¹). It consolidated existing air quality legislation and made provisions for Member States to postpone limit value attainment deadlines and allow an exemption from the obligation to limit values for certain pollutants, subject to strict conditions and assessment by the European Commission (EC).

National Air Quality Legislation

Air Quality Standards Regulations (2010) (as amended)

- 2.3 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 (as amended by the Air Quality Standards (Amendment) Regulations 2016)², which transposes relevant EU Air Quality Directives into national legislation and sets legally binding limits for concentrations in outdoor air of major air pollutants that impact public health such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

Environment Act (1995)

- 2.4 The provisions of Part IV of the Environment Act 1995 (H.M. Government, 1995) establish a national framework for air quality management, which requires all Local Authorities to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the objectives prescribed in the UK Air Quality Strategy (AQS)³ and the Air Quality Standards Regulations 2010 (Defra, 2010) (henceforth referred to as the "Air Quality Regulations") will not be met, the Local Authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves.
- 2.5 The UK Air Quality Strategy (AQS) (Defra, 2007) identifies nine ambient air pollutants that have the potential to cause harm to human health. These pollutants are associated with local air quality problems, with the exception of ozone, which is instead considered to be a regional problem. Similarly, the Air Quality Regulations set objectives, but for just seven of the pollutants that are associated with local air quality. These objectives aim to reduce the health effects of the pollutants to negligible levels.
- 2.6 The air quality objectives and limit values currently applicable to the UK can be split into two groups. Each has a different legal status and is therefore handled differently within the framework of UK air quality policy. These are:
 - UK air quality objectives set down in regulations for the purposes of local air quality management; and
 - European Union (EU) limit values transcribed into UK legislation for which compliance is mandatory.

¹ Defra (2010) The Air Quality Standards Regulations 2010

² The Stationery Office Limited, (2016); The Air Quality Standards Regulations (Amended), (2016). Statutory Instrument No. 1001

³ Defra (2007) UK Air Quality Strategy

UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations

- 2.7 In 2017, Defra and Department for Transport (DfT) released the UK plan for tackling roadside NO₂ concentrations⁴ as the UK is not compliant with the EU limit values for NO₂. The national plan principally focuses on providing additional funding to local authorities so that local action can be taken to improve air quality in the shortest possible time with measures such as improving bus fleets, support for concessionary travel and sustainable modes of transport and low emission buses. The plan required local authorities to set out initial plans by the end of March 2018, followed by final plans by the end of December 2018. Alongside the Defra plan a dataset of Defra's predicted pollutant concentrations along specific roads was published. This dataset is called the Pollution Climate Mapping (PCM) dataset and this is used to inform the assessment of compliance of the proposed Scheme with EU Limit Values.

2019 Clean Air Strategy

- 2.8 In January 2019, Defra published its Clean Air Strategy (Defra, 2019⁵) which outlined proposals to tackle emissions from a range of sources. This included providing clear effective guidance on how AQMAs, CAZ and Smoke Control Areas interrelate and how they can be used by local government to tackle pollution. New legislation will seek to shift the focus towards prevention of exceedances rather than tackling pollution when limits have been surpassed.
- 2.9 The UK Clean Air Strategy sets the following reduction targets:
- Fine particulate matter (PM_{2.5}) reduction against the 2005 baseline by 30% by 2020, and 46% by 2030.
 - Particulate matter (PM₁₀) reduction against the 2005 baseline to 50% or less of UK population living in areas with concentrations of (10 µg/m³) by 2025
 - Ammonia (NH₃) reduce emissions against the 2005 baseline by 8% by 2020 and 16% by 2030.
 - Nitrogen oxides (NO_x) reduce emissions against the 2005 baseline by 55% by 2020, and by increasing 73% by 2030.
 - Sulphur dioxide (SO₂) reduce emissions against the 2005 baseline by 59% by 2020, increasing to 88% by 2030.
 - Non-methane volatile organic compounds (NMVOCs) reduce emissions against the 2005 baseline by 32% by 2020, increasing to 39% by 2030.
 - Ozone (O₃) as secondary pollutant to ensure it does not increase as NO_x reduces and keeps within EU limits.

Other Relevant Policy

- 2.10 National policies relevant to improving air quality in the WMCA region are set out below in Table 1, with further details provided in Appendix A.

⁴ Defra and DfT (2017) Improving air quality in the UK: tackling nitrogen dioxide in our towns and cities

⁵ Defra (2019) Clean Air Strategy

Table 1: Summary of Relevant Policy

Policy Document	Summary	Relevance to Air Quality in WMCA region
Department for Transport (DfT) Air Quality – Clean Air Zone framework for England (May 2017) ⁶ .	This framework sets out the principles local authorities should follow when setting up Clean Air Zones in England. It explains the approach they should take if they are introducing a zone to improve air quality, and the types of measures they should include.	Provide a framework for implementing a CAZ where the national modelling approach has identified potential exceedances of the air quality objective. Birmingham City Council are in the process of implementing a CAZ (refer to Section 4).
HM Government “Clean Growth Strategy” (Oct 2017) ⁷ .	This strategy sets out the Government's proposals for decarbonising all sectors of the UK economy through the 2020s. It explains how the whole country can benefit from low carbon opportunities, while meeting national and international commitments to tackle climate change. It complements the Government's Industrial Strategy, Air Quality Plans.	
The National Planning Policy Framework (2019) ⁸	The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 7 and 14). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.	The NPPF sets out the framework upon which all Councils determine their planning policy, and as such is relevant to all the Councils in the WMCA region.
Planning Practice Guidance (2014) ⁹	The Planning Practice Guidance (PPG) provides additional guidance and interpretation to the Government's strategic policies outlined within the NPPF in a web based resource that is regularly updated.	PPG sets out what air quality assessments submitted as part of a planning application should contain. This is directly relevant to those interventions that will require planning permission.
HGV Road User Levy ¹⁰	In this document, the DfT specifically recognises local air quality and climate change as key factors in managing freight and congestion, and introduces the proposed plans for a long-term strategy for zero emission road transport expected in March 2018.	While HGVs represent a small percentage of road vehicles, each vehicle has a high emission rate, making them an important target for reducing overall emissions.

⁶ Defra (2017) Clean Air Zone Framework Principles for setting up Clean Air Zones in England

<https://www.gov.uk/government/publications/air-quality-clean-air-zone-framework-for-england>

⁷ HM Government (2017) The Clean Growth Strategy Leading the way to a low carbon future

<https://www.gov.uk/government/publications/clean-growth-strategy>

⁸ Department for Communities and Local Government, (2019), National Planning Policy Framework, the National Archives

⁹ Department for Communities and Local Government, (2014); Planning Practice Guidance (PPG).

<http://planningguidance.planningportal.gov.uk>

¹⁰ Dept. for Transport (2017) Reforming The HGV Road User Levy: Call For Evidence

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661814/reforming-hgv-road-user-levy.pdf

Policy Document	Summary	Relevance to Air Quality in WMCA region
The Right Tree in the Right Place for a Resilient Future ¹¹	The urban tree manual is a guide intended to support local authorities, charities, community groups and land owners in selecting and procuring the right tree for the right place in urban areas.	Green infrastructure and planting is a major part of the place-making theme, and can represent a viable supporting means to reduce exposure and atmospheric pollutants.

Brexit and Air Quality

- 2.11 The UK is set to leave the European Union (EU) at an unconfirmed date (exiting the EU is commonly referred to as “Brexit”). Air Quality legislation and policy is currently primarily driven by the EU, as set out in the sections above. Air pollution limits set by the EU will technically remain in UK law after Brexit, having been enshrined through the Air Quality Standards Regulation. However, there is concern in some quarters that the EU will no longer have a role in enforcement and the UK government would therefore be free in theory to repeal the existing limits and introduce weaker air quality rules, and review any deadlines for meeting them. Unfortunately there are no strong indications of exactly what will happen to air quality legislation after Brexit, and so this study is written under the assumption that existing policies will be maintained.

Local Air Quality Management

- 2.12 Under the requirements of Part IV of the Environment Act (1995), Local Authorities have been responsible for carrying out a phased review and assessment of local air quality since 1998. This responsibility includes the identification of areas at risk of exceeding the air quality objectives as set out above, and declaring an Air Quality Management Area (AQMA) if required. Once an AQMA has been declared the local authority has a responsibility to make efforts to improve the air quality within it, including publishing Air Quality Action Plans. The work undertaken to date by the respective Councils is detailed in Section 5.
- 2.13 At the LEP level the target in the WMCA Strategic Economic Plan (SEP) is to reduce the number of poor air days (a 4 or higher in the Defra Daily Air Quality Index to reflect likely legal breaches of the pollutants and the beginning of health warnings) from 40 in 2016 to 1 by 2030. This is currently monitored by the WMCA Performance Management Framework indicator PMF E.2. The indicator covers most of the pollutants in the UK air quality strategy; e.g. PM_{2.5}, PM₁₀, NO_x, SO₂, O₃. However, it omits NH₃ and NMVOCs which need to be reviewed in future monitoring.
- 2.14 Development control is an important aspect of Local Air Quality Management. There is currently no statutory guidance on the method by which an air quality assessment should be undertaken. The Institute of Air Quality Management (IAQM)¹², Environmental Protection UK (EPUK)¹³ and the Department for Environment and Rural Affairs (Defra) have published guidance for carrying out air quality assessments for development control purposes.

Pollutants of Concern

- 2.15 The local air quality review and assessment procedure has identified that NO₂ and particulate matter, both PM₁₀ and PM_{2.5}, are the pollutants of concern in the region. Exceedances of the NO₂ and PM₁₀ objectives have been recorded within the region and therefore the remainder of the document will focus on these pollutants only.

Nitrogen Dioxide

- 2.16 NO₂ and nitric oxide (NO) are both oxides of nitrogen and are collectively referred to as NO_x. All combustion processes produce NO_x emissions, largely in the form of NO, which is then

¹¹ DEFRA (2018) The Right Tree in the Right Place for a Resilient Future

¹² IAQM and EPUK, (2017); Guidance on land-use planning and development control: Planning for air quality. 2017

¹³ EPUK, (2010); Development Control: Planning for Air Quality (2010 Update): Update guidance from Environmental Protection UK on dealing with air quality concerns within the development control process.

converted to NO₂, mainly as a result of its reaction with ozone in the atmosphere. Therefore, the ratio of NO₂ to NO is primarily dependent on the concentration of ozone and the distance from the emission source.

- 2.17 The Government and the Devolved Administrations adopted two Air Quality Objectives for NO₂ which were to be achieved by the end of 2005. In 2010, mandatory EU air quality limit values on pollutant concentrations were to apply, although it continues to be breached in locations throughout the UK. The EU limit values for NO₂ in relation to human health are the same as the national objectives¹⁴:
- An annual mean concentration of 40 µg/m³ (micrograms per metre cubed); and
 - An hourly mean concentration of 200 µg/m³, to be exceeded no more than 18 times per year.
- 2.18 In practice, meeting the annual mean objective has been and is expected to be considerably more demanding than achieving the 1-hour objective. The annual mean objective of 40 µg/m³ is currently widely exceeded at roadside sites throughout the UK, with exceedances also reported at urban background locations in major conurbations. Exceedances are associated almost exclusively with road source emissions.
- 2.19 There is considerable year-to-year variation in the number of exceedances of the hourly objective, driven by meteorological conditions which give rise to winter episodes of poor dispersion and summer oxidant episodes. Analysis of the relationship between 1-hour and annual mean NO₂ concentrations at roadside and kerbside monitoring sites indicate that exceedances of the 1-hour objective are unlikely where the annual mean is below 60 µg/m³¹⁵.
- 2.20 Exposure to NO₂ is understood to be linked with decreased lung function, growth, increases in respiratory symptoms, asthma prevalence and incidence, cancer incidence, adverse birth outcomes and mortality. However, whilst evidence indicates direct health effects, it is also understood that cumulative effects may occur from exposure to associated pollutants, such as combustion products¹⁶. Therefore, whilst NO₂ is used as an indicator pollutant, the direct health effects associated with exposure to this pollutant are very complex.

Particulate Matter

- 2.21 Particulate matter is composed of a wide range of materials arising from a variety of sources and is typically assessed as total suspended particulates or as a mass size fraction. Potential background and regional sources include sea-salt, agricultural emissions (e.g. dust from exposure fields), industrial sites, and domestic wood stoves, whilst transport sources are due to combustion products from exhausts, tyre/brake wear, and re-suspended dust from road surfaces.
- 2.22 This study considers the annual mean and daily mean air quality objectives, as specified in the AQS for England, Scotland, Wales and Northern Ireland¹⁷. Two objectives have been adopted in England and Wales for PM₁₀ (fine particulate matter with a diameter of <10 µm), which were to be achieved by the end of 2004:
- An annual mean concentration of 40 µg/m³ (gravimetric); and
 - A 24-hour mean concentration of 50 µg/m³ (gravimetric) to be exceeded no more than 35 times per year.
- 2.23 One objective has been adopted for PM_{2.5} (very fine particulate matter with a diameter of <2.5 µm) in England and Wales which is an annual mean concentration of 25 µg/m³ (gravimetric). Furthermore, the 2019 Clean Air Strategy includes an objective to reduce PM_{2.5} concentrations across the UK, so that the number of people living in locations above the WHO guideline level of 10 µg/m³ is reduced by 50% by 2025.

¹⁴ Defra (2007) UK Air Quality Strategy

¹⁵ Defra (2016) Local Air Quality Management Technical Guidance

¹⁶ Committee On The Medical Effects Of Air Pollutants Statement On The Evidence For The Effects Of Nitrogen Dioxide On Health
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411756/COMEAP_The_evidence_for_the_effects_of_nitrogen_dioxide.pdf

¹⁷ Defra (2007) UK Air Quality Strategy

- 2.24 Both short-term and long-term exposure to ambient levels of particulate matter are consistently associated with respiratory and cardiovascular illness and mortality as well as other ill-health effects. Particles of less than 10 micrograms (μm) in diameter have the greatest likelihood of reaching the thoracic region of the respiratory tract. Here particles may remain resident and therefore have increased likelihood of doing harm.
- 2.25 It is not currently possible to discern a threshold mass concentration below which there are no effects on the whole population's health. Reviews by World Health Organisation and the Committee on the Medical Effects of Air Pollutants¹⁸ have suggested exposure to a finer mass fraction of particles ($\text{PM}_{2.5}$, which typically make up around two thirds of PM_{10} emissions and concentrations) give a stronger association with the observed ill health effects, but also warn that there is evidence that the coarse fraction (between PM_{10} – $\text{PM}_{2.5}$) also has some effects on health. Further details are provided in Appendix B.
- 2.26 Table 2 shows the difference between the WHO guidelines and the UK objectives as described above. The WHO guidelines are health based and are more stringent for particulate matter. This document focuses on the UK objectives as these are the legal limit which councils need to comply with.

Table 2: Comparison of WHO Guidelines and UK Objectives

Pollutant	WHO Guidelines		UK objective	
	Long term	Short term	Annual Mean	Short term
NO_2	40 $\mu\text{g}/\text{m}^3$	200 $\mu\text{g}/\text{m}^3$	40 $\mu\text{g}/\text{m}^3$	200 $\mu\text{g}/\text{m}^3$
	Annual Mean	1-hour mean	Annual Mean	1-hour mean
				To be exceeded no more than 18 times per year.
PM_{10}	20 $\mu\text{g}/\text{m}^3$	50 $\mu\text{g}/\text{m}^3$	40 $\mu\text{g}/\text{m}^3$	50 $\mu\text{g}/\text{m}^3$
	Annual Mean	24-hour mean	Annual Mean	24-hour mean
				To be exceeded no more than 35 times per year.
$\text{PM}_{2.5}$	10 $\mu\text{g}/\text{m}^3$	25 $\mu\text{g}/\text{m}^3$	25 $\mu\text{g}/\text{m}^3$	
	Annual Mean	24-hour mean	Annual Mean	-

Greenhouse Gas Emissions

- 2.27 This study is predominately focussed on local air quality, although it is recognised that emissions of Greenhouse Gases (GHG) have been deeply integrated into regional and local policies through a decade of central government guidance.
- 2.28 The GHG considered in the Review focus on those reported in the UK Climate Change Act¹⁹ which includes a target to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline. At the WMCA Strategic Economic Plan (SEP) level the current 2030 target is a 40% reduction against 1990 levels. This is currently monitored by the WMCA Performance Management Framework indicator PMF E.1. for carbon dioxide equivalent (CO_2e). Since the research stage of this report was completed the UK Government has agreed

¹⁸ COMEAP (1998). *The Quantification of the Effects of Air Pollution on Health in the United Kingdom*. HMSO, London. Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe.

¹⁹ UK Climate Change Act https://www.legislation.gov.uk/ukpga/2008/27/pdfs/ukpga_20080027_en.pdf (accessed June 2019)

to a national target of net zero emissions by 2050 and the WMCA Board are considering a sub-national net zero target by 2041.

- 2.29 Although GHG and air quality pollutants are both emissions into our atmosphere, the nature of impact is significantly different. Air pollution is often based on local thresholds exceed and impact on human health based on exposure, and is measured in hours or days. The main GHG CO₂ is measured on global thresholds based on decades, especially given the impact of CO₂ is regional, national and long term.
- 2.30 Co-benefits between air quality and GHG exist, for example the extraction and burning of fossil fuels is the main cause of CO₂ which drives climate change and is also a major source of air pollutants²⁰. Therefore there are many co-benefits around modal shift to lower emission public transport. However, it is recognised that there may be conflicts, such as shifting from diesel to petrol fuel, and so these risks have also been considered.
- 2.31 For this research the potential climate change impacts of GHGs have been considered in the appraisal process, but have not been used as a core outcome from the study. All the proposed regional level measures to improve air quality in this study are intended to have a neutral or positive impact in terms of reducing GHGs. For example improving the bus fleet in the region to the 'cleanest' diesel standard over the next 2 years will have a quicker impact on improving health, than a smaller percentage of buses becoming electric. Although modern buses do generally emit lower CO₂. In the longer term, over the next 3-8 years the aim will have to be moving towards zero emissions buses for health and climate objectives. This would require electric or alternative fuels buses being prioritised for routes with poor air quality and high health impact.

²⁰ IASS Air Pollution and Climate Change <https://www.iass-potsdam.de/en/output/dossiers/air-pollution-and-climate-change> (accessed June 2019)

3. WMCA Regional Strategies

- 3.1 The geographic area encompassed the WMCA 3 Local Enterprise Partnership (LEP) areas, which cover 19 unitary and district local authorities:
- **Black County LEP** - Dudley, Sandwell, Walsall, Wolverhampton;
 - **Coventry and Warwickshire LEP** - Coventry, North Warwickshire, Nuneaton and Bedworth, Rugby, Stratford-on-Avon, Warwick; and
 - **Greater Birmingham and Solihull LEP** – Birmingham, Bromsgrove, Cannock Chase, East Staffordshire, Lichfield, Redditch, Solihull, Tamworth, Wyre Forest.
- 3.2 Traditionally the areas used for strategic planning focus on the above three LEP geographies or the seven constituent unitary authorities that make up the metropolitan area. WMCA has a Devolution Agreement with the Government, whereby powers, funding and responsibility are handed down from central government to the local authorities. As part of this, WMCA published the Strategic Economic Plan (SEP) setting out what the WMCA aims to achieve by 2030 for employment, homes and transport, and more recently the local industrial strategy which covered areas such as housing, employment, transport, air quality, natural capital and energy.
- 3.3 Leadership of the WMCA comes from the Mayor and the leaders of the seven constituent unitary authorities. Non-constituent authorities include 10 local authorities from across the wider west midlands regions, which although have reduced voting rights play a crucial role at board level, helping to inform policy and drive forward the WMCA agenda.
- 3.4 Table 3 outlines the main policies and strategies regarding land use and transport infrastructure in WMCA region covered by the three LEP geographies, as these are significant frameworks that influence travel and associated impacts of, and from, local air quality. Details of each document are in Appendix C.

Table 3: Summary of WMCA Strategies

Strategy Document	Summary of Document	Relevance to Air Quality
WMCA Strategic Economic Plan	Sets out the vision, objectives, strategy and actions for improving the quality of life by 2030 for everyone working and living in the West Midlands; recognising the importance of regional economic growth in strengthening local and national competitiveness.	Supports sustainable growth through incentivised policy frameworks and targets that encourage the development of environmental technologies, sustainable transport solutions, sustainable energy use and waste minimisation.
Movement for Growth: Strategic Transport Plan	Sets out the region's vision and overall strategy for transport that supports economic growth and improves the lives of residents and workers.	Clearly prioritises air quality as a strategic concern. Air quality and transport related emissions are identified as a wider strategic priority to be tackled through targeted investment in improvements.
Movement for Growth: 2026 Delivery Plan for Transport	This Delivery Plan sets out the plan and progress for achieving Transport for West Midlands' long-term transport strategy "Movement for Growth" The high-level programme of capital schemes is the first delivery plan of the long-term strategy.	The document recognises the pollution caused by the volume of traffic on the regions roads, congestion and the popularity of diesel engines with vehicle owners. It cites poor air quality as reducing quality of life, the damage it does to health and the potential negative impact that it has on inward investment and growth.
WMCA Annual Plan 2018/2019	Set out WMCA priorities for 2018/19 so stakeholders and partners had clear areas of focus and delivery. Cites commitment to deliver clean, inclusive and resilient growth through a long term, integrated approach to delivering jobs, homes and transport.	Cited 2018 roundtable discussions with industry leaders and local partners on air quality that has begun to develop a long term roadmap to tackle a wide range of pollutants (as opposed to a single pollutant) in line with SEP targets.

Strategy Document	Summary of Document	Relevance to Air Quality
West Midlands Industrial Strategy	The Industrial Strategy focuses on what public and private sector partners need to do to support clean and inclusive growth and productivity gains in the years ahead.	The document identifies an overreliance on the road network compared to other modes of transport, which results in poor air quality and costly congestion. There is also a commitment to produce a regional air quality action plan, have the highest uptake of electric cars of any region, and prioritise 'future mobility' opportunities around low emissions vehicles and travel.
West Midlands Freight Strategy	The West Midlands Freight Strategy outlines an approach whereby the West Midlands can be seen as a beacon of best practice in freight management and where efficient logistics is seen as a vital engine for the economy, but imposes a much lower impact on our communities, environment and transport infrastructure.	National, Metropolitan and Local Tier objective to improve air quality. Support for the introduction of very low emissions or zero emissions delivery systems.
Transport for West Midlands Strategic Vision for Bus	The document sets out the vision for buses in the West Midlands to enable the region to develop its vital role and strive towards ensuring that the mode can thrive, supporting and connecting major rail and Metro investment, connecting communities and towns, and helping to build a healthier, happier, better connected and more prosperous region.	Advocates the creation of a zero-emission transport system recognising that in all seven constituents local authorities nitrogen dioxide (NO ₂) and/or particular matter concentration thresholds are exceeded (relative to EU limits).
West Midlands Low Emission Bus Delivery Plan	A plan to develop the delivery of low emission bus fleets and the installation of the required refuelling infrastructure by 2035. The Delivery Plan aims to guide and support the transition of the West Midlands bus fleet towards a zero/low emission fleet and, by providing a quantification of impacts and prioritisation of efforts will be a valuable source of evidence for funding applications.	Air quality improvement is the primary objective of this plan.
WMCA/Transport for West Midlands Transport Plan 2017/18	The WMCA and TfWM adopted the West Midlands Strategic Transport Plan "Movement for Growth" when it was formed in June 2016. In line with this, the WMCA has an agreed Devolution Deal with the Government which is strongly based on making the most of the opportunities High Speed Rail Two (HS2) provides for the West Midlands.	In meeting the challenges the region is facing on air quality, the bus will be key in providing the solution to encouraging people to consider their alternative travel options for accessing our key economic centres. We are also working with partners to deliver zero emission buses to our region's road to help address air quality and reduce the carbon footprint of the transport network.
TfWM Congestion Management Plan	The TfWM Congestion Management Plan seeks to identify and tackle the root causes of congestion in the region through targeted corridor investment and improved traffic management, investment in technology, increases in public transport capacity and improvement to services, investment in communications, marketing and travel demand management to better inform the user; all of which will be supported by the creation of a regional integrated traffic control centre.	The document advocates sustainability at its core and cites the many proposed components of the plan as having positive benefits for improving Air Quality, health and well being across the region.
West Midlands Key Route Network Evidence Report	The evidence report highlights the primary role of the Key Route Network is to enable the growth ambition of our region as we seek to build more houses, create jobs, improve the health of our people and help our population to make sustainable choices in order to improve the environment in which we live.	The report recognises that pollutants from road traffic and specifically traffic on the KRN and the strategic road network through our region where the largest volumes are carried, pose significant risks to achieving the vision of sustainable growth.

Strategy Document	Summary of Document	Relevance to Air Quality
Proposed West Midlands Low Emissions Vehicle Strategy	The Low Emissions Vehicle Strategy (LEVS) forms part of the newly adopted <i>West Midlands Strategic Transport Plan "Movement for Growth"</i> . The LEVS focus on vehicle emissions, embracing new, cleaner vehicle technology - much of which has been developed within the West Midlands region - and specifically promotes the use of low & ultra-low emission vehicles. It outlines issues with current vehicle technologies and highlights how successive European Emission Standards have not performed as well in the real world as had been originally indicated. The Strategy examines how low and ultra-low emission vehicles can provide savings for drivers and operators compared with standard vehicle technologies.	The strategy recognises that in certain locations levels of nitrogen dioxide (NO ₂) have remained stubbornly elevated over the last decade as action to improve air quality has stuttered for several reasons.
Black Country Ultra Low Emissions Strategy	This strategy is designed to complement a range of existing strategies and policies in order to promote the uptake and use of Ultra Low Emission Vehicles (ULEVs) throughout the Black Country.	This strategy seeks to provide an integrated approach to the reduction of road transport-related emissions in order firstly to improve air quality and secondly to address climate change issues. It will be progressed by an implementation plan to support delivery of key themes and serve as a platform to aid applications for related funding bids at a local, national and European level.
Future of Mobility: Urban Strategy	The strategy outlines how significant funding will be used to promote and adopt new technology, and how this will be used to promote sustainable growth and resilience in terms of local and regional transport and development aspirations. This is built around the Future Mobility Zone as a test-bed for best practice.	The adoption of novel or new technology to increase efficiency of transport is essential to support increased development growth whilst reducing emissions and improving air quality, and so this is a key mechanism to enable many of the aspirational measures outlined in this Plan.

4. Local Plans and Action Plans

Local Plans

- 4.1 The local authorities' Local Plans commit to improving the environment and moving towards a sustainable future. Each local authorities Local Plan is summarised in Table 4 in terms of the policies relevant to air quality, with further detail provided in Appendix D.
- 4.2 The Black Country LEP have developed a joint Core Strategy showing partnership working between Dudley, Sandwell, Walsall and Wolverhampton local authorities as a logical response to the intertwined nature of the sub-region's challenges and opportunities. Due to the strategic location of the Black Country at the heart of the region, the core strategy has been prepared in the context of spatial and economic relationships with adjacent areas of Birmingham, Southern Staffordshire, Worcestershire and with parts of Shropshire, particularly Telford and Wrekin.

Table 4: Local Plan Summary

Local Authority	Policy Document	Adopted	Relevance to Air Quality
Black Country Councils	Core Strategy	2011	<p>The Core Strategy is visionary and transformational and sets out how the Black Country should look in 2026 and establishes clear directions for change. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • CSP3: Environmental Infrastructure; • CSP5: Transport Strategy; • DEL1: Infrastructure Provision; • CEN8: Car Parking in Centres; • TRANS1: Priorities for the Development of the Transport Network; • TRANS2: Managing Transport Impacts of New Developments; • TRANS3: The Efficient Movement of Freight; • TRANS4: Creating Coherent Networks for Cycling and Walking; • TRANS5: Influencing the Demand for Travel and Travel Choices; and • ENV8: Air Quality.
Birmingham City Council	Big City Plan	2011	Sets out the vision and framework for how the City Centre will be transformed over the next 20 years. The plan centres around six board objectives; liveable, connected, authentic, knowledge, creative and smart.
	Birmingham Development Plan 2031	2017	<p>Sets out the vision and strategy for sustainable growth of the city for the period up to 2031 and in particular how climate change, quality of life, delivery of infrastructure and creation of an inclusive economy are addressed. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • TP7 Green infrastructure network; • TP38 A sustainable transport network; • TP40 Cycling; • TP41 Public Transport; • TP42 Freight; • TP43 Low emission vehicles; • TP44 Traffic and congestion management; and • TP45 Accessibility standards for new development.

Local Authority	Policy Document	Adopted	Relevance to Air Quality
Coventry City Council	Local Plan	2017	<p>Provides Coventry's blueprint and vision to help re-establish itself as one of the country's top 10 cities, enhance its position at the centre of Coventry and Warwickshire Sub-region and contribute towards the West Midlands engine for growth. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • H3 Provision of new housing; • AC1 Accessible transport network; • AC2 Road Network; • AC3 Demand Management; • AC4 Walking and Cycling; • AC5 Bus and Rapid Transit; • AC6 Rail; • AC7 Freight; • EM3 Renewable Energy Generation; and • EM7 Air Quality.
Dudley Metropolitan Borough Council	Development Strategy	2017	<p>Guides development within the Borough until 2026 by providing allocations and local planning policies to give greater certainty to the development process. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • S3: Renewable Energy; • S7: Landscape Design; • S16: Transport Infrastructure Improvements; • S17 Access and Impact of Development on the Transport Network; • S18 Cycling; • L1 Housing Development, extensions and alterations to existing dwellings; and • L11 Parking in Town Centres
Sandwell Metropolitan Borough Council	Site Allocations and Delivery Development Plan Document	2012	<p>The purpose of this document is to guide development within the Borough until 2021 by providing allocations and local policies. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • TRAN 2 Road Improvement; • TRAN 3 Car Parking; • EOS 10 Design Quality and Environmental Standards; and • DC 4 Pollution Control
Solihull Metropolitan Borough Council	Local Plan	2013	<p>The plan strategy promotes economic and job growth in the Borough and provides for new housing to meet the Borough's needs as well as land for other activities including retail, sport and leisure.</p>
	Council Plan	2018	<p>The plan outlines the councils vision, purpose and values to 2020 and then to 2025. The plan focuses on improving health and wellbeing, building stronger communities, managing growth and delivering value. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • P7 Accessibility and Ease of Access; • P8 Managing Demand for Travel and Reducing Congestion; • P10 Natural Environment; • P12 Resource Management; • P13 Minerals; and • P14 Amenity
	Clean Air Strategy	2019	<p>Shows Solihull's Commitment to improving air quality and the specific actions that we will take to achieve their ambition for cleaner air across the Borough. The themes focus on education, transport, planning, environment, public messaging and procurement.</p>
Cannock Chase District Council Area Action Plan	Local Plan	2014	<p>The local plan will shape the way in which the physical, economic, social and environmental characteristics of Cannock Chase District will change between 2006 and 2028. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • Policy 10 Sustainable Transport; and • Policy 16 Climate Change and sustainable Resource Use

Local Authority	Policy Document	Adopted	Relevance to Air Quality
North Warwickshire Borough Council	Local Plan	2018	<p>The plan contains planning policies to guide the development and use of land, which affect the nature of places and how they function at a strategic level as well as providing detailed policies for individual sites and applications. Policies concerning air quality:</p> <ul style="list-style-type: none"> • LP1 Sustainable Development; • LP28 Strategic Road Improvements; • LP29 Walking and Cycling; • LP31 Development Consideration; and • LP36 Parking.
Nuneaton and Bedworth Borough Council	Borough Plan	2015	<p>The Borough Plan will play a key role in shaping the future of the Borough up to 2031. Policies concerning air quality</p> <ul style="list-style-type: none"> • NB11 Ensuring the Delivery of Infrastructure Provision; • NB12 Strategic Accessibility and sustainable transport; • NB17 Health; • NB22 Renewable and Low carbon energy; and • NB23 Sustainable Design and Construction
Redditch Borough Council	Local Plan No. 4	2017	<p>Provides a framework approach for growth of the Borough and sets out the vision and objective for Redditch. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • Policy 3 Development Strategy • Policy 15 Climate Change • Policy 16 Natural Environment • Policy 19 Sustainable Travel and Accessibility • Policy 20 Transport Requirements for New Development • Policy 22 Road Hierarchy
Stratford on Avon District Council	Core Strategy	2016	<p>Sets out the vision for the council to 2031. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • CS.2 Climate Change and Sustainable Construction • CS.3 Sustainable Energy • CS.6 Natural Environment • CS.26 Transport and Communications • AS.1 Stratford-upon Avon • AS.8 Studley
Tamworth Borough Council	Local Plan	2016	<p>The Local Plan (2006 – 2031) was adopted in 2016 and replaces the previously adopted local plan from 2006. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • EN5 Design of New Development; • SU1 Sustainable Transport Network; • SU2 Delivering Sustainable Transport; • SU3 Climate Change Mitigation; and • SU5 Pollution, Ground Conditions and Minerals and Soils
Warwick District Council	Local Plan		<p>Sets out the long-term spatial vision for how the towns, villages and countryside in the District will develop and change and how this vision will be delivered through a strategy for promoting, distributing and delivering sustainable development. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • TR1 Access and Choice • TR2 Traffic Generation • TR3 Transport Improvements • TR4 Parking • TR5 Safeguarding for Transport Infrastructure • CC2 Planning for Renewable Energy and Local Carbon Generation • NE5 Protecting Natural Resources

Local Authority	Policy Document	Adopted	Relevance to Air Quality
Bromsgrove District Council	Local Plan	2017	<p>Sets out the long-term vision for how Bromsgrove Town, the villages and countryside will develop and change in the period up to 2030. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • BDP1 Sustainable Development Principles • BDP5A Bromsgrove Town Expansion Sites • BDP16 Sustainable Transport • BDP19 High Quality Design • BDP22 Climate Change
East Staffordshire Borough Council	Local Plan	2015	<p>Addresses the spatial and land use implications of economic, social and environmental change and presents a development strategy and planning policy framework that will meet the development needs of the borough's residents over the period 2012 – 2031. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • Strategic Policy 12: Derby Road, Burton upon Trent, Regeneration Corridor • Strategic Policy 23: Green Infrastructure • Strategic Policy 34: Health and Wellbeing • Strategic Policy 35: Accessibility and Sustainable Transport • Detailed Policy 7: Pollution and Contamination
Lichfield District Council	Local Plan	2015	<p>Helps shape the way in which the physical, economic, social and environmental characteristics of Lichfield District will change between 2008 and 2029. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • Core Policy 3: Delivering Sustainable Development • Core Policy 5: Sustainable Transport • Core Policy 10: Healthy and Safe Lifestyles • Policy NR7: Cannock Chase Special Area of Conservation
Wyre Forest	Core Strategy	2010	<p>Sets out the broad strategy and vision for development within the District up until 2026. Policies concerning air quality are:</p> <ul style="list-style-type: none"> • CP03: Promoting Transport Choice and Accessibility

Air Quality Action Planning

4.3 Many of the local authorities have declared AQMAs or otherwise recognised the presence of high pollutant concentrations and have therefore published Air Quality Action Plans (AQAP) in accordance with requirements of the Environment Act. The essential components of these plans have been reviewed here (Table 5) and incorporated into the development of interventions that may be suitable for the whole region. Further details are provided in Appendix E.

Table 5: Air Quality Action Plan Progress

Council	Past Progress	Recent & Proposed Progress
Birmingham City	<p>The Birmingham City Annual Status Report (ASR) (2016) summarises a number of measures that have been implemented, including:</p> <ul style="list-style-type: none"> • Feasibility Study for a Low Emissions Zone in the city centre; • Study examining the introducing biomass energy production into schools; • Extend the red route network and assess effectiveness; 	<p>The following measures were expected to be implemented between 2016 to 2018:</p> <ul style="list-style-type: none"> • Build new roads and modify existing to promote effective traffic management; • Policy on air quality and planning; • Increase number of park and rides; • Improvement of the public service fleet – BCC will support the programme for replacement buses as outlined by CENTRO's Environment strategy 2009.

Council	Past Progress	Recent & Proposed Progress
		<ul style="list-style-type: none"> Reduce the overall age of the taxi fleet and encourage the use of less polluting vehicles <p>The following measures are ongoing:</p> <ul style="list-style-type: none"> Control of industry through permits; Control of bonfires and other unauthorised fires. All vehicles procured by council to be electrically powered or use petroleum gas. Introduction of low carbon/electric vehicles.
Bromsgrove	<p>Bromsgrove ASR (2018) has several specific integrated actions:</p> <ul style="list-style-type: none"> Targeted highways improvements or junction enhancements Bromsgrove Transport Strategy includes a package of Public Realm Enhancements in Bromsgrove Town Centre and a review of network efficiency and infrastructure. Active Travel Investment Programme <p>Electric Vehicle Infrastructure Strategy</p>	<p>The following measures are proposed:</p> <p>Ultra-low Emission Taxi Infrastructure Scheme funding bid (2018)</p>
Cannock Chase District Council	<p>The Cannock Chase District Council ASR (2017) summarises a number of measures which have been implemented:</p> <ul style="list-style-type: none"> Policies for developer contribution to mitigation measures Design guidance <p>Review of road hierarchy speed limits</p>	<p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> Local transport plan Travel plans Share a lift scheme Improve local cycle facilities <p>Control emissions from industrial premises</p>
City of Wolverhampton	<p>The City of Wolverhampton ASR (2017) summarises a number of measures that have been implemented, including:</p> <ul style="list-style-type: none"> Wolverhampton Interchange Project Phase 1; Wolverhampton city centre scheme (pedestrianisation and re-routing); Showcase route extension and improvements; Urban Traffic Control System; Increase bus lane enforcement. 	<p>The following measures were expected to be implemented between 2015 to 2018:</p> <ul style="list-style-type: none"> Connected places programme New access road to railway; Black Country Air Quality Supplementary Planning Document; <p>The following measures were expected to be implemented between 2019 and 2025 or ongoing:</p> <ul style="list-style-type: none"> Midlands metro city centre extension; A454 Willenhall road improvement Advanced quality bus partnership – vehicle fleet improvement Black Country ultra-low emission vehicle strategy and implementation plan Movement for Growth: West Midlands Strategic Transport Plan; West Midlands transport emissions framework; West Midlands low emissions bus delivery plan; Local sustainable transport initiative; Council fleet modernisation Walking Strategy; Green fleet review Encouragement of City centre living; Car Share.

Council	Past Progress	Recent & Proposed Progress
Coventry City	<p>Coventry City Council ASR (2017) summarises a number of measures that have been implemented, including:</p> <ul style="list-style-type: none"> • Park and ride schemes; Public Realm improvement schemes • Wayfinding; • Whitley bridge works; • Broad lane improvements; • Tollbar island networks • Assist- Mi App 	<p>The following measures were expected to be implemented between 2014 to 2018:</p> <ul style="list-style-type: none"> • Holistic personal public eco-mobility • Mercury emissions trading scheme; • Pedestrian thoroughfare • University bus interchange/bike share scheme • Making every second count (travel planning) • Supporting secondary schools • Variable message signs project • Appy parking app • Intelligent variable measuring system • UK Cite • UK AutoDrive • CATCHI <p>The following measures are expected to be implemented in 2019 onwards or are 'ongoing' measures:</p> <ul style="list-style-type: none"> • Car share • Heatline project • Planning guidance • Agile working • The annual rush hour challenge • Love your bike scheme • City ride • Coventry station masterplan • Installation of two air quality mesh stations • Bike hire scheme • Public realm works • Employee training • SUITS
Dudley Metropolitan Borough	<p>The Dudley Metropolitan Borough Council ASR 2017 summarises a number of measures that have been implemented, including:</p> <ul style="list-style-type: none"> • Stourbridge rail station park and ride • Improving bus stations • Clean vehicle technology fund 	<p>The following measures were expected to be implemented between 2019 to 2023:</p> <ul style="list-style-type: none"> • Metro Extension • Metropolitan freight strategy <p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> ▪ Monitoring effectiveness of air quality planning ▪ Control of new biomass installations ▪ Consolidate smoke control order ▪ Low NOx boilers at new developments ▪ Planning guidance to encourage uptake of low emission vehicles ▪ Taxi licencing ▪ Implementation of cycle network ▪ Schools walking and cycling initiative ▪ Anti-idling measures ▪ Reducing congestion ▪ Improving bus infrastructure ▪ Improving DMBC fleet ▪ Travel planning promotion
East Staffordshire	<p>East Staffordshire ASR (2018) includes:</p> <ul style="list-style-type: none"> • outlines an expanded monitoring network <p>EcoStars Fleet Recognition scheme</p>	<p>The following measures were proposed or ongoing:</p> <ul style="list-style-type: none"> • The Council is working towards

Council	Past Progress	Recent & Proposed Progress
		<p>progressing measures from the East Staffordshire Integrated Transport Strategy</p> <ul style="list-style-type: none"> • Links to the Staffordshire Freight Forum • Real time bus passenger information project management & infrastructure improvements • A444 corridor study • Burton Town Centre Regeneration Project • Burton rail station improvements <p>Electric vehicle charge point project</p>
Lichfield	<p>Lichfield ASR (2017) includes core actions included in the AQAP (2018):</p> <ul style="list-style-type: none"> • Reducing traffic numbers on A5 and A38, either total volume or only HGVs depending on future M6 toll use; • EcoStars Fleet Recognition scheme <p>Upgrade to expressways</p>	
North Warwickshire	<p>North Warwickshire ASR (2018) identifies two measures that have been implemented:</p> <ul style="list-style-type: none"> • Active Traffic Management systems have been installed and • employed upon sections of the M6 and M42 within North Warwickshire • Warwickshire County Council have produced an Air Quality Strategy 	
Nuneaton and Bedworth Borough Council		<p>The Nuneaton and Bedworth Borough Council ASR (2017) summarises the following measures as 'ongoing':</p> <ul style="list-style-type: none"> • Identify and bring forward traffic management improvements; • Identify measures to reduce impact of HGV movements • Deliver improvements for cyclists/pedestrians in the area • Improvement for bus, rail and community transport infrastructure • Travel plans • Planning policies to incorporate air quality <p>Raise profile of air quality issues</p>
Redditch Borough Council		<p>The Redditch Borough Council ASR (2018) summarises the following measures as 'ongoing':</p> <ul style="list-style-type: none"> • Promote flexible working arrangements • Install electrical vehicle charging points • Travel Plans • Car Sharing • Forge closer links with local health agencies <p>Produce an air quality supplementary planning document</p>
Rugby Borough Council	<p>Rugby Borough Council ASR (2018) summarises a number of measures which have been implemented:</p> <ul style="list-style-type: none"> • Warwick Street gyratory improvements 	<p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> • Re-routing traffic - lorry route maps and agreements • Enforcement of idling vehicle legislation

Council	Past Progress	Recent & Proposed Progress
	<ul style="list-style-type: none"> Rugby western relief road 	<ul style="list-style-type: none"> Improve borough council fleet Improve bus emissions Promote cycling and walking Travel plans Public transport strategy <p>Travel awareness campaign</p>
Sandwell Metropolitan Borough	<p>The Sandwell MBC ASR (2018) summarises a number of measures which have been implemented, including:</p> <ul style="list-style-type: none"> Develop air pollution model of Sandwell Assessment of S106 agreements 	<p>The following measures are expected to be implemented between 2018 and 2014:</p> <ul style="list-style-type: none"> Review transport planning and traffic infrastructure Full review of council vehicle fleet Midland metro extension <p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> New SMBC vehicles are to be of a higher standard Car hire of SMBC employees Review taxi vehicle fleet Promotion of low emission vehicles Branding Improve access to transport options Increase bus lane enforcement Improvement of UTC systems to reduce congestion Ensure air quality is considered in planning framework Promotion of walking/cycling Travel plans
Stratford on Avon	<p>Stratford on Avon ASR (2018) has two measures:</p> <ul style="list-style-type: none"> Development of a supplementary planning document to include objectives on air quality and healthy communities <p>Become a member of the Coventry and Warwickshire air quality alliance.</p>	
Solihull Metropolitan Borough	<p>The Solihull MBC ASR (2017) summarises a number of measures which have been implemented:</p> <ul style="list-style-type: none"> Walking and cycling strategy Restrictions on road use around schools 	<p>The following measures are expected to be implemented between 2020 and 2021:</p> <ul style="list-style-type: none"> New and/or improved cycle lane Improve standards of bus services <p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> Connected transport strategy Trial of electric cars for Solihull MBC staff All refuse vehicles Euro 6; working towards all fleet Agile working Bikeability/cycle workshops and Scootability Travel plans Reducing the duration of roadworks on busy roads Multi-agency vehicle exercises
Tamworth Borough Council	<p>Tamworth ASR (2017) has four measures:</p> <ul style="list-style-type: none"> Promotion of walking Domestic smoke control Continued integration of air quality in planning documents 	

Council	Past Progress	Recent & Proposed Progress
	Regulation of industrial processes	
Walsall Council	<p>The Walsall Council ASR (2016) summarises a number of measures which have been implemented:</p> <ul style="list-style-type: none"> ▪ Planning guidance ▪ Procurement guidance ▪ Low emission zone feasibility ▪ M6 Active Traffic Management ▪ Walsall red route/ bus lane prioritisation ▪ Local sustainable transport fund ▪ Walsall town centre transport package 	<p>The following measures were expected to be implemented between 2015 and 2018:</p> <ul style="list-style-type: none"> • Daralston strategic metropolitan area • Low emissions strategy • OLEV Go Ultra Low city status scheme • Local sustainable transport initiatives • Junction 10 M6 improvements • Managing shorter trips fund • Variable message boards <p>The following measures are 'ongoing':</p> <ul style="list-style-type: none"> • Cycle network • 20mph zones • Cycle to work scheme • Bus lane, pedestrian crossing, school clearway enforcement • Workplace travel plans • Public health notifications • Council vehicle replacement
Warwick	<p>Warwick ASR (2018) has two measures</p> <ul style="list-style-type: none"> • 20mph zones in AQMAs • Active Travel Campaign 	<p>The following measures are proposed:</p> <ul style="list-style-type: none"> • creation and improvement of key corridors that connect boroughs within Warwick District • Proposed studies for taxi emissions and bus retrofit
Wyre Forest	<p>Wyre Forest ASR (2018) includes:</p> <ul style="list-style-type: none"> • Targeted highway and junction improvements • Freight quality partnership • Promote flexible working arrangements • Travel Planning 	<p>The following measures were proposed or ongoing:</p> <ul style="list-style-type: none"> • Further targeted highway improvements

Clean Air Zones

- 4.4 A CAZ can have two forms, non-charging or charging, and can be defined as either, (a) a geographical extent for action to improve air quality, or (b) people are required to pay a charge to enter or to move within the zone if they are driving a vehicle that does not meet the particular standard for their vehicle type in that zone. The latter type of CAZ may also be considered a Low Emissions Zone (LEZ).
- 4.5 The objective of a charging (or penalty) CAZ is therefore to, (a) reduce overall emissions from vehicles operating within the zone, (b) encourage vehicle operators to consider switching to compliant vehicle types and thus leading to accelerated fleet turnover, and (c) encourage the uptake of alternative modes of travel to transfer people and goods.
- 4.6 The establishment of a CAZ has been recognised as a possible tool for improving local air quality, but one which requires careful research to identify the economic, social and environmental impacts (positive and negative).

Birmingham CAZ

- 4.7 The CAZ for Birmingham²¹ is (as of April 2019) proceeding through the approval of the Full Business Case, and will include all roads within the A4540 Middleway Ring Road, excluding the Middleway.

²¹ https://www.birmingham.gov.uk/info/20076/pollution/1763/a_clean_air_zone_for_birmingham

- 4.8 The CAZ will represent the most stringent type, in accordance with guidance from the Joint Air Quality Unit (JAQU), representing Defra and DfT, with the following classified as compliant vehicle types:
- Diesel Euro 6 (VI);
 - Petrol or Petrol/LPG Euro 4;
 - Gas Euro 6; and
 - Fully electric or hydrogen fuel cell are compliant and avoid CAZ charges
- 4.9 Non-compliant vehicles will be charged a fixed daily rate. However, several mitigation controls are being implemented,
- Owners of non-compliant cars who have lived in the CAZ area since before September 2018 are exempt until January 2022, two years after the CAZ is introduced.
 - Owners of non-compliant cars who drive to a place of work in the CAZ and earn less than £30,000 a year are exempt until January 2021, one year after the CAZ is introduced.
 - Commercial fleet and individual vehicle operators will be offered financial support and exemptions.
 - Additional incentives will be offered, such as public transport support and subsidies for replacement or retrofit of vehicles for owners and commercial operators.

Air Quality Local Plans

- 4.10 Coventry City Council submitted a Local Plan study to JAQU in March 2018, which outlines targeted measures to improve compliance with the EU limit values. This plan specifically excluded the option of a CAZ or road-charging in favour of local measures.
- 4.11 However, in March 2019 Defra ministers rejected these measures deeming them insufficient to tackle NO₂ levels. Instead Coventry City Council have been directed to implement a Class D charging CAZ to tackle the city's air pollution problem. The CAZ will charge drivers of all non-compliant vehicles²².
- 4.12 Solihull was mandated to undertake a Local Plan in April 2019, and is expected to report the outcomes to JAQU in 2020.

Targeted Feasibility Studies

- 4.13 Several local authorities, including the Black Country LEP, were mandated in 2018 to undertake targeted Feasibility Studies due to exceedances of the EU limit values adjacent to discrete road links, but where a Local Plan or CAZ study was not deemed to be appropriate. Sandwell was mandated to undertake a further study in 2019.
- 4.14 JAQU is routinely updating the national PCM screening model and has recently (April 2019) identified that further exceedance links on two sections of road in Sandwell MBC. Further details are provided in Section 5.16.
- 4.15 It is expected that further Targeted Feasibility Studies will be mandated by JAQU in the future as screening tools and other evidence improves in-line with national guidance.

²² Air Quality News, Defra rejects Coventry's 'insufficient' clean air plans, orders Clean Air Zone <https://airqualitynews.com/2019/05/16/defra-rejects-insufficient-coventrys-clean-air-plans-orders-clean-air-zone/> (accessed June 2019)

5. Baseline Air Quality

- 5.1 The following section provides an overview of existing air quality in the three LEPs to gain an understanding of pollutant concentrations and trends across the whole West Midlands region. A source apportionment study was then undertaken to determine the contribution from different sources to total pollutant concentrations.

Local Air Quality Management

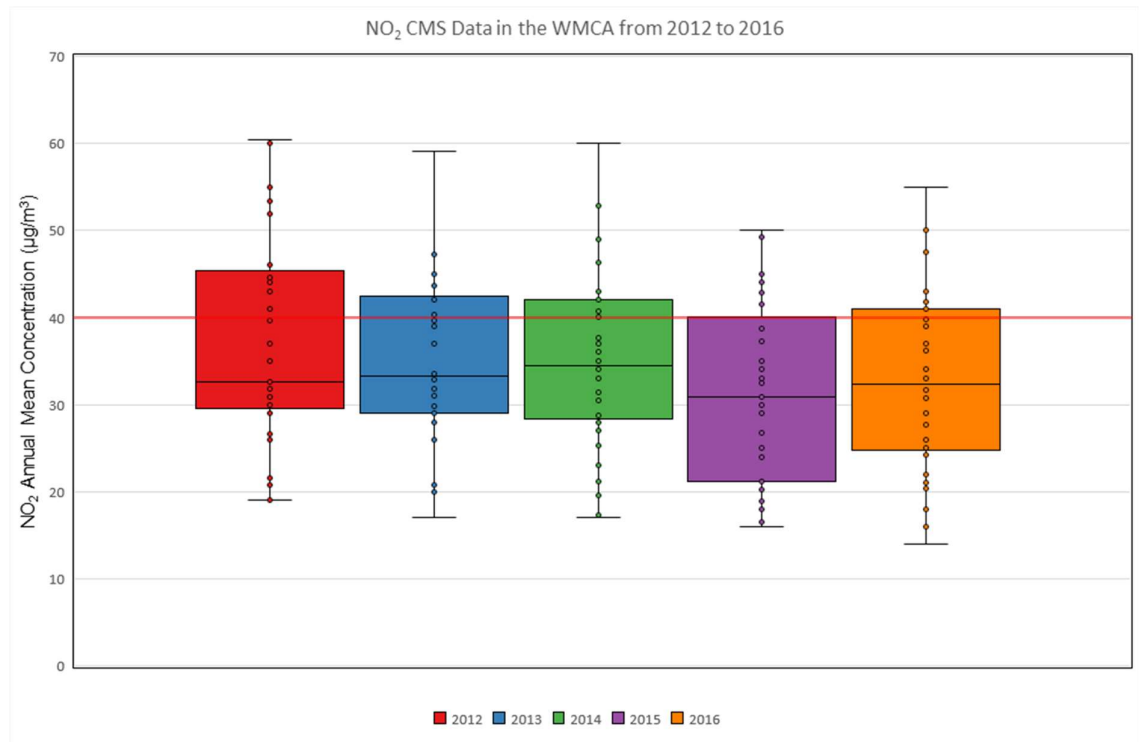
- 5.2 As discussed in Section 2, local authorities are required under Part IV of the Environment Act to carry out a phased review and assessment of local air quality. This responsibility includes the identification of areas at risk of exceeding the air quality objectives and declaring an AQMA if required.
- 5.3 A total of 30 AQMAs have been designated across the West Midlands as illustrated in Figure 2. **Error! Reference source not found..** Further details are provided in Appendix F.
- 5.4 Of the seven constituent local authorities, six have AQMAs covering the whole of their local authority areas, designated for the exceedance of the NO₂ annual mean objective. The seventh, Solihull, has no AQMAs. Furthermore, the Walsall AQMA is also designated for exceedance of the NO₂ hourly mean objective; there is a smaller AQMA (Chuckery Lane) within Walsall for exceedance of the PM₁₀ daily mean objective; and both Birmingham and Wolverhampton AQMAs are also designated for exceedance of the PM₁₀ daily mean objective.

Monitoring

Nitrogen Dioxide Monitoring

- 5.5 The West Midlands local authorities monitor NO₂ concentrations using continuous and passive techniques. A total of 34 continuous monitoring sites are located in nine local authorities within the West Midlands. Ten of these sites recorded an exceedance of the annual mean NO₂ objective in 2016, with the highest concentration of 55 µg/m³ recorded on the A491 High Street, Dudley.
- 5.6 Figure 1 presents the continuous monitoring data for the years 2012 to 2016 with the mid-lines representing the median concentration, the boxes representing the upper and lower quartiles of concentration, and the lines representing the maximum and minimum concentrations. Most sites show a slight downward trend over this time period leading to an average annual mean NO₂ reduction of approximately 1 µg/m³ per year.

Figure 1: Annual mean NO₂ concentrations recorded at continuous monitors located in the WMCA 3 LEP geographies (NB red line indicates annual mean NO₂ objective of 40 µg/m³).



- 5.7 The trend in NO₂ concentrations within the West Midlands is similar to the slow reduction which has been experienced nationally. This reduction is attributable to reductions in NO_x emissions; however, actions implemented by local authorities as outlined in their air quality action plans and as part of their local plans would have contributed. However, strategic region-wide interventions will be required to result in significant further reductions.
- 5.8 The West Midlands local authorities monitored NO₂ concentrations using passive diffusion tubes at 660 sites across the WMCA in 2016. Of these 184 recorded an exceedance of the annual mean objective, with the highest concentration of 82.0 µg/m³ recorded in East Staffordshire. Figure 3 illustrates the monitoring locations and 2016 annual mean NO₂ concentrations. The highest concentrations are recorded in the urban centres including Birmingham and Coventry.
- 5.9 All monitored annual mean NO₂ concentrations are provided in Appendix F.

Figure 2: Air Quality Management Areas in the WMCA 3 LEP Geography.

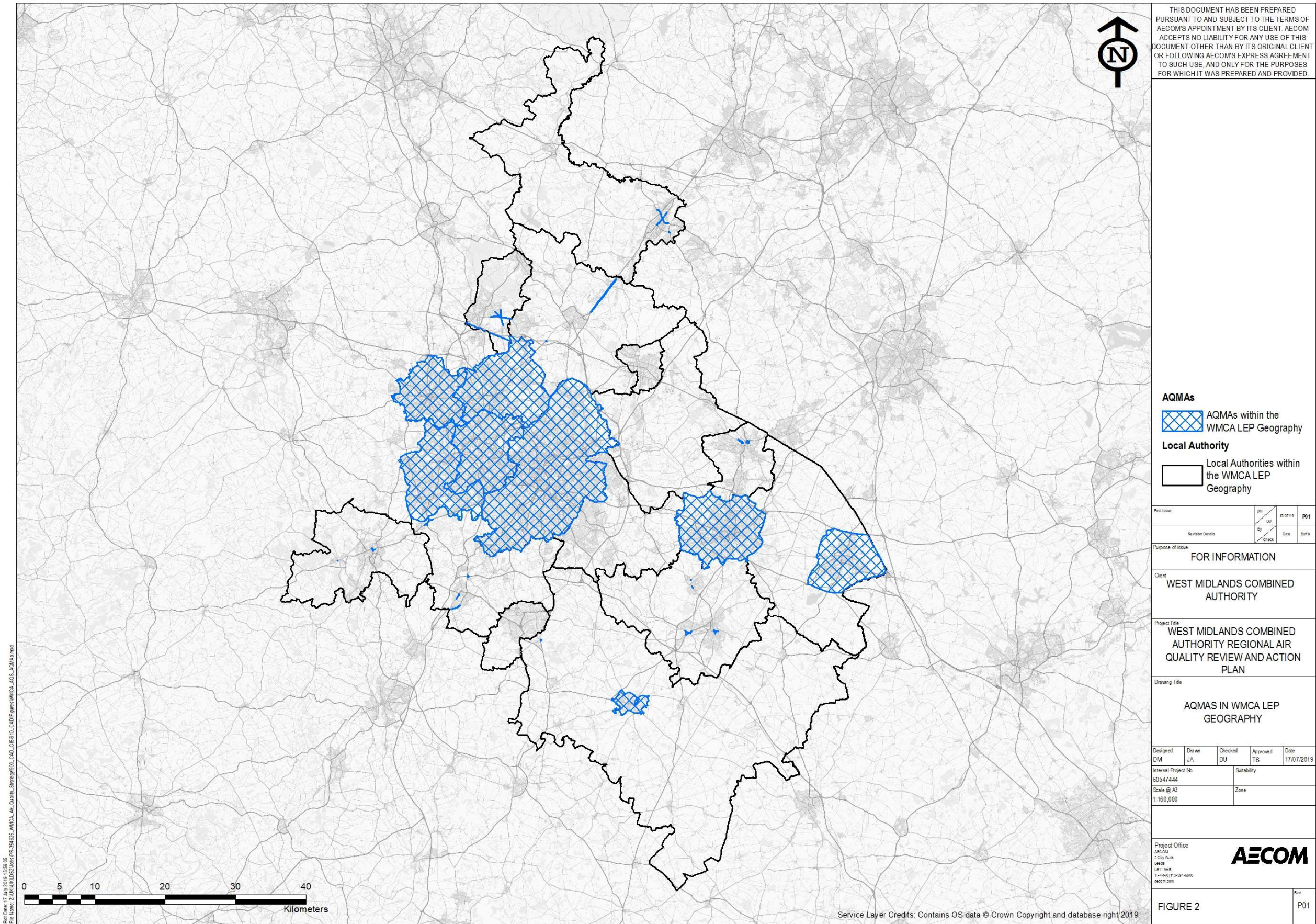
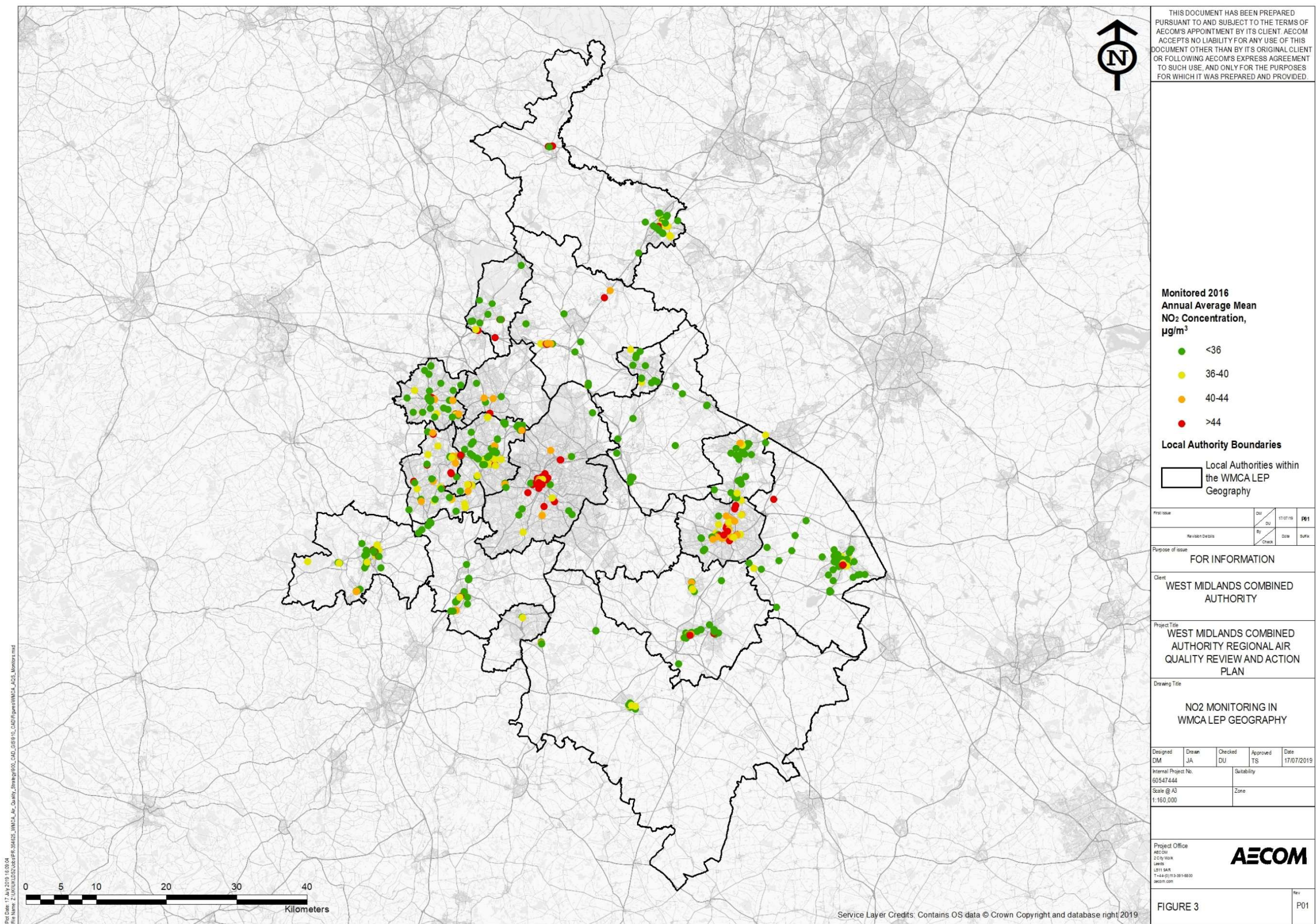


Figure 3 Local Air Quality Monitoring in the West Midlands



Particulate Matter

- 5.10 Nine of the nineteen unitary and district local authorities recorded PM₁₀ concentrations in 2016; seven collected PM_{2.5} data.
- 5.11 In total there were 19 continuous monitoring stations across the WMCA that recorded PM₁₀ concentration in 2016. All measured concentrations were below the annual mean objective level for PM₁₀ of 40 µg/m³, with the highest concentration of 26.0 µg/m³ recorded in East Staffordshire.
- 5.12 There were 17 continuous monitoring stations across the WMCA that recorded PM_{2.5} concentration in 2016. All measured concentrations were below the annual mean objective level for PM_{2.5} of 25 µg/m³, with the highest concentrations of 17 µg/m³ recorded at the Birmingham A4540 roadside site. As discussed in paragraph 2.21, an objective of the Clean Air Strategy is to reduce PM_{2.5} concentrations across the UK, so that the number of people living in locations above the WHO guideline level of 10 µg/m³ is reduced by 50% by 2025. Only the continuous monitors in Sandwell and Rugby, recorded concentrations below this objective at all their monitoring sites.
- 5.13 Further details are provided in Appendix F.

Monitoring Summary

- 5.14 The long-term data for the West Midlands indicates a very slight downward trend; however, it is not considered significant. This is largely consistent with the findings of the 2019 annual air pollution statistics report²³, which indicates that roadside PM₁₀ and NO₂ levels have remained steady since 2015.
- 5.15 It is broadly reasonable to expect that roadside pollutant concentrations will remain stable in the near-future, and the baseline conditions will not change significantly without external drivers, such as the intentions identified in this Review and Action Plan. However, it is recognised that in the long-term as the vehicle fleet is replaced through natural cycles we would expect to see some improvement in NO₂, whilst the removal of older diesels from the fleet should benefit PM_{2.5} reductions.

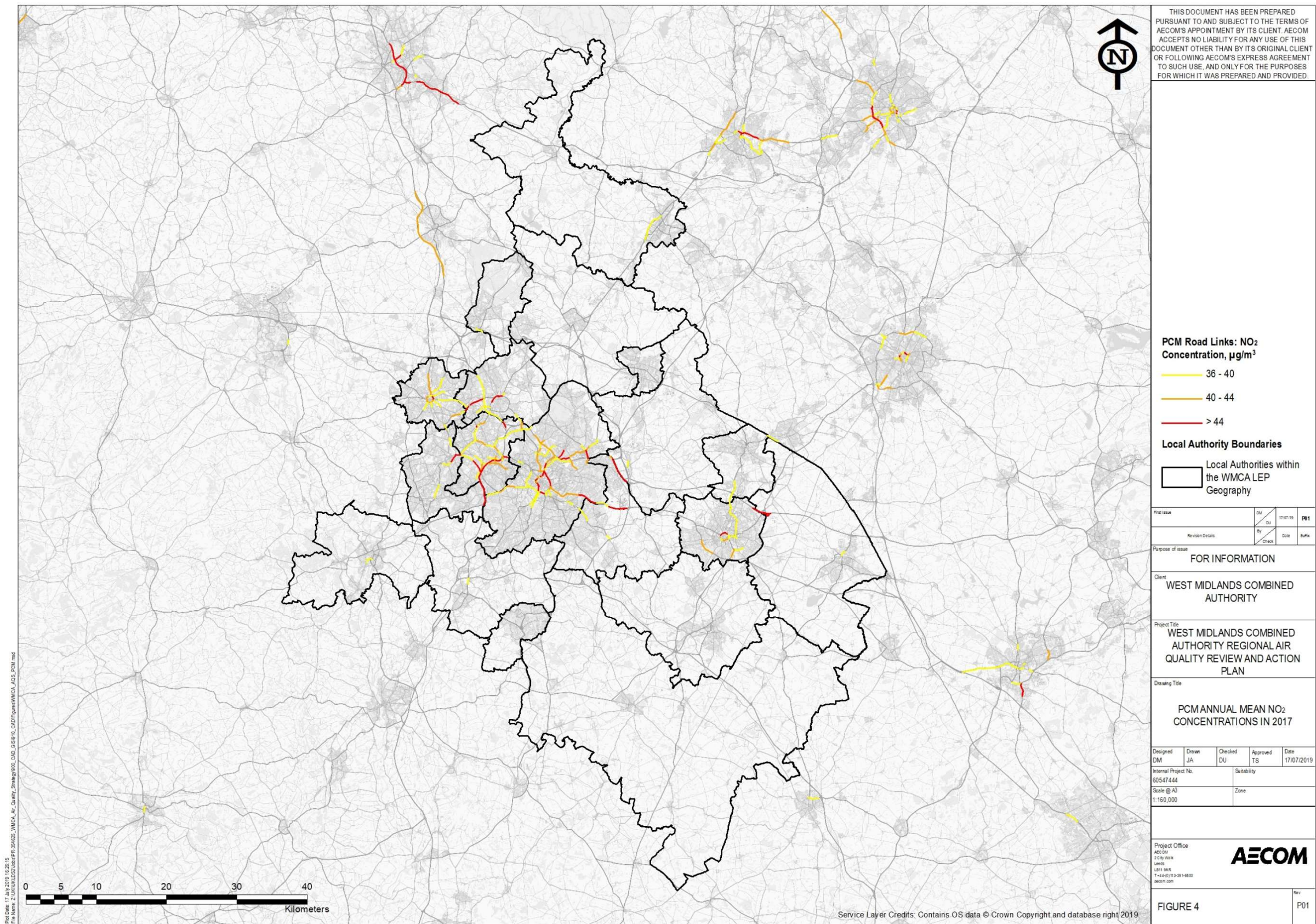
PCM Links

- 5.16 The Pollution Climate Mapping (PCM) model has been used by Defra to identify roads throughout the UK where exceedances of the annual mean NO₂ objective are predicted to occur. This information is used to report on the status of national compliance with the EU limit values, and so the national Clean Air Strategy is focussed on these roads.
- 5.17 In the West Midlands, the model has notably been used to mandate Birmingham and Coventry to undertake CAZ and Local Plan studies, respectively, but also to instruct a number of local authorities to undertake Targeted Feasibility Studies.
- 5.18 The PCM was most recently updated to use a 2017 baseline and revisions to the emission factor toolkit²⁴. It is expected that it will continue to be updated to track roadside pollutant concentrations and mandate local authorities to undertake further studies to inform appropriate mitigation controls.
- 5.19 Figure 4 illustrates the extent of non-compliant roads in the West Midlands in 2016.

²³ <https://www.gov.uk/government/statistics/air-quality-statistics>

²⁴ <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

Figure 4: PCM Annual Mean NO₂ concentrations in 2017 in the WMCA 3 LEP Geography.



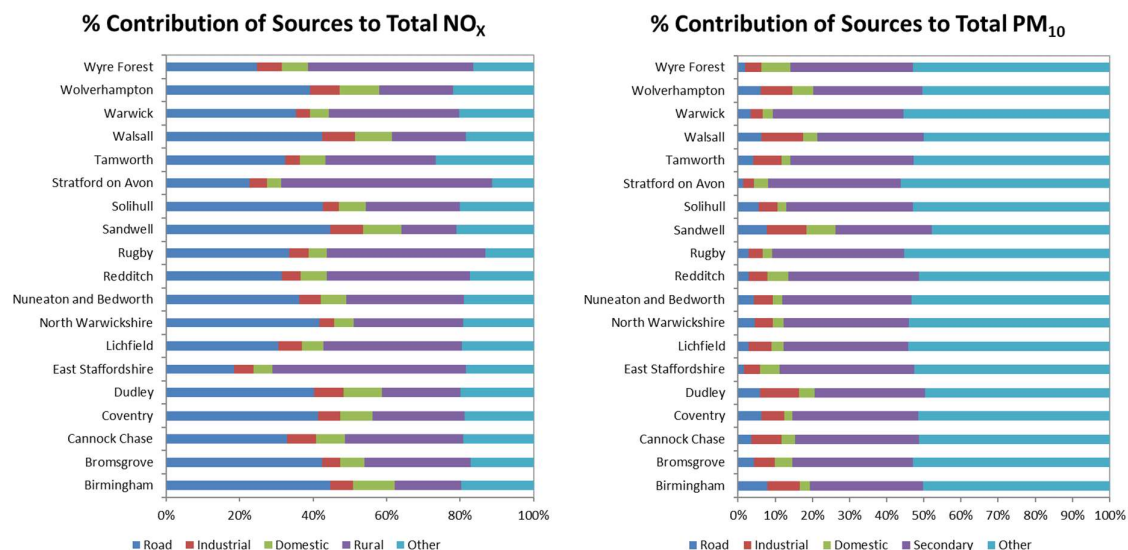
Source Apportionment

- 5.20 There are numerous emission sources in the region, broadly divided into road transport, industrial sources and background sources.
- 5.21 Industrial emissions are a major regional emission source. These are typically included in the background component as due to the effects of proximity to the source and relatively better dispersion than from transport-related emissions at road-level. Furthermore, as they are generally managed using permitting processes, there is limited scope to define specific interventions and have been incorporated where possible into the strategic and policy interventions.
- 5.22 The remainder of this section provides a discussion of the contribution of each source to pollutant concentrations in the constituent and non-constituent local authorities in the West Midlands. This is an essential component of the study as it will reveal which sources need to be targeted by the interventions.

Emission Sources

- 5.23 Modelled estimations of background air quality concentrations are provided by Defra for each 1 km square in the UK for each year between 2015 and 2030. As part of this the contribution to the total pollutant concentration from various sources is also provided.
- 5.24 The data presented in Figure 5 outline the breakdown of the reported emission sources from published DEFRA background modelling²⁵ for the constituent and surrounding council administrative areas that make up the 3 LEP geography.
- 5.25 These data indicate that for total NO_x concentrations road transport is a major component, with up to 45 % attributed to this source. Rural sources contribute a significant proportion, particularly in East Staffordshire and Stratford on Avon, where up to 57% of total NO_x are from this source category.
- 5.26 In contrast, the main source of PM₁₀ concentrations is 'other' which includes factors such as secondary PM₁₀ (formed in the atmosphere by chemical reactions) and from point sources. It should be noted that many sources emit both NO_x and PM and therefore actions targeted at these sources will result in reduction of both pollutants.

Figure 5: Contribution of emission source to total NO_x and PM₁₀ Concentrations



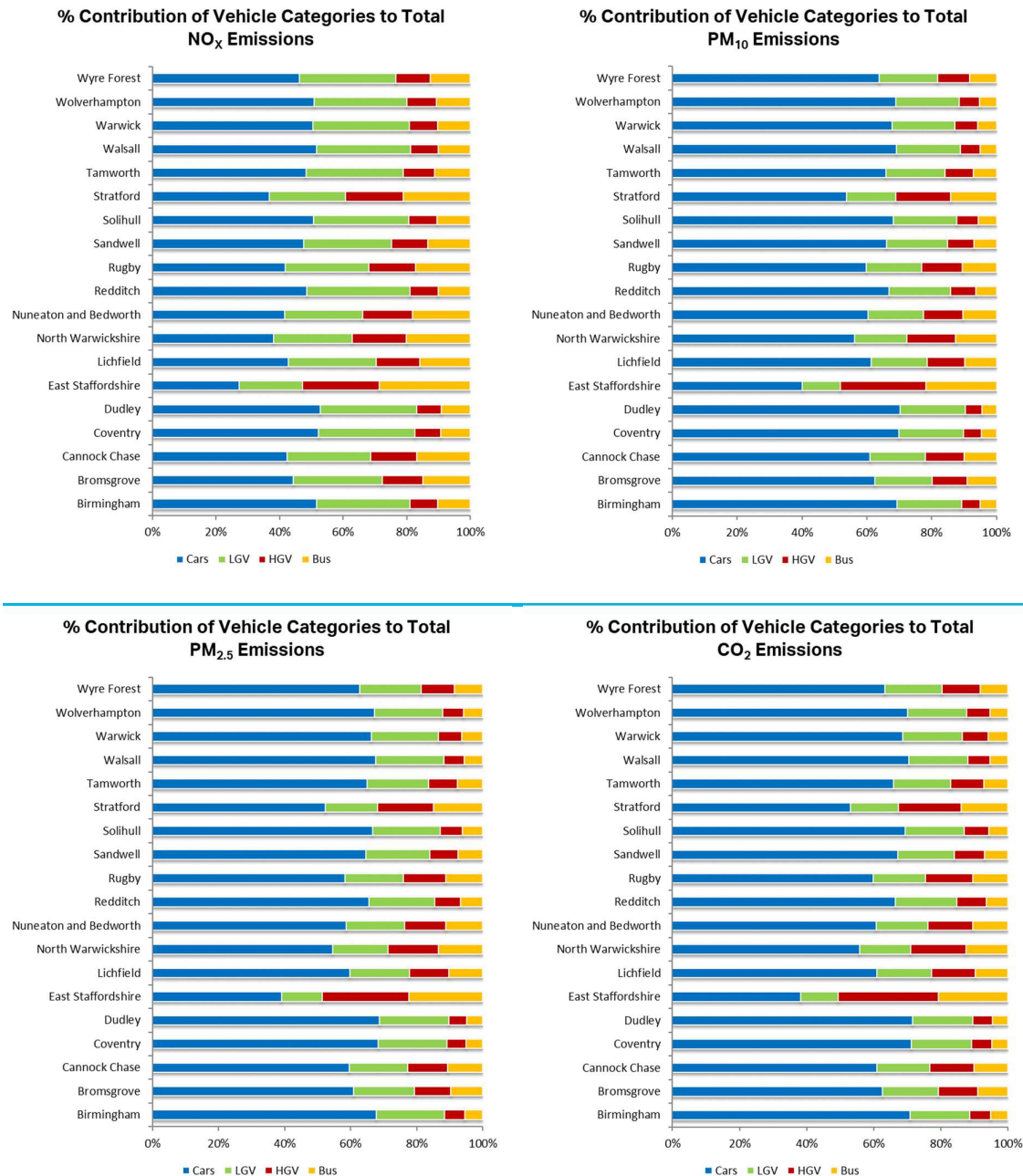
²⁵ <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

Transport Sources

5.27 With regard to local air quality effects, the proximity to the source is a key factor linking the resultant exposure and health effects. Therefore, the predominant pollutant sources affecting public exposure are generally attributed to emissions from road transport.

5.28 The data in Figure 6 indicate the contribution of different vehicle types for each local authority and indicate how cars are the most significant total emission source for all pollutants.

Figure 6: Contribution of Road-source NO_x, PM & CO₂ Emissions



5.29 Diesel cars are the major source of emissions on the majority of roads and are distributed throughout the region; the split for the model was approximately 50/50 petrol/diesel, although

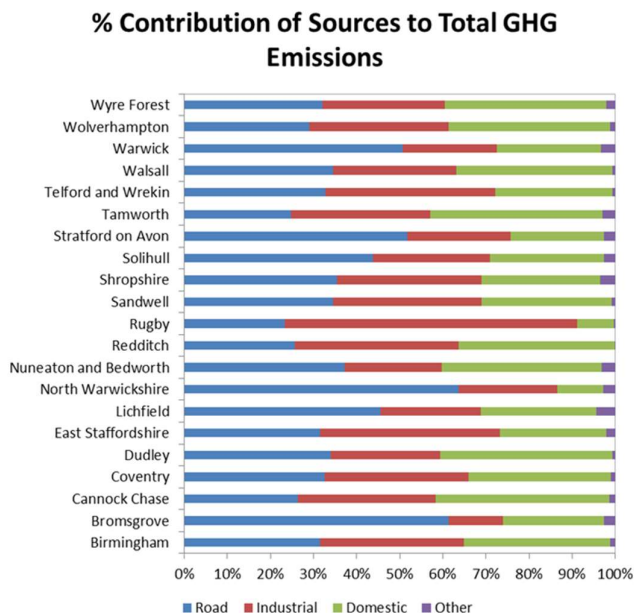
future projections currently expect a shift towards petrol and alternative fuels, with older diesel cars potentially staying in the fleet for longer. Similarly, LGVs are distributed around most roads with no specific routes or locations where they are a predominant source. Significant emissions from HGVs are confined to roads where large flows are concentrated, such as the Strategic Road Network (SRN) routes, distribution centres and heavy industry and manufacturing. Emissions from buses are also confined to key locations, where major bus corridors and interchanges lead to a large proportion of these vehicles.

- 5.30 Other notable emission sources from transport include rail and air travel. However, these are discrete sources where the exposure pathway is constrained by infrastructure (e.g. passengers at rail stations) and is either outside the scope of this strategic study, or is being tackled with specific management plans (such as at Birmingham Airport) or regional aspirations (such as the TfWM aspiration to improve the environmental performance of rail through greater use of bi-mode/ hybrid powered trains and further electrification through, for example, enhanced specifications in new rail franchises serving the West Midlands).

Regional Emissions

- 5.31 Greenhouse Gas (GHG) emissions are considered on a regional and national basis, rather than as a local issue, such as NO_x. These data are published by the National Atmospheric Emission Inventory (NAEI).
- 5.32 The data in Figure 7 show the CO₂ equivalent GHG emissions from the local authorities in 2016. The major sources are presented as road transport, industrial (including manufacturing and energy), and domestic (e.g. heating), as well as a relatively small 'other' component (e.g. agriculture). These individual sources are broadly similar, although there are a few outliers, such as Rugby, which includes a large cement plant which may bias the industrial emissions in this area.

Figure 7: Contribution of CO₂ equivalent GHG Emissions



Economic Damage Costs

- 5.33 Guidance to calculate damage costs are published by Defra based on the impact on an average population affected by changes in air quality²⁶. The damage costs are derived from empirical estimates of how much people in the UK are willing to pay for a reduction in the

²⁶ <https://www.gov.uk/air-quality-economic-analysis>

health risks associated with air pollution²⁷, along with the quantifiable losses in work days and direct economic health costs (social health costs are discussed below). Therefore, whilst it does not directly reflect the mortality or health impacts due to changes in air quality, it is an indicative measure that quantifies the societal costs.

- 5.34 The guidance stipulates that the damage cost should help determine the amount (value) of mitigation that is expected to be spent on measures to reduce the impacts. The calculation requires the use of the Defra Emissions Factor Toolkit²⁸ to estimate the additional pollutant emissions from a proposed intervention, whilst the latest Inter Government Department on Costs and Benefits (IGCB) Air Quality Damage Costs²⁹ were used with tools published by Defra to calculate the resultant damage costs for the specific pollutant of interest.
- 5.35 It should be noted that the calculation methodology is not contained within any National air quality planning guidance. The IGCB guidance was prepared for use by Government to assess the impact of changes to existing policy with regards to potential air quality impacts, and so has been used in this study to indicate the costs associated with emissions on a regional and strategic basis. .
- 5.36 The total damage cost for the West Midlands region due to emissions of NO_x and PM₁₀/PM_{2.5} in 2016, based on the 2018 values for the 'Road Transport Urban Large' category was calculated within a low/high confidence range defined in the guidance, but with a medium value of approximately £732 million per year. This is comparable to other regions and consistent with estimates of approximately £20 billion per year nationally. Therefore, the potential economic effect of reducing emissions is significant. Figure 8 provides damage costs per district.

Table 6: West Midlands Regional Damage Cost from Road Emissions, 2018 values

Pollutant*	Emissions, tonnes per annum	Annual Damage Cost		
		Low	Medium	High
NO _x	18603	£22,266,300	£250,318,500	£962,090,693
PM _{2.5}	1884	£100,970,816	£481,991,084	£1,484,479,817
		£123,237,117	£732,309,584	£2,446,570,510

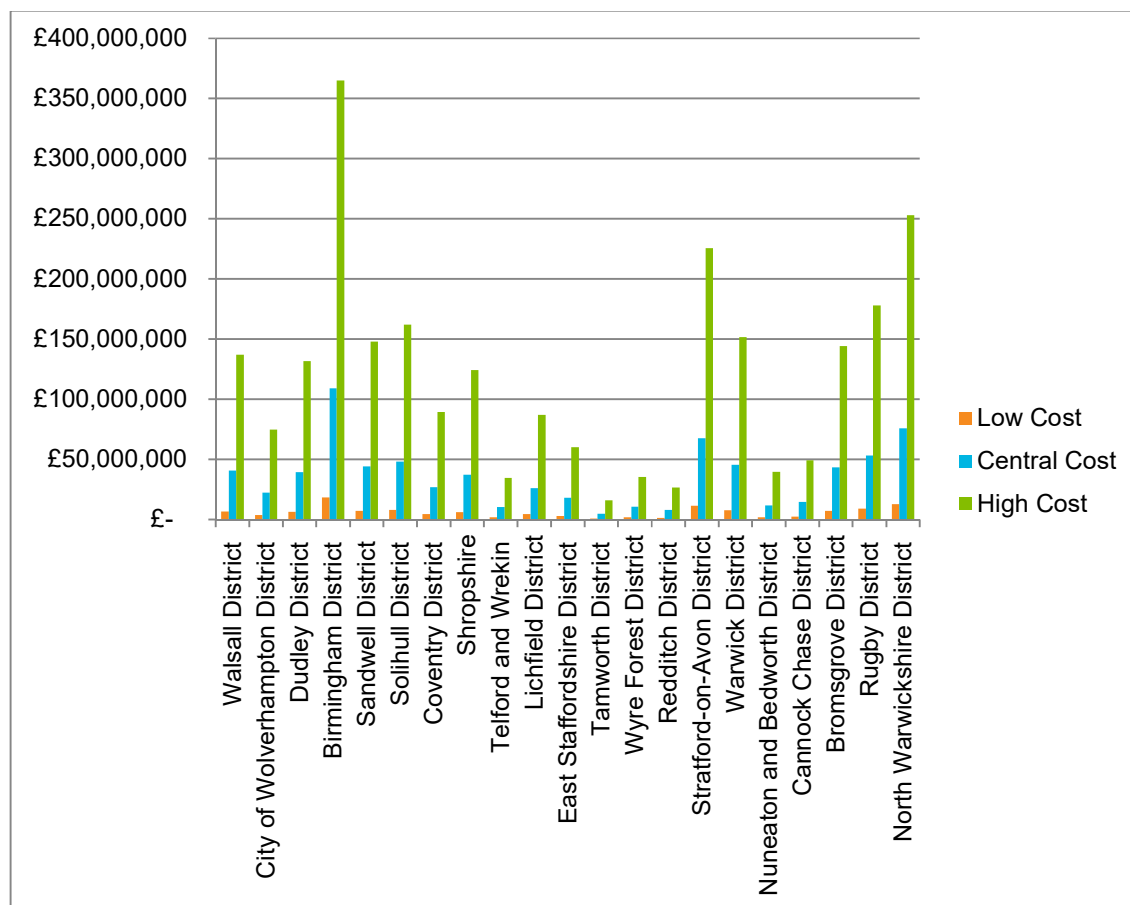
Note: * PM_{2.5} cost includes a scaled value for the PM₁₀ size fraction

²⁷ Defra (2015) Valuing impacts on air quality: Updates in valuing changes in emissions of Oxides of Nitrogen (NO_x) and concentrations of Nitrogen Dioxide (NO₂)
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf

²⁸ <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

²⁹ <https://www.gov.uk/guidance/air-quality-economic-analysis>

Figure 8: Annual Air Quality Damage Costs per District (medium range)



Health Costs

Knowledge on the links between health costs and air quality is improving rapidly. Recent monitoring and review work by Sustainability West Midlands (SWM) for the WMCA has identified that:

- By reducing the levels of one pollutant (PM_{2.5}) by 50%, 952 deaths would be prevented and £1.4m of direct NHS costs saved in the WMCA area per year.
- The fraction of mortality attributable to particulate air pollution has decreased slightly between 2011-2017, by an average of 0.3% throughout WMCA, which is similar to other CAs. (7 and Table 8).
- The average percentage of people who die as a result of exposure to particulate air pollution in 2017 in the West Midlands was 5.1%; this is the second highest out of all CA areas.

Table 7: Fraction of mortality attributable to particulate air pollution (MPP)

LEP	Local Authority	Latest figure % of MPP (2017)	Change / % of MPP		% Change	
			2011- 2017	2016- 2017	2011- 2017	2016- 2107
Black Country	Dudley	5	-0.3	-0.6	-5.7	-10.7
	Sandwell	5.7	-0.5	-0.6	-8.1	-9.5
	Walsall	5.5	-0.5	-0.6	-8.3	-9.8
	Wolverhampton	4.9	-0.5	-0.7	-9.3	-12.5

LEP	Local Authority	Latest figure % of MPP (2017)	Change / % of MPP		% Change	
			2011- 2017	2016- 2017	2011- 2017	2016- 2107
Coventry & Warwickshire	BCLEP AVERAGE	5.3	-0.4	-0.6	-7.9	-10.6
	Coventry	5.5	-0.3	-0.6	-5.2	-9.8
	North Warwickshire	5.2	-0.3	-0.5	-5.5	-8.8
	Nuneaton and Bedworth	5.3	-0.2	-0.6	-3.6	-10.2
	Rugby	5	-0.2	-0.5	-3.8	-9.1
	Stratford-on-Avon	4.7	-0.2	-0.3	-4.1	-6
	Warwick	5	-0.3	-0.4	-5.7	-7.4
	CWLEP AVERAGE	5.1	-0.3	-0.5	-4.7	-8.6
Greater Birmingham and Solihull	Birmingham	5.6	-0.3	-0.6	-5.1	-9.7
	Bromsgrove	4.7	-0.4	-0.5	-7.8	-9.6
	Cannock Chase	4.7	-0.3	-0.7	-6	-13
	East Staffordshire	5	0.1	-0.6	2	-10.7
	Lichfield	4.9	-0.2	-0.6	-3.9	-10.9
	Redditch	4.6	-0.4	-0.5	-8	-9.8
	Solihull	5.4	-0.2	-0.5	-3.6	-8.5
	Tamworth	5.3	-0.1	-0.7	-1.9	-11.7
	Wyre Forest	4.3	-0.3	-0.4	-6.5	-8.5
	GBSLEP AVERAGE	4.9	-0.2	-0.6	-4.5	-10.3
	WMCA AVERAGE	5.1	-0.3	-0.6	-5.5	-10.2

Table 8: Best and worst performing LAs

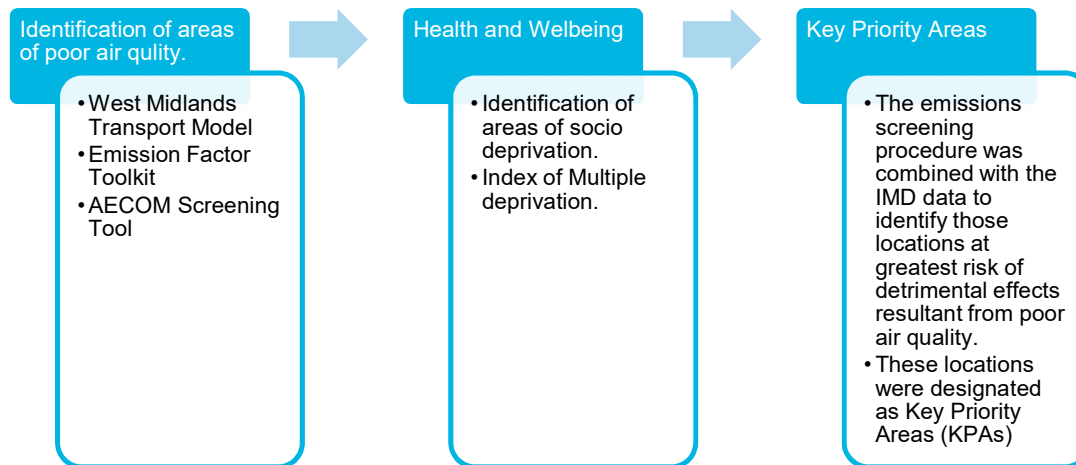
Lowest MPP 2017 (top 5)	% of MPP	Highest MPP 2017 (bottom 5)	% of MPP
1. Wyre Forest	4.3	1. Sandwell	5.7
2. Redditch	4.6	2. Birmingham	5.6
3= Bromsgrove	4.7	3= Coventry	5.5
3= Cannock Chase	4.7	3= Walsall	5.5
3= Stratford-on-Avon	4.7	5. Solihull	5.4

Best progress since 2011	Change in % of MPP	Poorest progress since 2011	Change in % of MPP
1= Sandwell	-0.5	1. East Staffordshire	0.1
1= Walsall	-0.5	2. Tamworth	-0.1
1= Wolverhampton	-0.5	3= Lichfield	-0.2
4= Bromsgrove	-0.4	3= Nuneaton & Bedworth	-0.2
4= Redditch	-0.4	3= Rugby	-0.2
		3= Solihull	-0.2
		3= Stratford-on-Avon	-0.2

Source: SWM sustainability metrics benchmark for WMCA, May 2019

6. Identification of Key Priority Areas

- 6.1 Key Priority Areas (KPA) were identified within the WMCA region, where interventions should be targeted. KPA were based on areas of poor air quality as identified by the AECOM Screening Tool (described below) which utilised traffic information from the West Midlands Transport Model. The KPA also took into consideration socio economic characteristics in the region in terms of health and wellbeing.



6.2

West Midlands Transport Model

- 6.3 The traffic data was obtained from the West Midlands PRISM version 5.2 transport model, which was supplied by Mott Macdonald on behalf of Transport for West Midlands. This is a strategic model that incorporates regional growth and strategic development to calculate the road traffic on each road link.
- 6.4 The data was provided as categorised (LDV and HDV) data for peak hours and inter-peak, as well as the 12-hour average daily flows and 24-hour Annual Average Daily Traffic (AADT) flow. The HGV component was scaled to 24-hours using the supplied adjustment factor in order to calculate a HGV% for each link.
- 6.5 The data did not explicitly include buses, and so this was modelled as part of the HGV fleet.
- 6.6 Speeds were scaled and adjusted to calculate the weighted average speed for each link.

Emission Factor Toolkit

- 6.7 The emission factor toolkit (EFT) version 8.0.1a³⁰ was used to calculate the emission rates in g/s for NO_x, PM₁₀ and PM_{2.5} for each of the road links in the traffic model.
- 6.8 The EFT uses drive-cycle data from the European COPERT³¹ model for various vehicle types and ages to determine speed / emission relationships. The emission profiles are used in conjunction with the traffic flow data to assign rates to each modelled road link.

³⁰ <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

³¹ <https://www.eea.europa.eu/publications/copert-4-2014-estimating-emissions>

- 6.9 The fleet age and composition was based on the nominal values in the EFT. This is discussed in more detail later in the report under the section about understanding future fuel and technology trends and types.
- 6.10 As discussed in paragraph 6.5, the traffic flow data did not explicitly count the bus flow data, and so this was modelled as part of the HGV flow using nominal splits defined within the EFT. Therefore, this may over or under-estimate this emission source in some instances (i.e. where there are no bus routes).
- 6.11 As of April 2019, 675 buses in the West Midlands were Euro VI standard or better (34% of the entire fleet). Funding has been secured that will see a further 1,390 buses upgraded to a minimum Euro VI standard by the end of 2020. This includes the March 2019 announcement of £5.5m from the Clean Bus Technology Fund 2017-19 Extension for a further 353 buses to be retrofitted in the region. This will see over 85 % of the West Midlands bus fleet meeting at least Euro VI standard by the end of 2020 (Table 9).

Table 9: West Midlands Bus Fleet Composition

Emission Standard	Jan 2018 Bus Fleet	Planned Upgraded Fleet for Dec 2020
Euro II	-	-
Euro III	22%	3%
Euro IV	17%	4%
Euro V	35%	5%
Euro VI or better	26%	88%

- 6.12 It is an aspiration in the West Midlands Vision for buses, to have all buses operating in the West Midlands at least Euro VI standard by April 2021.
- 6.13 In February 2019, the ultra-low emission bus scheme winners were announced, which included £2.2m for Coventry City Council (in partnership with National Express West Midlands and WMCA) for 10 electric buses and £143,000 for Wolverhampton City Council (in partnership with WMCA) for 1 electric bus. Birmingham Airport was also successful in securing £1.4m for 6 electric buses.
- 6.14 The regional bus fleet is undergoing a series of upgrades to increase the number of Euro VI compliant vehicles. The data in Table 9 was provided by Transport for West Midlands and indicates that in 2016 the nominal fleet composition used by the EFT was very similar to the actual fleet, if it is assumed the fleet was similar between 2016 and 2018 in the West Midlands.

Screening Tool

- 6.15 The AECOM screening tool predicts the annual mean roadside pollution concentrations (NO_x/NO₂, PM₁₀ and PM_{2.5}) at 5 m from the centreline using simple pollutant dispersion algorithms. The calculations exclude complex effects of meteorology, canyoning or gradients, but do provide an overall indication of the magnitude and extent of roadside pollutant concentrations and is considered appropriate for its intended purpose for this study.
- 6.16 The calculations use background pollution concentrations published by Defra for 1km grid squares, and NO₂ was calculated using version 6.1 of the NO_x to NO conversion spreadsheet³².
- 6.17 Due to the extent of the study area it was not possible to undertake a full verification by comparing the model outputs with monitoring data. However, to ensure the model did not under-predict concentrations, the road-source emissions were adjusted using a nominal factor of x2, based on studies of smaller regions.

³² <https://lagm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>

- 6.18 The modelled base year for this study was 2016; no future baseline concentrations were predicted. The reasons for this are due to the uncertainties in the future scenarios, such as the effects of the Birmingham CAZ, as well as known limitations to the EFT. The long-term monitoring trends do not indicate any clear upwards or downwards trend in roadside concentrations, so the outputs from the screening were considered to be suitable to determine conditions in the short and medium-term.
- 6.19 The annual mean roadside concentration of NO₂, PM₁₀ and PM_{2.5} in 2016 is presented in Figure 9 to 11. This indicates that highest concentrations occur near the major routes, as expected due to higher traffic flows, although many roads within the urban areas are also associated with high roadside concentrations due to relatively lower speeds and higher background concentrations.
- 6.20 The main emission sources on the majority of road are private cars, with diesel fuelled vehicles representing the largest component. However, on major radial and regional routes HGVs become more significant, which shows how these larger vehicles tend to operate predominantly on the Key Route Network rather than the smaller urban routes. It is also notable how significant LGVs were predicted to be on urban routes.

Figure 9: Screening Outputs, Annual Mean NO₂ Concentrations in 2016

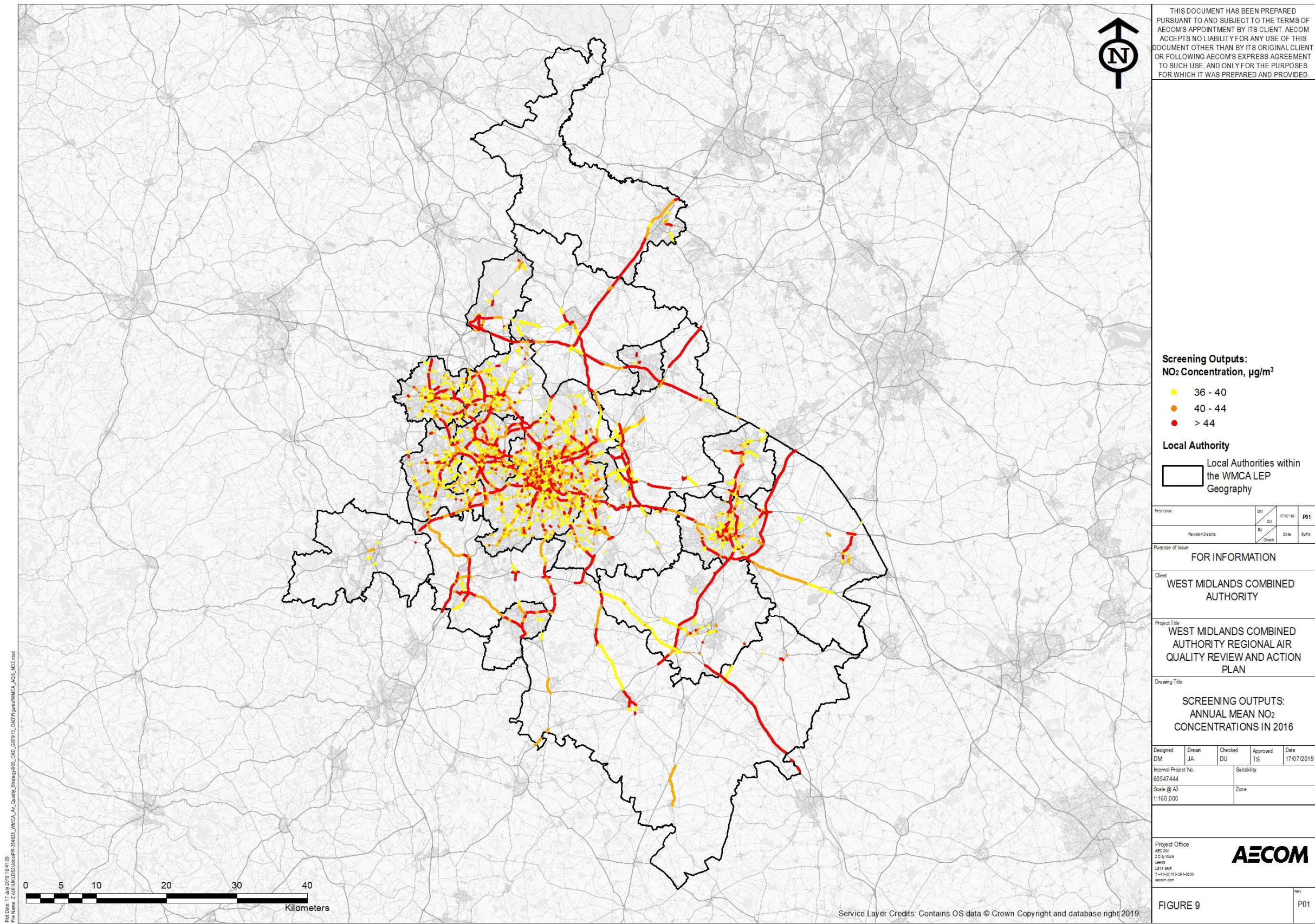


Fig. 9

Figure 10: Screening Outputs, Annual Mean PM₁₀ Concentrations in 2016

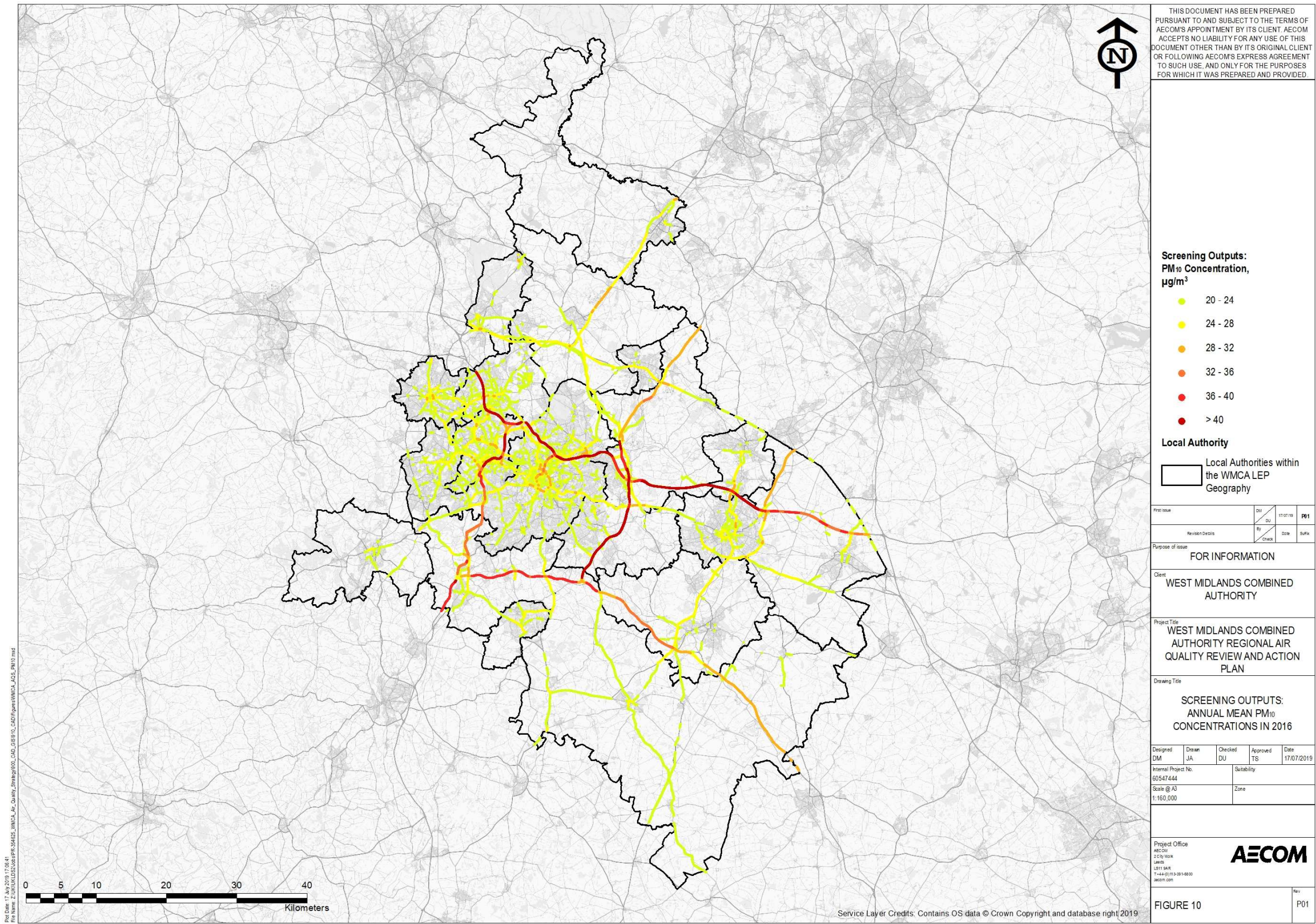


Figure 11: Screening Output, Annual Mean PM_{2.5} Concentrations in 2016

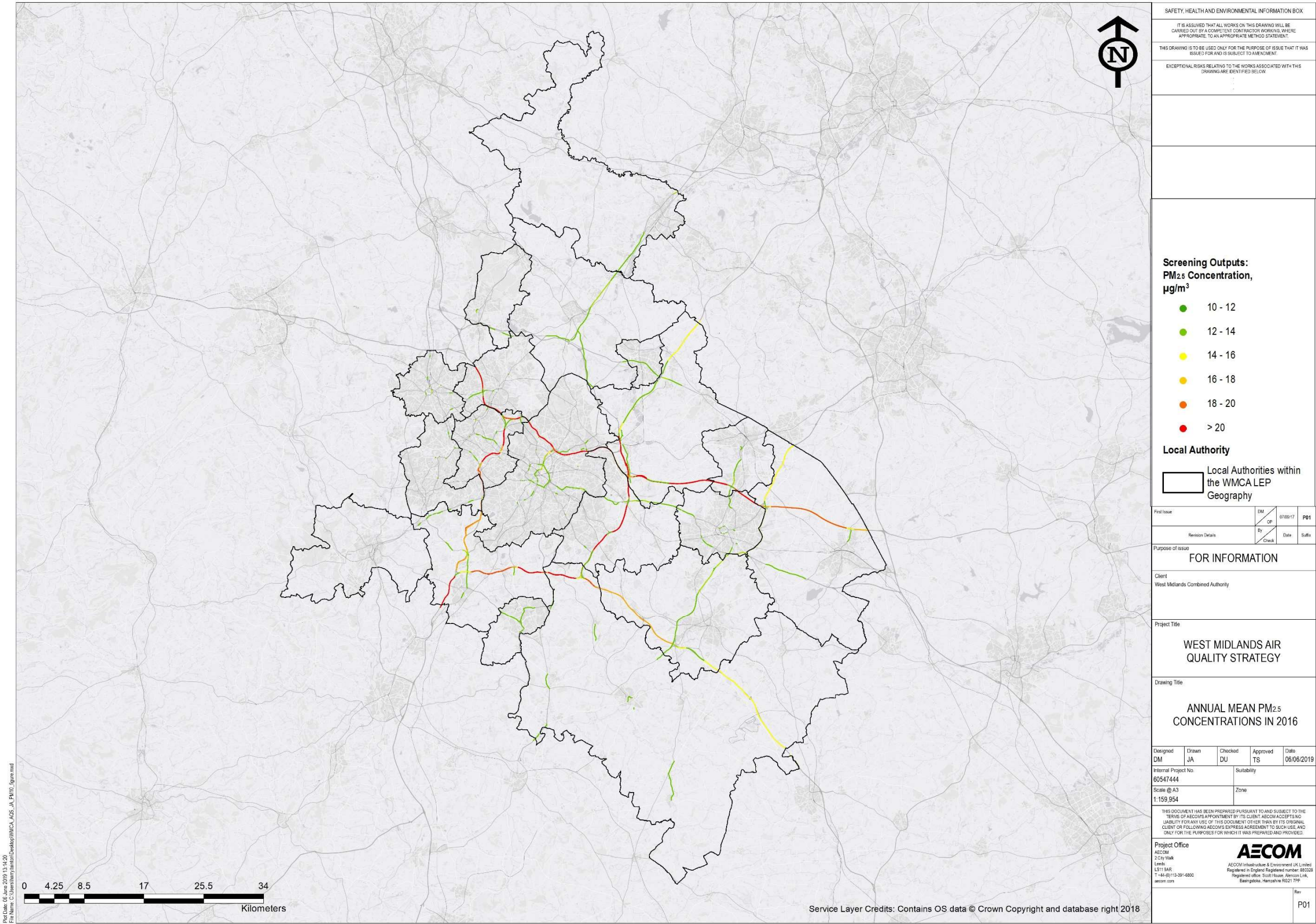


Figure 12: Screening Outputs: Percentage NO_x Emissions in 2016 from Cars

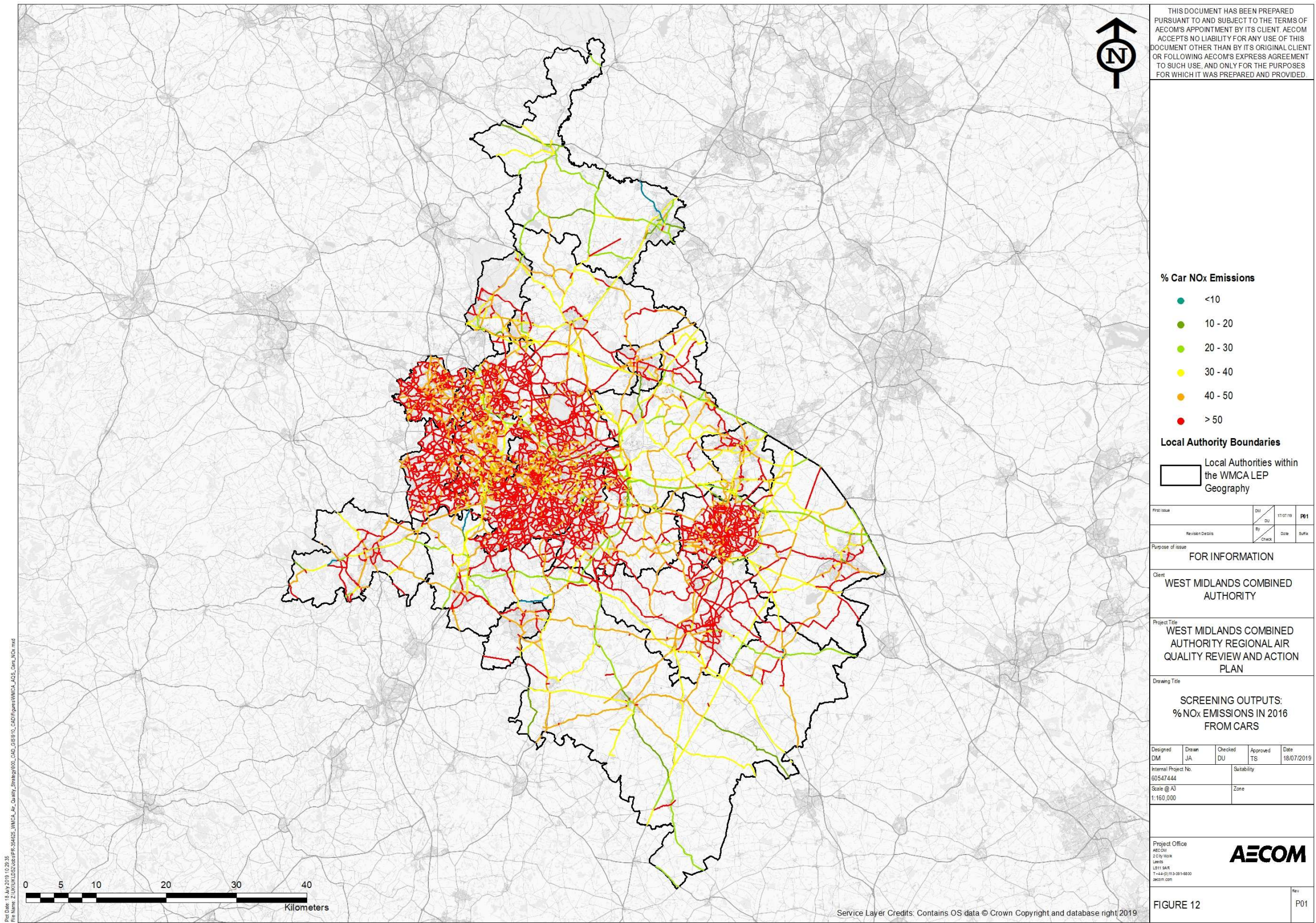


Figure 13: Screening Output, Percentage NO_x Emissions in 2016 from LGVs

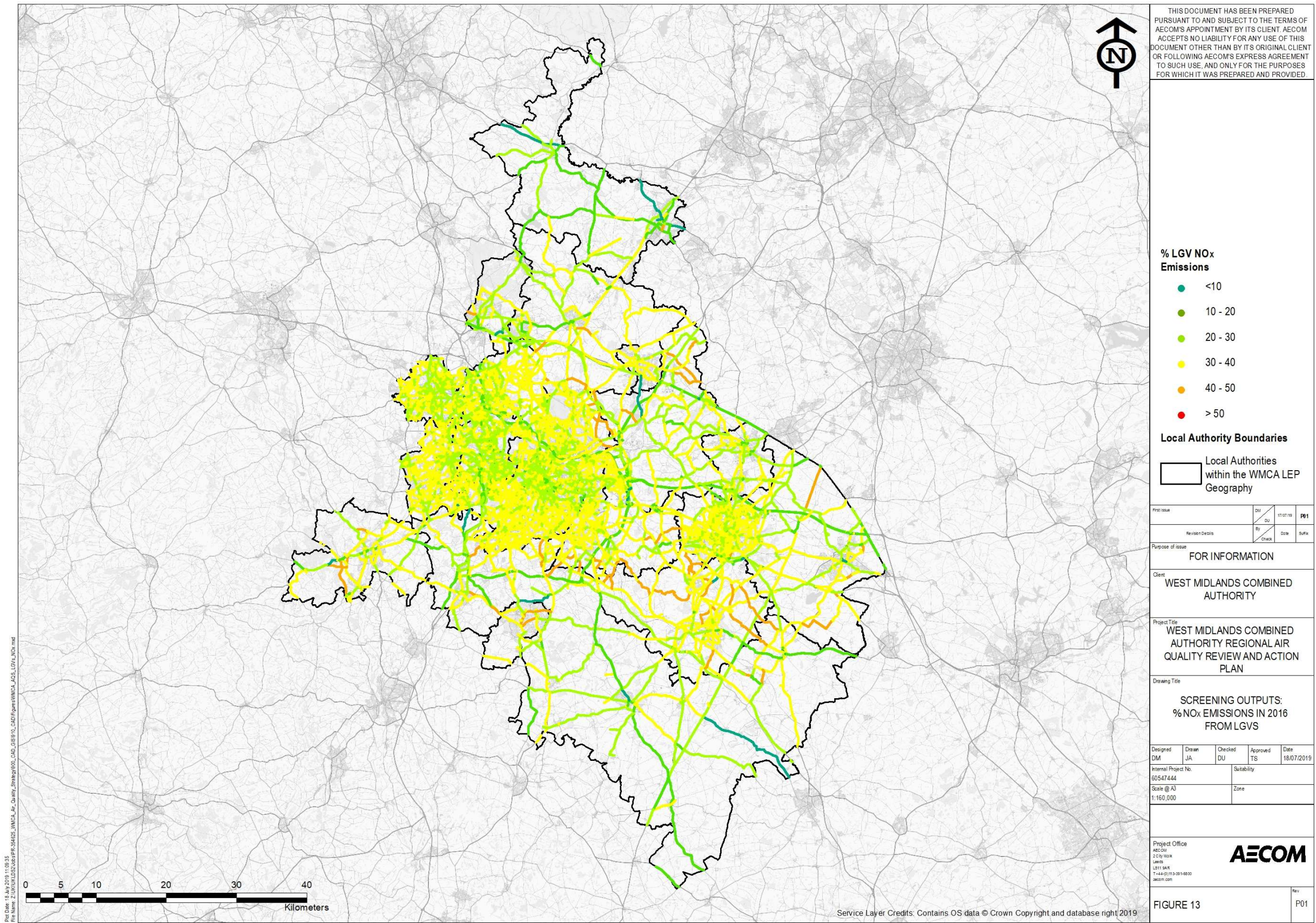
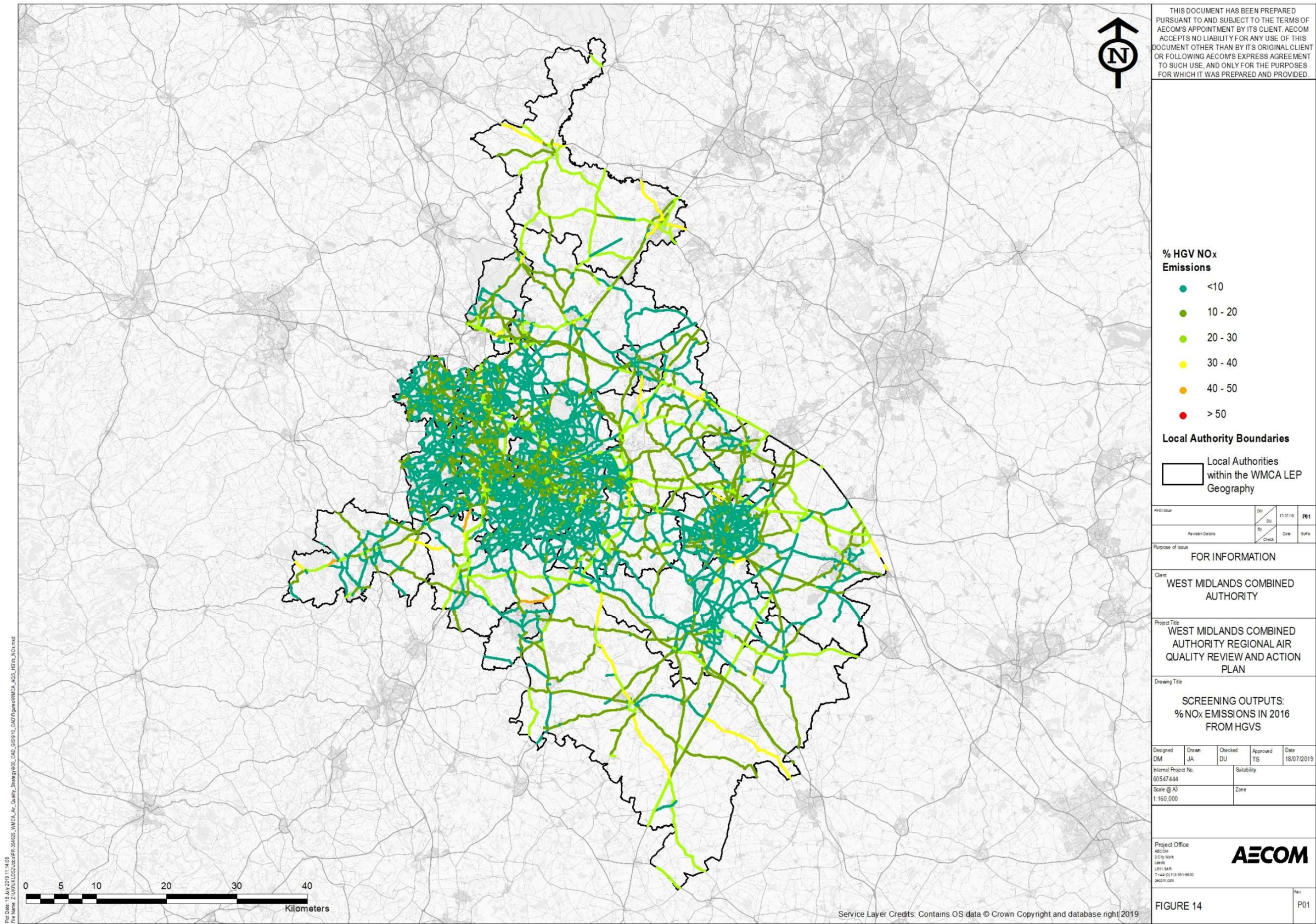


Figure 14: Screening Output, Percentage NO_x Emissions in 2016 from HGVs



Health and Wellbeing

- 6.21 Air quality impacts influence, and are influenced by, the health and wellbeing of the population via a complex matrix of interactions. These factors have been considered using the Indices of Multiple Deprivation.
- 6.22 The Index of Multiple Deprivation (IMD) 2015 is the official measure of relative deprivation for Lower Super Output Area (or neighbourhoods) in England³³. The IMD ranks every neighbourhood in England from 1 to 32,844 (most to least deprived area). Deprivation deciles are calculated by ranking the 32,844 neighbourhoods in England from most to least deprived and dividing them into 10 equal groups. The index is based on scores for:
- Income
 - Employment
 - Education
 - Health
 - Crime
 - Barriers to housing & services
 - Living Environment
- 6.23 The index is used in this study to indicate the potential health effects of changes in air quality, and to indicate the ability of a population to adapt to potential interventions, where accessibility or economic impacts may occur.
- 6.24 Three key indices have been charted across the WMCA area. These are the (overall) Index of Multiple Deprivation (Figure 15), the Health component (Figure 16), and the Income component (Figure 17). The figures indicate that overall higher levels of deprivation are focused in urban areas and lower levels of deprivation in rural areas.
- 6.25 It is broadly understood that individuals living in more deprived areas may be disproportionately sensitive to the cumulative health effects of poor air quality. Areas with a low IMD (and especially, with low health index scores) are at greatest risk of detrimental effects from poor air quality. For example, where respiratory or cardiovascular disease is already prevalent in a population, the cumulative effects of air pollution are worse than in an otherwise healthy population.
- 6.26 Conversely, the most significant health benefits may be attained by targeting interventions in areas where existing poor air quality coincides with low IMD and health index scores. Key priority areas will be identified with this in mind.
- 6.27 Whilst the greatest benefits may be achieved by targeting interventions in areas with low IMD, there are also potential risks associated with this approach, as the populations in these areas may be least able to respond to the economic or practical effects of the interventions.
- 6.28 Potential interventions must therefore be targeted based on the ability of a population to adopt them, which is indicated by the IMD (and especially, the income index scores). Examples include:
- Interventions to stimulate the purchase of compliant vehicles may have lower take-up in areas of low IMD where older, more polluting vehicles are kept on the road longer as the upfront cost of purchasing a new vehicle may be prohibitive.
 - Interventions to promote the use of public transport are expected to be less effective in areas of high IMD where household budgets are more likely to be able to stretch to private car ownership.

33

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/464430/English_Index_of_Multiple_Deprivation_2015_-_Guidance.pdf

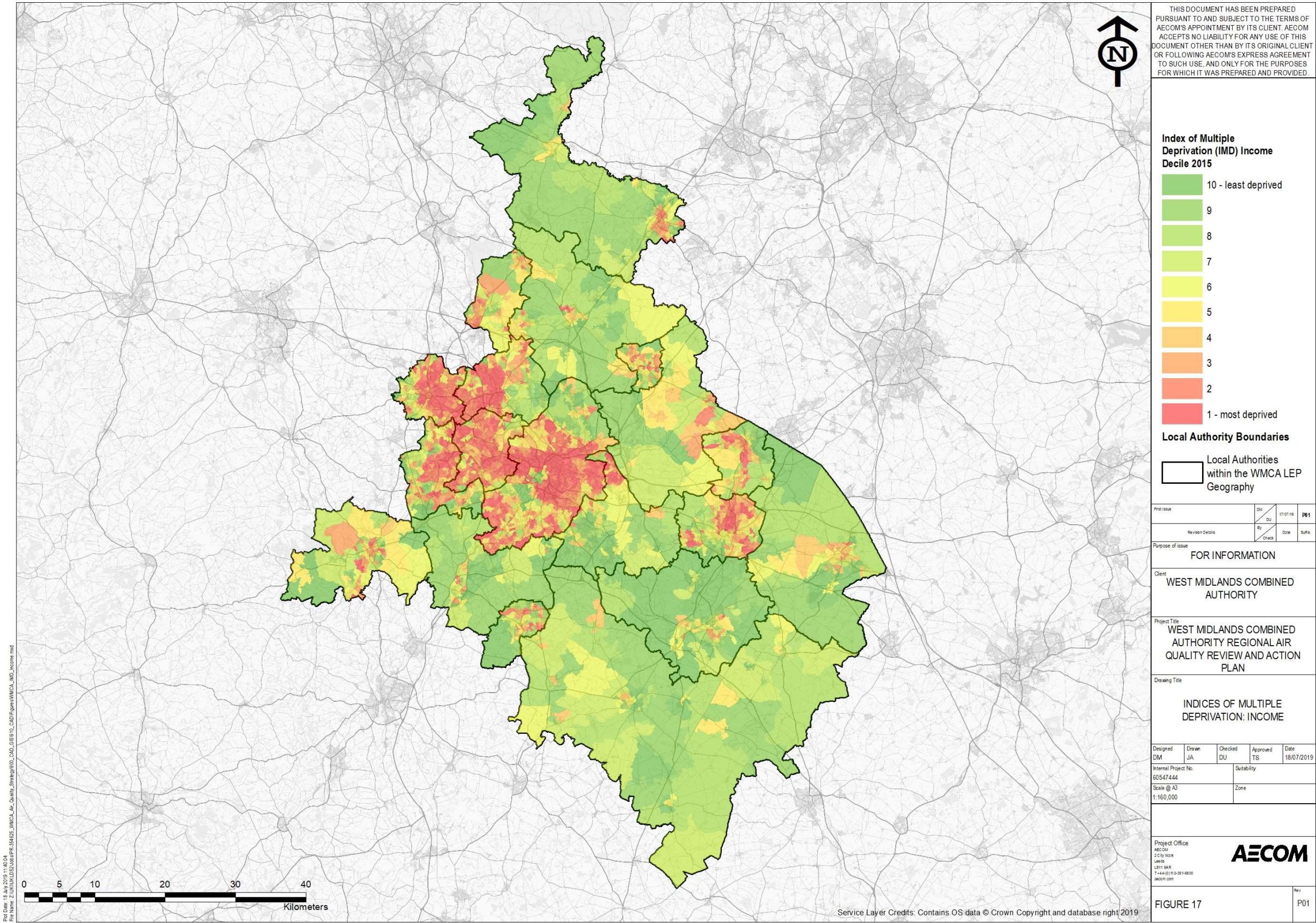
- Interventions to promote walking and cycling are expected to be less effective in areas of low IMD where there are higher barriers to participation including large distances from the home to essential services and poorer health, including disability, which may preclude these activities partially or entirely.
- Interventions based around education and engagement may be less effective in areas of low IMD where baseline education levels of the population may be lower.

6.29 It is essential that interventions intended to reduce emissions and public exposure do not contribute to reduced accessibility or social inclusion, such as penalising owners of older vehicles without ensuring suitable alternative travel opportunities are in place.





Figure 17: Indices of Multiple Deprivation: IMD 2015 as Income Index Score

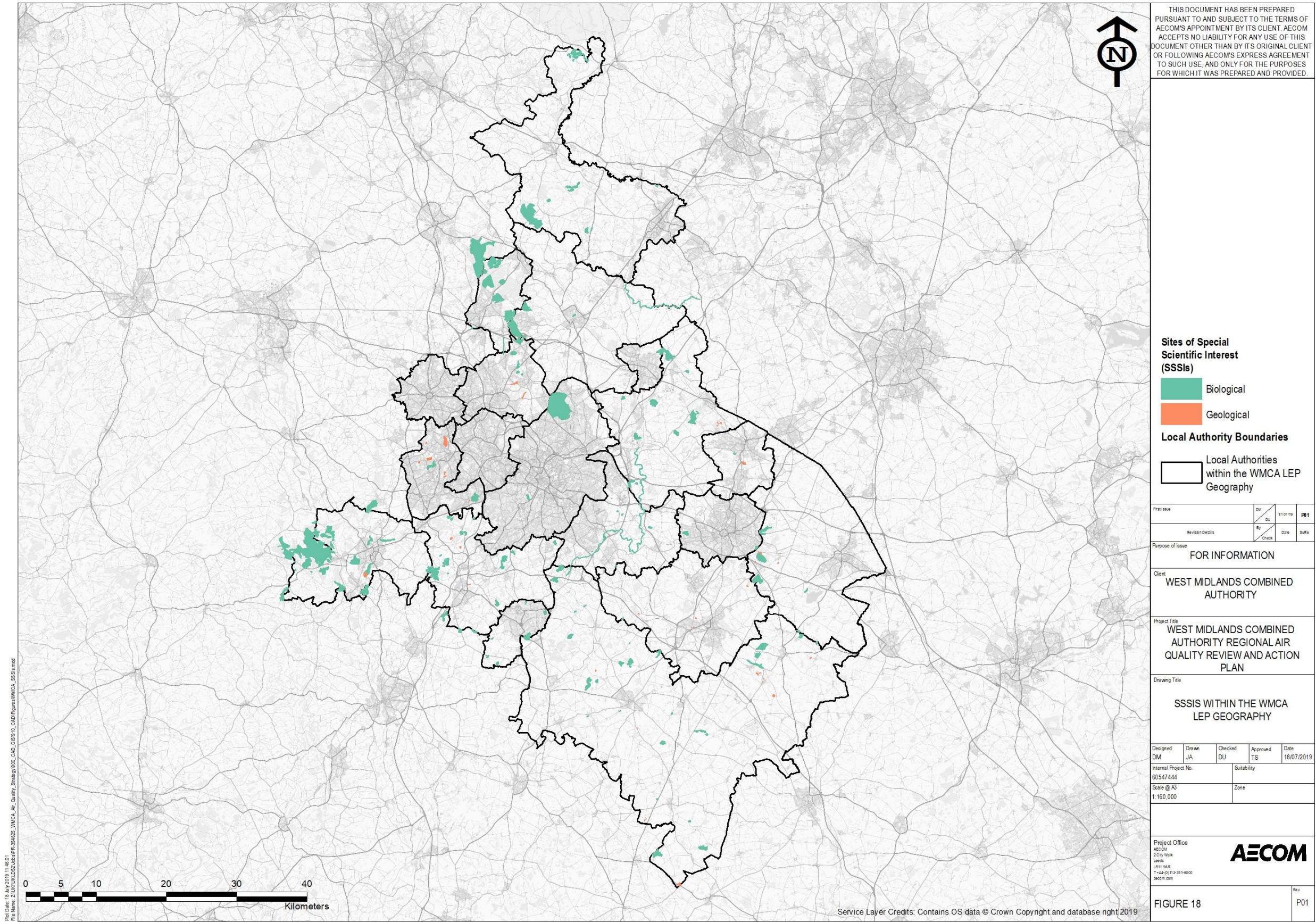


Ecosystems

- 6.30 There are 137 Sites of Special Scientific Interest (SSSIs) that are wholly or partially within the boundaries of the WMCA area. Of these, five also have Special Area of Conservation (SAC) designation. The sites are shown in Figure 18.
- 6.31 Of the SSSIs, 103 have been designated for biological interest, i.e. for plant and/or animal ecosystems. The habitats supporting these ecosystems may be sensitive to air pollutants, via concentrations in air or by deposition.
- 6.32 The remaining SSSIs have been designated for geological interest. These sites may be sensitive to acid rain, which is a result of nitrogen and sulphur oxides in the air.
- 6.33 These sites, in combination with designated and undesignated spaces within the region, offer benefits to air quality as well as risks as receptors. Vegetation presents surfaces for the capture of gases and particles, and can act as a barrier, affecting dispersion.
- 6.34 A report by the Air Quality Expert Group to Defra stated that, at a regional level, tree planting can have a significant effect on regional air quality, particularly on particulate matter. A case study of the West Midlands, of relevance to this study, found reductions of up to 40% PM₁₀ were obtainable by tree planting at 100% of capacity in the region.³⁴

³⁴Air Quality Expert Group (2018), Impacts of Vegetation on Urban Air Pollution https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1807251306_180509_Effects_of_vegetation_on_urban_air_pollution_v12_final.pdf

Figure 18: SSSIs within the WMCA 3 LEP Geography



Key Priority Areas

- 6.35 The emissions screening procedure was combined with the IMD data to identify those locations at greatest risk of detrimental effects resultant from poor air quality. These locations were designated as Key Priority Areas (KPAs) and used to inform the development of the interventions.
- 6.36 Whilst the greatest benefits may be achieved by targeting interventions in the KPAs, the potential risks were also recognised, as the populations in these areas may be least able to respond to the economic or practical effects of the interventions, such as a need to purchase a compliant vehicle.
- 6.37 The data presented in Figure 19 indicates those areas where the screening predicts roadside concentrations exceeding the EU limit values for NO₂ in 2016. These road links have been coded with the IMD score for deprivation, to indicate those areas that should be prioritised with regard to air quality interventions.
- 6.38 The extents presented in Figure 19 focus on the constituent local authorities; the potential outcomes from the interventions may affect a wider extent including all local authorities within the LEPs, but the implementation mechanisms will occur within the constituent local authorities.
- 6.39 Targeting discrete areas to improve air quality is not within the scope of this document. However, it is important to understand the extent and general patterns of high pollution concentrations, and how it correlates to sensitive populations.
- 6.40 The key considerations indicated by this data are:
- Key priority areas are focussed near the major through (e.g. motorways) and radial routes.
 - There is a clear bias towards the lower IMD scores (i.e. more deprived) near urban centres of Coventry, Birmingham, the Black Country and Wolverhampton, with higher scores (i.e. less deprived) on the surrounding routes. Overall, the potential exposure to high concentrations is greater for more deprived population groups.
 - In terms of the emission sources in the Key Priority Areas, cars and LGVs are the most significant source on urban routes, whilst HGVs are increasing significant on major through routes. This indicates that cars and vans should be prioritised to reduce emissions in the most deprived areas with high pollutant concentrations.
- 6.41 The measures discussed in this document consider the transport modes that may be affected, and where they achieve beneficial effects that specifically focus on these KPAs (i.e. deprived areas with high pollutant concentrations near urban routes) they are assigned a more positive ranking score.

Figure 19: Key Priority Areas

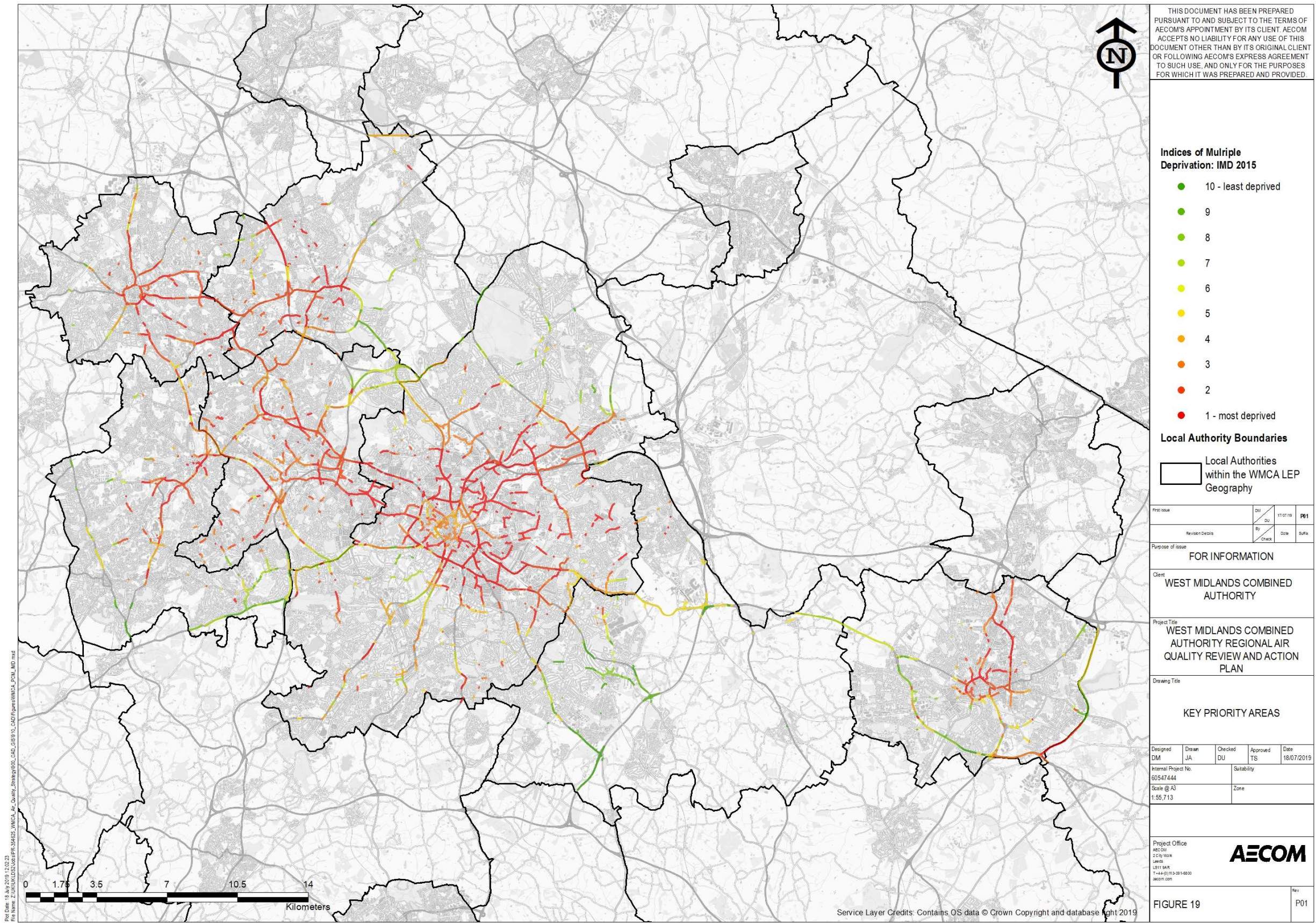


Fig. 19

7. Identifying Interventions

- 7.1 The remainder of the report constitutes the Action Plan which defines discrete and coordinated interventions that will achieve the aspirations outlined in the preceding sections and inform how they will be implemented.
- 7.2 The preliminary long-list of interventions was derived from a review of all existing documents and policies. Where local air quality benefits may be associated with a programme or scheme, the potential effects were subjectively discussed.
- 7.3 Potential regional, physical and non-physical interventions were identified and where possible included an outline of the potential effects in order to provide a quantified framework that informed the stakeholder consultation (see below). The review took account of the following sources of information and examples:
- Local and regional air quality interventions that are already committed or under investigation;
 - Interventions identified in the AQAP;
 - Interventions identified in a national toolbox context by Defra and national plans or guidance;
 - Best practice identified by other regions or cities, which may be transferrable; and
 - Existing proposed or committed schemes that may affect local air quality.
- 7.4 Consultation with key stakeholders was subsequently undertaken in order to identify further interventions, and to ensure local concerns and issues were properly identified.

Consultation Workshop

- 7.5 A consultation workshop was held on 11th March 2019 to discuss the project with key stakeholders from WMCA, unitary, district authorities and planning, transport, environment, and health representatives.
- 7.6 The workshop was structured around a long-list of potential measures split into a series of interventions types; hard, soft and policy and behavioural change measures. These were used as broad themes to stimulate conversation and ideas amongst the stakeholders and indicate the types of opportunities and constraints that may be significant for the development of the potential interventions. Each of the potential measures on the long-list was discussed in the following terms to understand how the stakeholders considered what applicability it may have in terms of the objectives for this plan:
- What are the potential magnitude and extents of local air quality effects?
 - What are the potential magnitude of greenhouse gas effects?
 - Is there a regional added value and specifically what is the role of the WMCA?
- 7.7 It was expected that many of the 'hard' measures may fail the test for regional added value, whereas there would be partial success for 'soft' measures, and good success for policy and behavioural measures. Where these broad tests were considered to be passed, they were considered further in terms of:
- the implementation mechanism; and
 - Highlight early recognition of potential detrimental or beneficial effects in terms of social or economic outcomes.
- 7.8 The feedback and comments from the consultation were subjectively reviewed and sifted to determine the core themes and opportunities, within which the short-list of interventions were grouped and presented in the following Sections.

Appraisal Scoring

- 7.8.1 The approach and overall philosophy for the appraisal of the short-list of potential interventions was to focus on the health and wellbeing benefits that may be achieved by using local air quality improvements as a core performance indicator. This incorporated multidisciplinary considerations and measures to ensure that the interventions can be implemented within the framework of existing and future baseline conditions, legislation and best practice.
- 7.8.2 The interventions are focussed mainly around transport issues, as discussed in paragraph 5.27, although the option review and consultation recognised the wider complex issues surrounding emission sources and exposure.
- 7.8.3 The interventions were attributed approximate timescales for the effect on local air quality to take place:
- Long-term interventions include large scale infrastructure projects such as the development of an integrated rail and rapid transit network, formed of suburban rail, light rail, Bus Rapid Transit and Very Light Rail, electric charging infrastructure, a strategic segregated cycle network on main corridors and longer term demand management measures to help tackle congestion.
 - Medium-term interventions are intended to have an effect within a few years following the initial adoption of the options. These interventions include incentives and penalties to change people's behaviour through education and introducing new opportunities for modal shift or development of transport infrastructure and regulation that will have an abrupt effect following implementation.
 - Immediate interventions may be implemented within a matter of months, and are intended to achieve local air quality benefits in the Key Priority Areas through increased resourcing and coordination of travel planning and development control. It was recognised that these interventions are essential to create the ground-work that will support the other measures, but may individually achieve limited benefits.
- 7.8.4 The preferred interventions have been ranked objectively based on the predicted environmental and health effects, as well as the opportunities and constraints that affect the implementation and overall feasibility (Table 10). This approach ensures that appropriate weighting is afforded to the air quality effects, but incorporates the larger issues that will determine the success of each Option.
- 7.8.5 The indices are provided in for each theme and summarised in Section 19. The outcome is the multiple of each criteria score, whereby the maximum score would be 2187 (i.e. 3x3x3x3x3x3), and the lowest score would be 1 (i.e. 1x1x1x1x1x1).
- 7.8.6 These were also tested with the steering group members, TfWM, and the University of Birmingham WMAir project. These are intended to provide a transparent technical guide to inform future technical and political decision making. They can be reviewed annually as new evidence and experience of implementation is gathered.

Table 10: Appraisal Scoring Criteria

Score	Local Air Quality			Climate Change (GHG)	Implementation			
		Extent	Magnitude		Magnitude	Timescale of Effect	Cost & Feasibility	Inclusion & Accessibility
High	3	Large area, including key priority areas	Large, quantifiable change	Large, quantifiable change	Immediate <12 months	No cost	Major Beneficial	Major Beneficial
Medium	2	Discrete areas, including key priority areas	Moderate, certain to achieve some quantifiable change	Moderate, certain to achieve some quantifiable change	Short / Medium < 3 years	Direct minor cost	Minor Beneficial	Minor Beneficial
Low	1	Discrete areas, but not necessarily a key priority area	Minor, subjectively likely to lead to a change, but may not be easily quantified	Minor, subjectively likely to lead to a change, but may not be easily quantified	Long > 3 years	Direct major cost	Neutral or Detrimental	Neutral or Detrimental

Responsibilities and Resources

- 7.8.7 The implementation of the outcomes from this study will be coordinated by WMCA on behalf of the constituent and non-constituent local authorities, and progress reported to the WMCA Environment Board on a regular basis, with an annual review to identify where new action is required.
- 7.8.8 The commitment to implement the interventions is undertaken jointly by key stakeholders, such as local authority air quality officers. Where financial or staff resources are required, WMCA will coordinate the requirements and resources with the aim of achieving the action.
- 7.8.9 The original brief was to identify regional level actions that were the easiest to implement and have the biggest impact on air quality and health. At the end of the research certain stakeholder groups were asking for bolder action.
- 7.8.10 Therefore the WMCA will also work with stakeholders as part of the action plan to identify additional high impact, but difficult to implement interventions that could be used to inform a series of asks for Government and future devolution deals.

8. Interventions

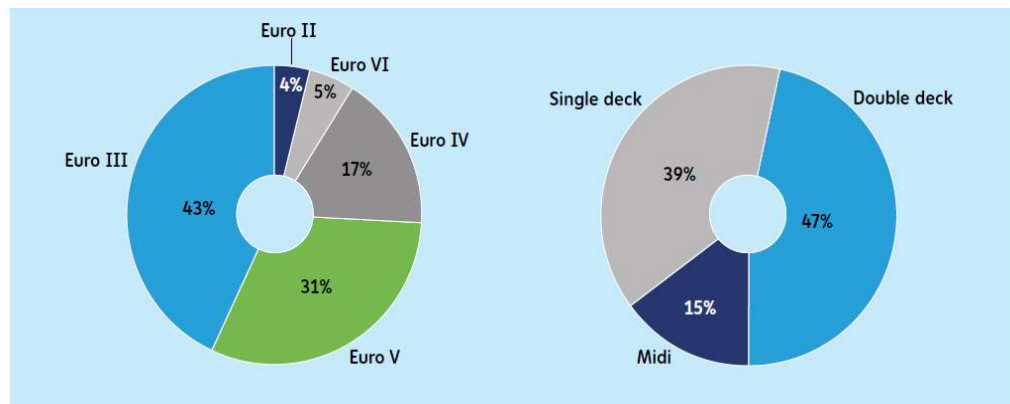
8.1 The potential interventions are appraised in the following sections:

- Section 9: Buses
- Section 10: Travel Choices
- Section 11: Highway Planning & Coordination
- Section 12: Freight
- Section 13: Planning Guidance
- Section 14: Healthy Streets
- Section 15: Technical Practice Network
- Section 16: Technology & Innovation
- Section 17: Public Engagement
- Section 18: Funding

9. Buses

- 9.1 Currently there are approximately 2,300 buses operating in the West Midlands, a figure which is expected to remain fairly constant to 2035. As of April 2019, 675 buses in the West Midlands are Euro VI standard or better (34 % of the entire fleet). Funding has been secured that will see a further 1,390 buses upgraded to a minimum Euro VI standard by the end of 2020. This includes the March 2019 announcement of £5.5m from the Clean Bus Technology Fund 2017-19 Extension for a further 353 buses to be retrofitted in the region. This will see over 85 % of the West Midlands bus fleet meeting at least Euro VI standard by the end of 2020. Every year, approximately 200 buses are procured to replace vehicles scrapped at the end of their lifetime³⁵.

Figure 20: West Midlands Bus Fleet Breakdown in 2015 (EURO class and bus type)



Source: West Midlands Low Emission Bus delivery plan

- 9.2 Owing to the stringency of EU regulations, which states that all new buses purchased must meet EURO VI emission standards, there is an obvious progression of the West Midlands bus fleet towards less polluting vehicles. It is an aspiration in the West Midlands Vision for Bus, to have all buses operating in the West Midlands at least Euro VI standard by April 2021. This would be achieved mainly through replacing buses and retrofitting others, subject to further funding being secured to support the transition to cleaner, greener vehicles.
- 9.3 The effects on emissions and associated damage costs (see Section 5) that may be achieved by operating vehicles with different emissions standards are presented in Table 11, based on a single bus operating at 60 km/hr for 250,000 miles per year.

Table 11: Bus Emission Standards Damage Costs

Euro Class	Emissions, kg/250,000 miles			Annual Cost at	
	NO _x	PM _{2.5} *	Low Value	Central Value	High Value
Euro III	2144	79	£9,888	£	£221,136

³⁵ West Midlands Low Emissions Bus Delivery Plan

Euro Class	Emissions, kg/250,000 miles			Annual Cost at	
	NO _x	PM _{2.5} *	Low Value	Central Value	High Value
				64,393	
			£5,963	£40,625	£141,261
Euro IV	1516	41	£5,725	£36,945	£126,549
Euro V EGR	1199	43	£5,603	£35,273	£119,950
Euro V SGR	1063	43	£3,205	£15,970	£50,075
Euro VI	84	29			

Note: * includes PM₁₀ as PM_{2.5}

- 9.4 Targeting improvements to buses to reduce emissions and limit public exposure can be specifically targeted to the KPAs (see paragraph 6.35). This will potentially have the greatest effect on deprived social groups who are dependent on public transport provision, where there are clear associations with travel choice and accessibility.
- 9.5 The following themes have been identified as areas where there are the potential for further interventions by the WMCA to manage emissions from buses.

Bus upgrades to Euro VI and ultra-low emission buses

- 9.6 The WMCA Low Emission Bus Delivery Plan outlines a Delivery Plan to 2035 for low emission bus adoption and the installation of the required refuelling infrastructure. The Delivery Plan aims to guide and support the transition of the West Midlands bus fleet towards a zero/low

emission fleet. The Delivery Plan is a comprehensive document which describes the opportunities and constraints of different technologies, guidance, funding and the WMCA role and actions to assist bus operators to move towards the use of low emission buses.

- 9.7 The main obstacle for bus operators to adopt ultra-low emission buses are the high ownership premium compared to a regular diesel bus, including higher vehicle and infrastructure capital costs as well as uncertain residual values. Also vehicle reliability, performance, maintenance costs and spare part supply chain are all barriers to adoption that govern bus operators' procurement decisions. It is essential that these obstacles are overcome.

Refuelling infrastructure for zero emission buses

- 9.8 Appropriate electrical charging infrastructure is essential to ensure the uptake of electric and hybrid buses. Depot-based charging infrastructure for buses to charge overnight, are one form of charging. Typically this would be sufficient for buses to refuel enough to last a shift; however, depending on driving practices and routes, it may be necessary to provide 'en-route' charging. The Delivery Plan discusses the potential supply chain constraints associated with frequent short 'top-up' charging events and states that a power capacity challenge could be encountered by adding significant additional peak power demand. The region's first 'en-route' charging infrastructure is being installed at Birmingham International Airport and will be in operation from December 2019, initially charging the Airport's shuttle services.
- 9.9 Hydrogen buses only require depot based refuelling infrastructure solutions due to their high capacity on-board storage units. These buses would be suitable for longer routes and negates the issues described above associated with electric vehicles on longer routes. The Delivery Plan describes up to 480 hydrogen buses in use by 2035 in the West Midlands, shared across multiple depots.

Box 1: Example of Hydrogen Refuelling Research

Birmingham City Council are currently involved in a pan-European research and development project aimed at resolving the significant knowledge gap around large-scale hydrogen refuelling. The outcome of this will benefit the West Midlands as hydrogen bus uptake increases.

Assignment of buses to routes

- 9.10 The assignment of appropriate buses to routes is essential to maximise the air quality benefits of the EURO VI and ultra-low emission buses, as these need to be deployed on routes where buses make the largest contribution to air quality, but also needs to take into consideration social deprivation i.e. the routes within the KPAs.
- 9.11 From a logistic perspective in terms of refuelling infrastructure, electric and hybrid vehicles are more suitable for shorter (local or regional) routes; whereas hydrogen buses are suitable for longer (national) routes; thus allowing refuelling of both types of buses at depots, with no enroute refuelling required.

Box 2: WMCA interventions regarding bus upgrade

There is a regional priority to improve bus provision and reduce emissions, which is recognised in the baseline review. Therefore, interventions concerning bus upgrades have been identified to support the actions outlined in the WMCA Low Emission Bus Delivery Plan:

- Co-ordinate bus upgrades, retrofitting and replacements across the region to ensure the best outcomes for air quality.
- Provide information to bus operators through workshops, WMCA website or other existing platforms such as the LowCVP Bus Working Group about:
 - Funding opportunities;
 - Support with funding applications and financing solutions, particularly for smaller operators;
 - Relay information and experiences about the real-world performance of low emission buses;
 - Host a West Midlands forum to share information on low emission bus trials within the West Midlands as well as national trials; and
 - Establish constructive dialogues regarding the installation and owning of new ultra-low emission bus infrastructure, as well as advice regarding grid operators, land ownership, space constraints etc.
 - Act as an independent party to collate, verify and anonymise (where possible) emission performance and infrastructure data to be shared with operators across the region.
- Co-ordinate funding opportunities across the region and ensure opportunities are accessible for both large and small bus operators. Also WMCA can assist in making the applications for funding easier, especially for smaller operators.
- Commission a study to determine where buses currently operate based on their euro classification to determine if low emission buses are operating in the Key Priority Areas
- Develop a 'West Midlands Clean Bus Fund' and distribute to the most progressive operators, for routes in the Key Priority Areas.
- Publicise 'clean bus routes' on the WMCA website to highlight on-going efforts to improve air quality.
- Proactively lobby for funding support schemes to reduce emissions from buses

Policy Links	Theme Links
West Midlands Low Emission Bus Delivery Plan Strategic vision for buses	Electric Vehicles Funding Key Route Network Refuelling Strategies Re-assignment of buses to routes

Table 12: Appraisal Scoring – Bus Upgrade

Theme	Local Air Quality		Climate Change (GHG)	Implementation				Total
	Magnitude	Extent		Magnitude	Timescale of Effect	Cost & Feasibility	Inclusion & Accessibility	
Bus upgrades to Euro VI and ultra-low emission buses	3	3	3	1	1	3	2	163
Refuelling Infrastructure for zero emission buses	3	3	3	1	1	3	3	243
Assignment of Buses to Routes	3	3	1	1	2	1	1	18

10. Travel Choices

10.1 Travel Choice represents personal empowerment for individuals to engage with how and where to travel, and the WMCA fulfils a specific role to enable this. It is essentially built around the following objectives:

- Connecting people with jobs by improving accessibility of the wider public transport network, with a particular focus on local walk and cycle access to embed low-carbon travel from the outset;
- Supporting business activity in priority areas where potential employment opportunities are or will be available; and
- Targeting congestion and business transport efficiency by focusing on areas where local traffic congestion undermines business productivity.

10.2 To achieve these goals, travel choice initiatives can:

- Raise awareness of the full range of travel choices and broaden travel horizons;
- Give people the information they need about how, when and even if, they make a journey;
- Promote and build confidence in sustainable transport modes; and
- Improve the sustainable transport offer through a range of incentives and initiatives.

10.3 WMCA were awarded £20m from the Department of Transport (DfT) for the Future Mobility Zone programme³⁶. The fund is intended to support the transition of assets from technology research and development environments towards integration within the everyday transport system that people use. There is an emphasis on supporting enhanced transport services such as better travel information, demand responsive services, incentivised travel choices as well as elements of self-driving vehicle technology. These are intended to be services which everyday travellers can experience and benefit from and because of this there is a need for regionally driven design and integration.

10.4 As part of the negotiations between WMCA and DfT in the awarding of this grant, WMCA set out a number of deliverables which will assist in delivering a number of the interventions:

- A major boost to the swift ticketing system;
- Better customer travel information;
- Digitisation of the transport system;
- Advanced data analytics and processing;
- A pilot of mobility credits which is a system of electronic voucher credits to incentivise drivers to give up their private vehicles in exchange for a limited time period of support such as electric vehicles (EV) car hire, car share, conventional and on-demand public transport, taxi, walking and cycling.
- Taxi-share trail in Wolverhampton;
- A self-driving vehicle showcase to support the implementation of a large-scale Solihull and Coventry based demonstration trial.

10.5 As described in Section 4, a number of local authorities have included actions within their air quality action plans aimed at encouraging the public to use alternative forms of transport and therefore reduce reliance on single occupancy car journeys. This highlights that travel choices is being pursued as a means to improve air quality at both local authority and regional level as a core theme. Therefore, the following themes have been identified as areas where there are the potential for further interventions by the WMCA.

³⁶ WMCA Board Future Mobility Zone Programme, 22nd March 2019

- 10.6 Most of these interventions will be focused in urban areas, particularly city centres, where there are the population densities to enable uptake of these options on a large scale. Therefore these themes will be targeted in Key Priority Areas.
- 10.7 There is also widespread promotion and awareness activity such as regional events, co-ordinated with National Clean Air Day.

Cycling & Walking

- 10.8 Cycling is an essential travel mode, and a core sustainable option for travel choice, as well as supporting healthy living and social engagement. Increased walking and cycling in line with the West Midlands Cycling Charter and LCWIP will also support improved air quality. However, it is also recognised that increasing provision for walking and cycling, and promoting awareness to increase patronage will achieve limited benefits with regard to reducing emissions. Unless significant modal shift from car travel in congested conditions occurs.
- 10.9 Therefore, the travel modes have not been included in this study as discrete measures, but embedded throughout the themes as essential provision to ensure long-term improvements and opportunities for travel choice and modal shift.

Mobility as a Service

- 10.10 Mobility as a Service (MaaS) is at the heart of transport planning, and the principles are recognised in numerous national and regional policy and guidance documents.
- 10.11 MaaS represents a broad shift away from traditional, potentially rigid travel choices, in favour of more personalised options utilising new technology, such as ride hailing and on-demand public transport, or self-driving vehicles and micro-transport solutions. It also supports investment and appraisal of novel approaches and uses of travel choice.
- 10.12 In terms of the benefits to emissions and air quality, there is an opportunity to focus on a move away from the simple choice of car vs public transport, and adopting access to a more personalised transport choice.
- 10.13 MaaS has been recognised within the DfT's Future of Mobility Urban Strategy³⁷ as an area of focus for the regulatory review. More specifically it will support the following principles of the Strategy:
- The benefits of innovation in mobility must be available to all parts of the UK and all segments of society;
 - New mobility services must lead to the transition to zero emissions;
 - Mobility innovation must help to reduce congestion through more efficient use of limited road space, through sharing rides and increasing occupancy
 - The marketplace for mobility must be open to stimulate innovation
 - New mobility services must be designed to operate as part of an integrated transport system combining public, private and multiple modes for transport users.

On-demand Buses

- 10.14 On-demand buses are essentially an app-based public transport service where passengers can 'order' and track a vehicle from the app and allow them to select a pick-up point and reserve a seat. Passengers initially download the free app and complete a simple registration process which includes payment details. Once registered passengers can plan and book journeys. The potential for on-demand buses where demands are not easily met by conventional commercial bus services needs to be explored further.

³⁷ DfT, Future of Mobility: Urban Strategy. Moving Britain Ahead, March 2019

Box 3: On-demand Buses, London Trial³⁸

A commitment of the Mayors Transport Strategy is to trial on-demand buses in outer London. Following a month long consultation, a small scale 'demand responsive bus' trial will be launched in the London Borough of Sutton, with the potential to extend into a small part of the London Borough of Croydon for 12 months. The vehicles will be EURO VI compliant bringing them in line with the ultra-low emission zone vehicle standards.

Once passengers are registered they can enter their origin and destination in the app (within the demarcated service area). They will then receive a journey proposal within seconds including the estimated time of arrival of the vehicle at the desired pick up point, walk time (to pick up point) and route to the pick-up point, expected journey time to selected local and final fare. The customer can then confirm or reject their journey. Customers will then receive updates when their vehicle is two minutes away and again on its final approach.

Box 4: On-demand Buses^{39, 40}

Merseytravel in conjunction with Arriva have launched their on-demand app-based public transport service, 'ArrivaClick' at the end of Summer 2018. There are no fixed routes, with journeys determined by where passengers want to go within an area running from the city centre to Liverpool John Lennon Airport. Powered by Via, the global ride sharing transportation firm, vehicles will be routed in real-time to find the optimal route for their trip. The shortest and fastest routes are calculated, with a guaranteed fare and real-time information on time of departure and arrival.

Oxford Bus Company operates the 'PickMeUp' service which is on-demand ride sharing minibus service. Passengers get pick up from a 'virtual bus stop' within a short walkable distance of where they are.

Ride Hailing

- 10.15 Ride hailing is targeted specifically at taxis, with on-line apps such as UBER becoming increasingly popular. Other cities have several ride hailing apps, with London boosting seven.
- 10.16 In order to consider this in the context of leading to potential improvements to air quality, the WMCA would need to explore options such as the use of ride hailing apps for Euro VI or electric vehicles only. However, a major risk with the idea of ride hailing is that it attracts people who would typically use public transport as their travel choice.

Box 5: Ride Hailing GETT UK⁴¹

GETT UK operates in London, although its corporate services are available in 135 countries and last year become the UK's first ride-hailing app with the option to book exclusively electric taxis, with GETT also incentivising its drivers to invest in electric or hybrid vehicles.

Commercial MaaS

- 10.17 MaaS can also be scaled up to meet the needs of delivery and servicing operators and not just individuals. This can be initiated by individual companies or by groups of companies who can co-ordinate electric van sharing schemes for deliveries as described in Box 6.

³⁸ Transport for London, Demand Response Bus Trial <https://consultations.tfl.gov.uk/buses/demand-responsive-bus-trial/>

³⁹ Merseytravel, On-demand public transport service 'ArrivaClick' coming to Liverpool this summer <https://www.merseytravel.gov.uk/about-us/media-centre/news/Pages/On-demand-public-transport-service-%27ArrivaClick%27-coming-to-Liverpool-this-summer.aspx> (Accessed April 2019)

⁴⁰ Oxford Bus Company, Pick Me Up, <https://pickmeup.oxfordbus.co.uk/> (accessed April 2019)

⁴¹ Gett UK, <https://gett.com/uk/> (accessed April 2019)

Box 6: Commercial MaaS^{42, 43}

In October 2018, Bosch announced plans to team up with Toom hardware stores in Germany to launch their own electric van-sharing service, which people can hire to transport their bulky purchases.

In Brixton, market stall owners and local shopkeepers are encouraged to sign up to Zipcar's van scheme which a new electric van sharing scheme.

e-Bikes

- 10.18 An e-bike or electric bike is a standard pedal cycle fitted with a battery and electric motor. When you pedal, the motor kicks in to take up some of the strain. Once they reach the top speed of 15 mph the battery or motor cuts out, once the speed drops below 15 mph it will restart. Thus limiting the speed of the bike. This makes 'cycling' a more attractive mode of transport for city centre use.
- 10.19 This infrastructure may also be used to support other 'micro-transport' options, such as e-scooters, subject to the introduction of supporting national legislation and acceptable mitigation of user risks⁴⁴.
- 10.20 Docking stations should be placed at transport hubs such as train stations and bus stations as well as within city centres to enable non-car journey's to be more joined up.

Box 7: eBikes Derby⁴⁵

eBikes Derby are the country's largest electric bikeshare scheme with over 200 eBikes and 30 initial docking stations at key trip destinations across the city.

Users register through the ebikes Derby website or the Social Bicycles App where they are provided with an account number and PIN, which are entered into a bike to release it from the docking station. To make a temporary stop, users press the hold button and lock the bike to a rack with the lock provided. Once finished the bike is locked into an ebike hub which are situated around the city.

Park & Ride

- 10.21 Transport for West Midlands (TfWM) provides over 8,500 car parking spaces across the public transport network to accommodate access to rail and metro by car. Park and ride is particularly popular for frequent commuters into Birmingham city centre as it can offer a significant journey time saving; it allows commuters to avoid delays caused by highway congestion and makes it feasible for people to commute further distances (which would usually take much longer to drive).
- 10.22 Park and ride is one of a number of measures that support access to rail and rapid transit by different modes. The WMCA Strategic Transport Plan: Movement for Growth⁴⁶, recognises that park and ride is an important component that supports integration of the rail and rapid transit network with the wider transport system. In addition, as discussed in Section 4, several local authorities within the West Midlands have specifically included actions within their Local Air Quality Action Plans to increase park and ride capacity at specified sites (including new and existing sites).

⁴² Bosch, Bosch enters the car-sharing business with electric vans. <https://www.bosch-presse.de/pressportal/de/en/bosch-enters-the-car-sharing-business-with-electric-vans-172353.html> (accessed April 2019)

⁴³ Air Quality News, Why mobility as a service holds the key to better air quality in cities

<https://airqualitynews.com/2019/04/02/why-mobility-as-a-service-holds-the-key-to-better-air-quality-in-cities/> (accessed April 2019)

⁴⁴ https://www.austintexas.gov/sites/default/files/files/Health/Epidemiology/APH_Dockless_Electric_Scooter_Study_5-2-19.pdf

⁴⁵ Derby ebikes <https://www.ebikesderby.com/> (accessed April 2019)

⁴⁶ WMCA, Movement for Growth: The West Midlands Strategic Transport Plan

- 10.23 As committed in The Movement for Growth 2026 Delivery Plan⁴⁷, TfWM has been developing 'an evidenced and prioritised strategy for strategic park and ride provision.' The first component of this strategy was adopted via the WMCA board report "Park and Ride, policies and principles – towards a strategy" in March 2019.
- 10.24 In this report, the role of park and ride to access rail and rapid transit is set out as "enabling greater access to the rail and rapid transit network for those who lack feasible alternatives to access the network by non-car means". Its role in improving emissions is set out as supporting "the continued economic success of congested centres by accommodating increasing travel demand and providing choice within a wider strategy to reduce congestion and air pollution by providing a viable alternative to end-to-end car travel".
- 10.25 In environmental terms, where park and rides results in an overall reduction of vehicle mileage (in particular on congested and polluted roads) it can help reduce carbon emissions and air pollution from transport. However, actual observed traffic reductions in large urban areas resulting from additional park and ride provision can often be relatively small and short-lived if it is implemented as an isolated measure and without proper consideration of the range of effects it can have on the wider transport system.
- 10.26 Key success factors which improve the extent to which park and ride can aid in an overall strategy to reduce emissions (and their impacts) include:
- Developing park and ride in tandem with measures which discourage accessing key centres by car is essential for overall emissions reduction;
 - Minimising the extent to which park and ride attracts users who could travel more sustainably – where implemented, park and ride has often been observed to attract users who previously travelled more sustainably and currently a third of existing users of park and ride in the West Midlands drive less than a mile to access sites; and
 - Ensuring that the public transport vehicles are low emissions themselves;
 - In particular with bus-based park and ride, ensuring that public transport remains attractive enough to attract park and ride users without worsening congestion on the highway for other road users (which can exacerbate local air pollution).
- 10.27 Despite this, two specific issue with the use of Park & Rides were also identified in the report:
- Approximately a third of existing users in the of the Park and Rides in the West Midlands drive less than a mile to access the Park & Ride, taking up a space for those who live further away.
 - It is estimated that almost 90 % of park and ride users in the West Midlands emanate from households where the chief earner is employed in a profession with a non-manual ABC1 banding of the NRS social grades classification system. In the West Midlands generally only approximately 50 % are in this band. However, the report does not discuss the reason for this, such as accessibility, price.

Ticketing

- 10.28 The key priorities for the WMCA in terms of ticketing include:
- Ensuring there are coherent and joined up travel options for cross-boundary travel across the West Midlands;
 - Ensuring public transport is accessible to all in terms of cost; and
 - Ensuring public transport is a viable option to support flexible working practices.
- 10.29 Swift is the West Midlands ticketing platform which already provides a joined up system for purchasing tickets for trams, buses and trains. There are also a number of card types such as adult season tickets, child season tickets, pay as you go and 16 – 18 photocard.

⁴⁷ WMCA Movement for Growth: 2026 Delivery Plan for Transport

Car Clubs

10.30 Promotion of car clubs essentially reduces reliance on car ownership by providing cars which can be hired when required. Car clubs provide short-term and ad-hoc access to personal transport based on a monthly or annual fee, plus cost per journey and/or distance travelled. Membership of a club is vetted, and users can access a range of vehicle types from multiple allocated parking locations.

10.31 Specific benefits to users include:

- Access to a vehicle where personal vehicle parking is limited, such as urban flats.
- Users have access to a vehicle when required, and so whilst individual journeys cost more than a private car, without the need for users to be concerned with tax, MOT and maintenance, the annual cost may be significantly lower for occasional use.
- Vehicles are typically new, and a high level of modern features.

Electric Vehicles

10.32 Alternative fuelling and recharging infrastructure is essential to support the uptake of new, low and zero-emission vehicle technologies. The new Local Industrial Strategy aims to have the highest share of electric vehicles in the UK. Existing measures are outlined in the Black Country Ultra Low Emission Vehicle Strategy⁴⁸. The electric vehicle (EV) charging infrastructure is an essential part of any prospective ULEV framework, as this is essential to enable users to confidently own and operate electric vehicles. The users must be confident that:

- The charging socket will be compatible with their vehicle (there are currently 10 different socket types for fast and slow, AC/DC conditions⁴⁹ which has led to confusion amongst users about which types are compatible);
- The power supply must be free, or use an easily accessible charging framework;
- There must be sufficient provision of charging points to satisfy demand;
- The power rating for the supply must be suitable to charge the vehicle in the time allowed; and,
- The charging station must be operational when required, although it is recognised that a proportion of the points may be out of service this should be kept to a minimum.

10.33 In order to effectively promote the uptake of EV in the region, these constraints should be recognised so that a coordinated solution can be implemented.

10.34 In addition to the public charging infrastructure, EV users will need to be able to charge vehicles at home. Where properties include off-street parking, it should be possible to install a supply, although properties without off-street parking do not have this option. In this event, EV may only be a feasible technology to those owners where they have reliable access to alternative facilities, such as a workplace.

⁴⁸ Black Country Ultra Low Emission Vehicle Strategy, 2017

⁴⁹ Zap Map, EV connector types, <https://www.zap-map.com/charge-points/connectors-speeds/> (accessed April 2019)

Box 8: Plugged-in Midlands

The plugged-in Midlands programme website already provides details of all charging point locations in the West Midlands, which is a useful tool for EV owners to refer to.

Through a successful OLEV bid, Dudley MBC have introduced vehicle rapid charging units in Dudley, Brierley Hill and Halesowen town centres. The charging units are installed in council owned public car parks and are available for use by the general public at all times.

In 2015, Birmingham City Council published its Blueprint for low carbon fuel infrastructure detailing proposal for rolling out alternative refuelling infrastructure, including electric charging, natural gas/bio-methane and hydrogen.

Box 9: EV in Norway

In Norway, electric cars outsold fossil fuel powered ones in Norway last month for the first time. This has been achieved by providing big incentives to boost electric car sales such as waiving hefty vehicle import duties and registration and sales taxes for buyers of electric cars. Owners also do not pay road tolls and use bus lanes in congested city centres. However, these perks will be phased out in 2021, the effect of which on electric car uptake is unknown.

10.35 As shown in Norway, large-scale incentives to purchase electric cars are controlled by the government and therefore in terms of the WMCA role in increasing the uptake of electric vehicles it is restricted to installing and operating sufficient infrastructure and provide benefits, where possible, for EV drivers.

Box 10: The ULEV Experience⁵⁰

The ULEV Experience is a programme dedicated to supporting businesses to understand, trial and implement ULEV, funded by Nottingham City Council's Go Ultra Low City project. The programme offers businesses:

- Fully funded fleet reviews;
- Low emission vehicle loans enabling companies to undertake a month trial of electric or plug in hybrid electric vehicles
- Business engagement and events such as the Electric Vehicle Question Time event which featured a number of panellists explaining the benefits they have received from running ultra-low emission vehicles on their fleets. Nottingham businesses and public sector organisations were invited to the event in order to hear the experiences of local companies that have adopted ULEV's as well as having the opportunities to network with each other and meet the ULEV Experience team.

Further business support is also available in the form of a Workplace Travel Service grant of up to £25,000 to support sustainable transport initiatives such as workplace charging infrastructure.

Travel Plans

10.36 Travel plans are essentially a package of measures designed to reduce single-occupancy car use and encourage sustainable travel. Travel plans can be for workplaces, schools or individuals.

⁵⁰ Nottingham City Council <https://www.transportnottingham.com/driving/ultra-low-emission-vehicles/> (accessed April 2019)

Box 11: Let's Get Moving

'Let's Get Moving' Public Health Coventry and Warwickshire have commissioned Groundwork West Midlands to work with a minimum of 1,000 staff within 30 companies to improve levels of physical activity. This service will deliver 'let's get moving' pathway and a package of personal travel planning to staff over this 1 year project.

'Making Every Contact Count' Public Health (Coventry) are redeveloping the MECC scheme to provide a greater focus on personal travel planning. MECC is a core training for all practitioners delivering NHS Health checked as well as for the wider workplace.

Box 12: City Mapper⁵¹

Citymapper is an app and website which gives users detailed information about journeys in specific cities including Birmingham, London and Manchester. Through the app you can find your origin and destination places as well as seeing the different journey options; the tickets can also be bought on the app. The app is unique as it offers multi-modal journey planning which includes public transport such as buses and undergrounds as well as private taxis including Uber. A new feature has also, been introduced which offers users the option to car share called 'Smart Ride' for part of the journey. The app can offer details on current delays which helps users better plan their journey and ultimately makes the user experience in new cities easier.

Box 13: WMCA interventions regarding travel choices

WMCA can pursue the following interventions:

Mobility as a Service

- Explore the feasibility of on-demand buses in discrete areas of the West Midlands, linked to developer funding where available or to support Park & Ride capacity constraints i.e. with a focus on Key Priority Areas
- Integrate the online aspect of the on-demand bus operation into the existing West Midlands Swift ticketing platform.
- Develop an app for taxis, specifically for vehicles EURO VI compliant or electric vehicles, which can be promoted on the Swift website. Any taxi can sign up to be included in the app; however, they must be EURO VI compliant or electric.
- Provide information and educate businesses to MaaS schemes which are available and highlight the financial and well as environmental benefits.

e-bikes

- Promote the use of e-Bikes particularly in city and town centres. Provide docking stations at transport hubs such as train stations and bus stations as well as within city centres to enable non-car journey's to be more joined up.
- Integrate the online aspect of ebikes onto the West Midlands Swift website for the public to register.

Park & Ride

- Measures are required to ensure that Park and Ride improves the sustainability of access to rail and rapid transit by ensuring it is available for those who lack feasible alternatives. The following behaviours should be addressed:
 - People who live close enough to park and ride sites to walk or cycle should be encouraged to do so rather than driving to sites.
 - People should be encouraged to use their nearest park and ride site to reduce vehicle miles travelled on roads.
 - Park and ride sites in the West Midlands are often full very early in the morning. This means they are unavailable to people who are not able to travel so early and have to travel later (during peak travel times). Increasing the availability of park and ride to those who are not able to travel so early could reduce highway

⁵¹ CityMapper https://citymapper.com/birmingham?set_region=uk-birmingham (accessed April 2019)

journeys that are currently made in the peak.

- TfWM is exploring how a combination of charging and booking could help address the behaviours above, noting that it has been successfully implemented elsewhere in the UK and around the world. More detail on this is available in the WMCA board report “Park and Ride, policies and principles – towards a strategy”⁵². Booking has already been trailed in the West Midlands at four park and rides; Longbridge, Rowley Regis, Sutton Coldfield and Tile Cross Park and it’s clear that trial users valued the ability to book. If implemented, TfWM could explore prioritising access to booked space by prioritising allocation of bookings to those who are unlikely to have sustainable alternatives.
- There are opportunities to encourage more sustainable car access to park and ride sites by encouraging and facilitating car sharing by implementing appropriate incentives, providing information to users and promoting applications that help people share car trips.
- Park and ride sites could encourage low emission vehicle take-up through the implementation of EV charging infrastructure. This needn’t only be for park and ride users; EV charging hubs could be made available to the surrounding community, in particular to support uptake of plug-in electric vehicles by those without off-street parking who lack charging infrastructure. The case for such infrastructure requires further exploration.
- There are opportunities to improve energy sustainability of park and ride sites. LED lighting has already started to be rolled out at TfWM sites and there are opportunities to implement wider sustainable technologies such as solar panels.
- There are also opportunities to provide other transport infrastructure and measures at park and ride sites (as well as wider rail and rapid transit stations and stops) to encourage wider sustainable access. This could include improvement to walking and cycling routes beyond the immediate station/stop as well as on-site infrastructure such as bike racks and e-bike docking stations. There are also opportunities to consider how Demand Responsive Services could improve access to rail and rapid transit for those who currently have to use their car.
- In terms of ensuring Park and Rides are accessible to all social classes, research needs to be conducted to ascertain why Park and Rides are more popular with particular social demographics. For example if the cost of Park & Rides is the reason then this can be linked to ticketing options; however, if its due to locations of Park and Rides, further growth of Park and Rides need to be sited appropriately.

Ticketing

WMCA, via the Swift ticketing platform, do provide a coherent West Midlands ticketing system for trams, trains and buses. However, the following interventions will ensure it is accessible to all:

- When using the ‘pay as you go’ card, ensure the cheapest ticket price is charged to the customer. Often, people who do flexible working miss out on discounts offered to weekly or monthly ticket holders, thus making journeys more expensive if people only work for example 3 days a week or school term time only. This can be achieved by capping the public transport fare.
- Low-income households make up a disproportionately low percentage of customers who use the Park & Rides in West Midlands. If the cost proves to be the reason for this, then a discount for low-income households in the West Midlands could be implemented.
- The Swift platform provides consistency in terms of travel across the West Midlands. However, for people who live on the boundary and use public transport that travel beyond the West Midlands, a different ticketing pricing system will be in place. WMCA have agreements in place with two bus operators who travel within and outside the West Midlands and for certain bus routes, where a ticket purchased on the Swift website can be used for the entire journey. WMCA should explore options to extend this to other bus operators.

⁵² WMCA Board, Park and ride policies and principles – towards a strategy.

Car Clubs

- As part of the Swift website, provide a platform to access information regarding car clubs. This could include a map indicating locations of car clubs, availability of cars etc. Through this portal, cars can be booked with standardised fees across all car clubs, with customers only requiring a single account.
- Set minimum standards for the vehicles fleets within car clubs, with all vehicles required to have zero emission capability. This can provide a gateway for the public to experience driving and charging electric cars.
- Ensuring car clubs are accessible to people who need them. Car clubs need to be located in areas where access to public transport is limited as well as at train stations and park and rides etc to ensure car clubs can provide access to public transport.

Electric Vehicles

- Ensure all new housing and office developments include electric sockets suitable for charging vehicles, for each property where off street parking is provided. The existing LETCP Planning Guidance provides consistent EV re-charging standards for new developments in the West Midlands as Type 1 mitigation. WMCA should ensure this is enforced;
- Increase the number of car parking spaces which have electric charging points, both within car parks and also on-street parking;
- Ensure the charging points are maintained and any issues are resolved in a timely manner;
- Similar to the 'save-a-space' scheme, provide an on-line app service where car parking spaces with charging points can be reserved. If people can guarantee that charging facilities will be available to them, then they are more likely to purchase/use electric vehicles
- Provide incentives for vehicle hire companies to purchase electric vehicles.
- Keep up to date with new, faster, more efficient charging technologies.
- Track the sales of electric and hybrid vehicles within the West Midlands to identify the rate of uptake within the region and the location of the buyers to identify trends and potential areas where electric vehicles uptake is limited and the reasons why;
- Research by What Car? Found that knowledge gap was to blame for slow electric vehicle sales. Despite electric cars being suitable for more motorists than ever before, a lack of understanding is stopping drivers from buying one. WMCA can improve people's knowledge of electric vehicles. The window to increase sales and use of EV is now, as EV charging costs will likely increase in the future with new metering technology and broad adoption.

Travel Plans

- Ensure all Councils within the West Midlands have workplace travel plans (most councils have set actions within their AQAP to prepare travel plans);
- Provide resources to support Councils to help enforce the adoption and use of Travel Plans;
- Develop bespoke tools to assist workplaces, schools and individual to develop Travel Plans to help users make the most efficient choices with regard to travel times, mode of travel etc;
- Ensure Travel Plans are aligned with the other interventions such as MaaS, promotion of car sharing
- Ensure any sites with existing conditioned Travel Plans are maintained. For example ensuring monitoring of travel choices from occupants of a new residential development is documented.
- Provide commercial/employer travel planning guidance and training.
- Councils such as Dudley MBC have measures for travel planning promotion in the wider community and identify schools as an area where Travel Plans should be more specifically promoted. WMCA should ensure all councils have Travel Plan targets.
- WMCA role will be firstly to promote the uptake of Travel Plan and secondly to ensure they are enforced.

Policy Links	Theme Links
DfT, Future of Mobility Urban Strategy WMCA, Movement for Growth: The West Midlands Strategic Transport Plan WMCA Movement for Growth: 2026 Delivery Plan for Transport WMCA Board, Park and ride policies and principles – towards a strategy. Black Country Ultra Low Emission Vehicle Strategy. LETCP Planning Guidance	Walking and Cycling Planning Electric vehicles infrastructure Businesses and Schools Park and Rides Travel Plans Taxi's Ticketing Electric Vehicles

Table 13: Appraisal Scoring – Travel Choices

Theme	Local Air Quality		Climate Change (GHG)	Implementation				Total
	Magnitude	Extent		Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	
Cycling and Walking	1	3	1	3	3	3	1	82
PT MaaS	2	3	2	2	3	3	2	432
Commercial MaaS	2	3	2	2	3	2	2	288
On-demand Buses	1	3	1	3	3	3	2	162
Ride Hailing	1	2	1	3	3	3	1	54
e-Bikes	1	2	1	3	2	3	2	72
Park and Ride	3	2	3	2	1	3	1	108
Ticketing	2	3	1	2	3	3	1	108
Car Clubs	1	1	1	1	3	2	2	12
Electric Vehicles	2	3	2	2	2	1	2	96
Travel Plans	2	3	2	1	2	3	2	144

11. Highway Planning & Coordination

- 11.1 Air quality as an issue that is gradually becoming more of a priority when investing in and improving the UK's major roads; however, there are further ways that this development can be brought forward so that air quality is considered as a key performance indicator of the road network.
- 11.2 The WMCA have the opportunity to influence how strategic and local roads within the West Midlands consider air quality as an issue and encourage a greater focus on this through policy and guidance. The existing congestion management plan⁵³ developed by Transport for West Midlands, sets out the key aims within the region regarding Highways;
- Increase capacity: through public transport improvements including developing Sprint (high frequency bus rapid transit service), bus and rail networks, Park & Ride as well as improvements on the Key Route Network (KRN);
 - Improve efficiency: through technological improvements, introduction of the Regional Transport Coordination Centre (RTCC) to help manage all transport modes and by making better use of the M6 TOLL; and
 - Manage demand: through changing travel behaviours, journey planning using personalised transport solutions and encourage employers to re-examine their policies.
- 11.3 Any interventions by the WMCA should support and compliment these aims; however, the WMCA are in a position to explore other options such as the introduction of wide-ranging aspirational policies to re-assign road-space for alternative travel and place making instead of increasing capacity for more vehicles.

Box 14: Example of Air Quality Prioritisation on the roads⁵⁴

Highways England manage, operate and maintain the Strategic Road Network (SRN) across the UK and have set out a need to deliver a cleaner network to improve the health of users and those living closely to the SRN. There is £75 million of investment for air quality interventions through an Air Quality Designated Fund (AQF) this is to allow for improvements in air quality as a result of reduced greenhouse gas emissions from the SRN. Highways England has an aim to accelerate the transition to a zero-emission fleet by helping to implement charging points for Ultra Low emission Vehicles (ULEV) every 20 miles across the network. Also, there are investigations taking place to implement a barrier which protects those living closest to the SRN from poor air quality this is in partnership with the Dutch Roads Authority.

- 11.4 The following themes have been identified as areas where the WMCA can implement interventions to increase capacity (KRN upgrades), reduce congestion (traveller information) and reduce reliance on private car use (changing traveller behaviour). Many of the Key Priority Areas include the major through and radial routes and therefore the following themes will apply.

Key Route Network (KRN) Upgrades

- 11.5 The West Midlands is at the heart of the UK's transport network so there is a focus on improving the Key Route Network (KRN). The KRN was identified to determine the key local routes for commuters and freight through the region and focus on making these areas robust and aid local connectivity.

⁵³ Transport for West Midlands, Congestion Management Plan <https://www.tfwm.org.uk/media/2917/congestion-management-plan.pdf>

⁵⁴ Highways England <https://s3.eu-west-2.amazonaws.com/assets.highwaysengland.co.uk/Designated+Funds/Air+Quality+Fund+Plan-v6-web.pdf> (accessed April 2019)

- 11.6 The West Midlands Key Route Network Evidence report⁵⁵ sets out the need for a region wide travel plan in order to help tackle issues faced by all of the local authorities within the WMCA. The report focus' on the wider highways impacts on air quality rather than just congested hotspot areas. As such potential WMCA interventions should effectively prevent capacity issues across the region by improving the KRN, rather than just focussing investment and improvement on specific hotspot areas as a short term solution.
- 11.7 Through investment in the KRN there can be a greater focus on the origin and destinations of those travelling within the West Midlands to allow for freer flowing travel for all of the journeys and not just through the particularly congested areas.
- 11.8 Clearly, solving hotspots is an unsustainable approach which is why the study into the KRN is vital in improving the road network. Through the KRN study there is now an ambition to deliver other improvements outside of the highways including walking and cycling improvements, which look at ways to move traffic away from the KRN and move the region closer to emission free travel.
- 11.9 The Transport for West Midlands (TfWM) Congestion Management Plan⁵⁶ also has a focus on creating a resilient KRN with the hopes to integrate short and long term time scales to prepare for events such as the Commonwealth games in 2022 but, also long term impacts of the implementation of such measures such as Sprint⁵⁷.

Redistribution Effects

- 11.10 Major infrastructure schemes may lead to unforeseen effects due to redistribution of journeys, whether this may be modal shift, diversionary, or changed destination. These effects may be temporary, long-term or permanent, and may occur before, during or after the event as travellers use the available information to make decisions.
- 11.11 In terms of local air quality and the relationship with this study, the redistribution and behavioural effects of a scheme beyond the immediate objectives of a scheme can have significant effects and should be recognised in the early conceptual stages of programmes to ensure they are integrated into the detailed design instead of requiring specific mitigation.
- 11.12 Therefore, it is essential to recognise the potential redistribution effects of schemes, and to consider the larger behavioural changes that may occur in conjunction with other measures; e.g. scrappage, road charging, etc.,.

Changing Travel Behaviour

- 11.13 Generally travel behaviour changes very little and very slowly; however, underneath this relative stability is a much greater level of change at the individual and household level. This is triggered by a number of 'push' factors that deter people from their previous choice of mode (overcrowding, congestion or fare increase) and 'pull' factors that encourage people to change mode such as changing your home, job or school; life changes such as having a baby; a change in health or mobility or the desire to make lifestyle changes such as getting fit.⁵⁸
- 11.14 As experienced during the London 2012 Olympics, a major event such as this, led to a considerable influx of visitors to the city, resulting in overcrowding and congestion, thus providing the push factors for travellers in London to change their mode of travel. In 2022, Birmingham will host the Commonwealth Games and there will experience similar 'push' factors and therefore providing an opportunity to change people's travel behaviour.
- 11.15 On a smaller scale, planned large scale roadworks will also result in congestion. Again, providing a 'push' factor to encourage people to change their travel behaviour

⁵⁵ Transport for West Midlands, West Midlands Key Route Network, Evidence Report 2018.

<https://www.tfwm.org.uk/media/2873/west-midlands-key-route-network-evidence-report-2018.pdf>

⁵⁶ <https://www.tfwm.org.uk/strategy/network-resilience/congestion-management-plan/>

⁵⁷ TfWM Congestion Management Plan, <https://www.tfwm.org.uk/media/2917/congestion-management-plan.pdf> accessed April 2019

⁵⁸ Transport for London, Olympic legacy personal travel report http://content.tfl.gov.uk/olympic-legacy-personal-travel-report.pdf?_sm_au=iVVWgR6mVVHJD0DR

11.16 WMCA's role should be to ensure alternative travel is available and accessible during these events to enable travellers to change their travel mode. Their role will also be to support these people to maintain their new travel mode after the event i.e. roadworks or Commonwealth Games. TfWM has commenced a regional travel demand management programme and is expanding its capability during large scale roadworks as well as in advance of the Commonwealth Games.

Commonwealth Games

11.17 In 2022 Birmingham will host the Commonwealth Games. As discussed, this will provide a trigger to change people's travel behaviour due to the associated congestion and overcrowding that is inevitable during such an event of this magnitude.

11.18 Similarities can be drawn from the 2012 London Olympic, which observed large changes in travel behaviour during the games. In 2013, Transport for London published the Olympic Legacy Monitoring: personal Travel Behaviour during the games report⁵⁹. Key findings were:

- Over three quarters of the London travelling population made a change to their travel patterns by either reducing, re-timing, re-routing or re-modifying their journey;
- 54 % of commuters changed their travel behaviour during the Games; far higher than any other group of traveller;
- There were no significant differences in the choice to change travel behaviour by age, household structure or household income;
- Commuters who changed their travel were more likely to work for large businesses;
- The most popular changes that commuters have made in response to the disruption are to travel using the same mode, but by a different route or to travel by a different mode. Other changes included travelling earlier or later to work than usual; and
- Clear relationship between how easy commuters thought it would be to make a change and how likely they were to have planned to make that change during the Games, with those who thought a change would be easy more likely to plan to do it.

11.19 Prior to the Olympics, Transport for London launched the Travel Demand Management programme. As part of this was the 'Get ahead of the Games' campaign to support travel during the Games. A website was launched, which included a variety of tools to assist travellers in planning their journeys during the Games and encourage people to consider changing their travel behaviour. The website included walking maps, interactive maps as well as the ability to subscribe to e-mails and text messages about specific issues on their journey, with journey route information gathered from their Oystercards. The Get ahead of the Games Twitter account was also launched.

11.20 The role of the employer was identified as being a significant influence on whether individuals made changes to their journey. As part of the Travel Demand Management Programme, the Travel Advice for Business (TAB) programme was launched. The TAB programme worked with businesses across London to provide information to help them continue to operate during the Games by providing workshops and site specific advice to develop a travel plan.

11.21 After the Olympics, 11% of London travellers who changed their behaviour, sustained it. The main reason for travellers returning to their 'normal' travel behaviour was that the alternative option had been more inconvenient in some way, such as slower, more expensive.⁶⁰ WMCA can learn from this and ensure a higher number of travellers sustain their new mode of travel after the Commonwealth Games.

Roadworks

11.22 WMCA have major roadworks across the KRN planned which will undoubtedly cause disruption, which is the optimum moment to influence travel behaviours of those regularly commuting on these routes. Through these disruptions there is the potential for commuters and

⁵⁹ Transport for London, Olympic Legacy Monitoring: personal Travel Behaviour during the Games.

http://content.tfl.gov.uk/olympic-legacy-personal-travel-report.pdf?sm_auiVVWqR6mVHJD0DR (accessed April 2019)

⁶⁰ Transport for London, Olympic Legacy Monitoring: personal Travel Behaviour during the Games.

http://content.tfl.gov.uk/olympic-legacy-personal-travel-report.pdf?sm_auiVVWqR6mVHJD0DR (accessed April 2019)

employers to adopt a different view on travel whether that be working from home once a week or simply travelling to work slightly later to avoid the AM peak congestion.

11.23 There is an opportunity for the WMCA, if planned appropriately, to profit from these major road updates by implementing technology which allows commuters and other users to determine the best route and mode of travel to work. It is likely that through this temporary inconvenience some travellers may remain with the new method of travel as it may be just as convenient as the car or better. The Highways investment plan is aimed at increasing capacity on the KRN through projects such as:

- Keeping Coventry Moving highway signalling scheme;
- A34 Stratford Road Growth Corridor signalling scheme;
- Solihull Bridge five year programme (2017/18);
- A4124 traffic signal upgrades and bus priority;
- Brierley Hill Strategic Centre highways improvements;
- A34 Birmingham Road/A4041 Queslett Road/Newton Road;
- A461 Eastern Opportunity Area;
- Bromford gyratory improvements; and
- Holloway Circus improvements.

11.24 There is an opportunity to use these needed improvements to provide further in-direct benefits to the network by decreasing the demand for it. There is an opportunity to see a modal shift for those affected by the KRN improvements if other methods of transport are invested in appropriately.

11.25 The WMCA also has an opportunity to prioritise local air quality as a KPI over journey time, and so introduce wide-ranging aspirational policies to re-assign road-space for alternative travel, green infrastructure (GI) and place making instead of increasing capacity for more vehicles. In this way, it may be possible to apply long-term planning and cross-discipline engagement to free-up capacity using new technologies, targeted infrastructure improvements, and provision of alternative transport options, but then re-assign this road-space for GI and segregated green travel instead of supporting future car growth.

Traveller Information

11.26 Transport for West Midlands have plans for the Regional Transport Coordination Centre (RTCC) which would act as a central base within the West Midlands with knowledge of all transport modes acting as a common view of the transport network. The RTCC will have the capability to provide clear guidance to travellers during the KRN disruption or general transport disruptions to allow drivers and commuters to divert or plan ahead appropriately⁶¹.

11.27 Therefore, there is opportunity for the WMCA to invest in the RTCC to make sure that it provides a consistent communication of transport information. Through utilising the RTCC it is likely that congestion due to disruption on the KRN can be minimised which will also improve the air quality within the region.

⁶¹ TfWM Congestion Management Plan, <https://www.tfwm.org.uk/media/2917/congestion-management-plan.pdf> accessed April 2019

Box 15: WMCA interventions regarding highway planning and coordination

WMCA can pursue the following interventions:

KRN Upgrades

- Ensure air quality is considered at the conceptual stage of programmes to determine the potential effects associated with the redistribution of traffic and air quality
- Support businesses in developing travel plans during roadworks on KRN with options such as working from home or working slightly later to avoid peak periods.

Changing Travel Behaviour

- Use planned large scale roadworks and the 2022 Commonwealth Games as opportunities to change people's travel behaviour. Although it is acknowledged that TfWM are already implementing this.
- Prior to the 2022 Commonwealth Games launch a website to assist people travelling in Birmingham, plan their journeys and encourage alternative modes of transport.
- Work with employers to discuss specific travel plans for use during these events to change people's travel behaviour such as encouraging home working, travelling earlier or later to work.

Traveller Information

- Invest in RTCC so disruption on the KRN can be minimised which will also improve the air quality within the region.
- The WMCA should also look at introducing wide-ranging aspirational policies to re-assign road-space for alternative travel and place making instead of increasing capacity for more vehicles.

Policy Links	Theme Links
Congestion Management Plan West Midlands Key Route Network Evidence report	Travel Plan Planning Guidance Public transport Traveller information

Table 14: Appraisal Scoring – Highway Planning and Coordination

Theme	Local Air Quality		Climate Change (GHG)	Implementation				Total
	Magnitude	Extent		Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	
KRN Upgrades	3	3	3	2	1	2	3	324
Changing Travel Behaviour	3	3	3	2	1	3	2	324
Traveller Information	2	2	1	2	2	3	1	48

12. Freight

- 12.1 Freight traffic moving through the region is a major issue faced by the WMCA, therefore, adopting policies regarding through freight traffic in order to minimise adverse impacts should be a priority. The structure of the supply chain of freight should be examined and managed in order to effectively improve air quality, especially in the urban areas of the region.

Freight Emissions

- 12.2 The effects on emissions and associated damage costs (see Section 5) that may be achieved by operating vehicles with different emissions standards are presented in Table 15, based on a single HGV operating at 60 km/hr for a nominal 250,000 miles per year. As discussed earlier, these values should be used cautiously, as they are indicative of total societal costs rather than absolute amounts. These data indicate a significant reduction in emissions, and when these data are compared to bus (see Table 11) and taxi (see Table 18) emissions it is clear that HGVs can be disproportionately significant in terms of local air quality and emissions management.

Table 15: HGV Emission Standards Damage Costs

Euro Class	Emissions, kg/ 250,000 miles		Annual Cost at		
	NO _x	PM _{2.5} *	Low Value	Central Value	High Value
Euro III	2300	81	£10,255	£67,398	£232,059
Euro IV	1643	43	£6,247	£42,999	£149,923
Euro V EGR	1258	43	£5,840	£37,964	£130,308
Euro V SCR	889	45	£5,558	£33,662	£113,137
Euro VI	73	31	£3,321	£16,436	£51,396

M6 Toll

- 12.3 The M6 Toll is recognised as a major freight route through the West Midlands, although many policy documents highlight the need to better utilise this in order to tackle congestion pressures faced on the M6. For example, it is considered an alternative time-saving motorway described as being the most “reliable and smart route through the Midlands”⁶². Therefore, it is an opportunity for businesses to benefit from this reliability especially for longer distance journeys through the West Midlands.
- 12.4 A key limitation to a higher uptake of users on the M6 Toll is the mainline pricing structure with a van being charged at £11.30 and a Class 5 HGV at £11.50. There have been some changes introduced by Midlands Expressway Ltd including a commercially aimed TAG deal which offers discounts when payments are pre-paid which also allows the use of a fast lane at the payment booths. Furthermore, there are currently trials including the return pass and Hopper pass; these trials are only aimed at car users rather than freight, but may be of benefit to smaller businesses that regularly use the M6 Toll.
- 12.5 The performance of the surrounding strategic road network has a large influence on the amount of use that the M6 Toll receives. It is important to consider how freight traffic not stopping in the Midlands can be encouraged to avoid the M6 and instead pay to use the Toll. Table 16 shows annual average daily flow (AADF) data that has been extracted from the DfT’s Road Traffic Statistics⁶³ to determine the number of HGV’s regularly using the M6.
- 12.6 The M6 Toll could potentially accommodate a proportion of the 17% of HGV traffic currently using the M6, which would dramatically increase the performance of the M6 and reduce emissions associated with HGV and Freight in this area.

⁶² <https://www.m6toll.co.uk/about-us/>

⁶³ <https://www.gov.uk/government/collections/road-traffic-statistics>

Table 16: Annual Average Daily HGV Flow M6 J5-J8

Year	AADF HGV	AADF All Vehicles	Percentage of HGV's (%)
2017	23,634	140,702	16.8
2016	23,136	127,973	18.0
2015	22,468	125,460	17.9
2014	22,740	131,491	17.3
2013	17,686	119,243	14.8
2012	17,230	129,577	13.3
2011	17,634	126,815	13.9
2010	17,274	126,294	13.7
2009	17,346	118,522	14.6
2008	18,363	115,295	15.9

12.7 The M6 Toll offers the region additional road capacity during peak periods and by encouraging through freight traffic to use it, congestion may be alleviated elsewhere. The WMCA should embrace the opportunity to better advertise and work with freight companies to utilise the toll road.

Box 16: Example of Toll Usage ^{64 65}

The Melbourne City Link is a part of a network of toll roads across Australia and is very successful at attracting users. Continued developments in road technology has helped to keep the road up to date including the introduction of electronic license plate reading and image processing tools to give accurate information. This allows for a free-flowing journey without having to stop at a toll booth. When using the road there are multiple options on how you can pay including online by setting up an account, a one off trip by purchasing a pass online, pay after you use the toll or using cash at several newsagents nearby. These factors are likely to play a part in the success, making travelling by toll more convenient for its users.

Urban Logistics Management

12.8 CBRE Analysts cite the traditional nature of logistics along motorways and on urban boundaries as not being enough to support the ever changing nature of inner city delivery demand and so called last mile delivery. It sees an ever growing need for logistics facilities and hubs to be located closer to city centres. CBRE see “increasing growth of demand for logistics hubs or consolidation centres to service big cities”. They cite the recent New London Plan that offers “overall support to increase or retain industrial floor space capacity, should enable a better accommodation of logistics and industrial activity within London, where competition for floor space usage has been fierce and will continue to be in the future”.

12.9 CBRE see the “intensification of land uses will be key and, to make the most of all logistics spaces inside cities, innovative multi-storey warehouses will become usual within British urban landscapes, just as they already are in some congested Asian cities such as Tokyo, Shanghai, Hong Kong or Singapore. European developers have recently started importing those building structures, with the example in the UK being a new three-storey warehouse near London City Airport. Other options we will see in the future to accommodate industrial space inside UK cities are underground warehouses or mixed use buildings”

12.10 The issues facing urban freight discussed previously are certainly relevant to the West Midlands and as with London, it should be seen as a priority to consider increases/intensifications in inner city logistics centres and retention of existing sites in order to accommodate the changing demands associated with inner city delivery (i.e. rise in internet shopping) and to support the implementation of sustainable last mile delivery. If such moves

⁶⁴ https://www.kapsch.net/ktc/downloads/reference/success_stories/Kapsch-KTC-SS-AU_Toll_Road_Network.pdf?lang=bq-BG

⁶⁵ <https://www.linkt.com.au/pay-for-tolls>

were to be adopted by the WMCA it is likely that there would positive impacts on air quality and congestion and that a number of wider policy objectives could be achieved (i.e. employment, health, growth).

Freight Technology

Freight Optimisation

12.11 Route optimisation tools such as those trialled by ILOS in Vienna, Austria look at key indicators and traffic patterns from real time traffic data and so called “floating car data” as well as the development of appropriate quantification methods to achieve a possible saving potential in terms of time or distance. This in turn leads to savings in fuel, emissions and operating costs. The main economic and environmental benefits are then calculated and obtained using the ILOS method and selected indicators. The following potential benefits were evaluated for urban freight transport by using real time traffic data: Time: up to 60% reduction; Distance: up to 15% reduction; Fuel & Emissions: up to 20% reduction; Costs: up to 30% reduction.

Box 17: Example of Vehicle Technologies ^{66 67}

Nissan is at the forefront of vehicle technology recently trialling brain-to-vehicle technology. Such technology could change the way future electric vehicles are constructed, this technology predicts intended movements of the driver and detects the driving style to use driver assistant technology. Nissan also were the innovators behind the E-pedal which is now available in the Nissan Leaf electric car. The E-pedal is used for both acceleration and deceleration, being the first of its kind. This new technology could potentially attract drivers to choosing electric vehicles over a regular diesel/petrol vehicles purely based on the technological advantages.

12.12 Further, the use of floating car data for real time navigation enhances the routing solution⁶⁸:

- The selection of optimal routes and the avoidance of stop & start driving conditions reduces emissions and saves costs
- The route optimisation for planning urban transport reduces journeys time.
- This is achieved by calculating both faster and shorter journeys. Intelligent real time journey planning depends on time- and route-specific data and on the quality of the available floating car data information source.

Box 18: Example of Large Delivery Company Strategy ⁶⁹

The Royal Mail have an environmental strategy to adopt existing and new technologies in order to reduce emissions as well as promoting environmental behavioural change. Since 2004 they have reduced carbon emissions by 29% by gradually adopting electric delivery vans within the fleet.

Benefits of the policy are clear, in 2017-18 the Royal Mail used 500,000 litres less of diesel which amounts to 1,300 tonnes of CO₂ less being emitted into the atmosphere. The Royal Mail are working with Arrival to develop modular 6 tonne trucks being the first delivery fleet operator to invest and take delivery in these.

More recently there have been electric trike trials in urban areas to assist with urban mobility, the trikes are electric but also are supplemented by solar panels which were specifically built for the Royal Mails use.

⁶⁶ <https://www.nissan.co.uk/experience-nissan/intelligent-mobility.html>

⁶⁷ <https://www.nissan-global.com/EN/TECHNOLOGY/OVERVIEW/b2v.html>

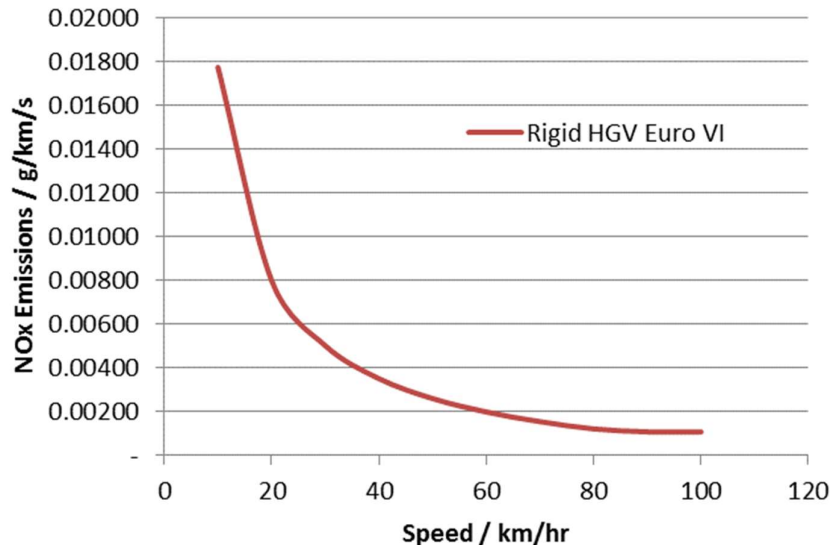
⁶⁸ http://www.bestfact.net/wp-content/uploads/2016/01/CL1_029_QuickInfo_ILOS-16Dec2015.pdf

⁶⁹ <https://www.royalmailgroup.com/en/insights-innovation/innovation/electric-vehicles-turning-an-iconic-red-fleet-green/>

Platooning

- 12.13 Platooning is a concept gaining more traction with large truck companies such as Scania and Volvo testing this method worldwide. It involves convoys of semi-autonomous or autonomous vehicles communicating through Wi-Fi to drive closer together in a “platoon” configuration. Benefits of truck platooning include lower fuel consumption due to the reduction of air-drag friction for trailing vehicles. Platooning can reduce CO₂ emissions emitted from the vehicles by 8% for the leading vehicle and 16% for those following.
- 12.14 Truck manufacturers continue to develop platooning technology including communication standards for multi-brand truck platooning through large scale demonstrations; to better understand the limitations of platooning. It is deemed that platooning is a safer method of transporting through freight traffic especially over long distances as braking is automatic and dependent on the lead trucks actions. The smaller distance between the platooning trucks allows for better highways utilisation which would help to alleviate congestion on strategic roads in the West Midlands⁷⁰.
- 12.15 Working alongside the M6 Toll, there could be opportunity to merge truck platooning with better utilisation of the Toll road to make better use of this infrastructure and technology to better accommodate freight through traffic in the region.
- 12.16 Fuel efficiency increases reduce fuel consumption which in turn reduces the amount of emissions generated by platooning vehicles. This new technology, with more investigation and trials, is seen a developing method to improve air quality while continuing to deliver freight effectively by road across the UK. The profile in Figure 21 indicates how emissions from heavy engines are reduced with increased speed up to a plateau in real-world conditions, and so reduced stop-start movement can have a significant effect in reducing short-term peak emission events.

Figure 21: Example of HGV Euro VI Speed vs Emissions Profile



- 12.17 Truck platooning has been investigated by the DfT who carried out a feasibility study in 2014 to better understand the benefits and limitations of platooning in the UK. Following on from the study the DfT gave the first operational vehicle platoon trial the go ahead in 2017 which shows a national interest in platooning⁷¹. This interest should be pursued in the West Midlands in order to benefit from the newest technologies being trialled across the world.

⁷⁰ Platooning summary document, European Automobile Manufacturers Association (2017)
https://www.acea.be/uploads/publications/Platooning_roadmap.pdf

⁷¹ Platooning Feasibility Study, DfT (August 2017) <https://www.gov.uk/government/publications/truck-platooning-uk-road-trial-feasibility-study>

Box 19: Example of Platooning ⁷²

Scania working alongside partners have launched extensive platooning trials along a 520 kilometre route between Södertälje and Helsingborg in Sweden. From this testing it is hoped further benefits and the scale of these benefits can be better understood. By travelling in convoy the trailing vehicles have reduced fuel consumption by up to 12% allowing for greater distance journeys. With additional testing it is suggested as the vehicles become more technically advanced autonomous vehicles will provide more benefits with better reactions between the platoon. Scania have also formed a partnership with Ericsson who will contribute their knowledge of 5G technology to enable new forms of mobility within the concept of platooning.

Electric Freight

- 12.18 Electric vehicle usage is at an all-time high in the UK with approximately 195,000 plug-in cars registered and 8,500 plug-in vans. There are approximately 19,375 public charge points which equates to 10 electric vehicles to every public charging point.
- 12.19 Freight companies are gradually implementing electric vehicles into their fleets to better adapt to growing air quality concerns in urban areas⁷³, and so the WMCA has a role to anticipate how this will affect the regional commercial fleet and to enable and support the adoption of zero-exhaust emission technology particularly in key priority areas.
- 12.20 Electric vehicles are likely to be important in reducing road emissions in the future especially from the highest polluting freight vehicles however; there are implications for a quick uptake if the required supporting charging infrastructure is not available.
- 12.21 Freight Electric vehicles in Urban Europe (FREVIEW) sets out guidance for local authorities as well as carrying out surveys. It is stated if 10% of the London freight fleet was electric there would be 207,000 tonnes of greenhouse gas savings which in turn could save over 1 billion dollars in public spending due to the improved air quality available in the city centre ⁷⁴.
- 12.22 A limitation in the near future to electric vehicles is the lack of larger trucks available over 3.5tonnes; this technology is gradually being developed⁷⁵. However, using smaller electric vans rather than a lorry will add additional pressures to roads. The WMCA would need to manage this vehicle delivery to prevent unnecessary congestion due to an increased number of electric vehicles.
- 12.23 Volvo has a focus on developing new electric vehicle technology with some of its newest electric refuse collection vehicles set to be rolled out in 2019. The 16 tonne FL Electric has a range of 185 miles on full charge and takes approximately 1-2 hours when fast-charged or up to 10 hours when connected to the mains grid⁷⁶.
- 12.24 Although companies like Volvo are providing increasingly more developed vehicles, FREVIEW highlights the limit of range for most of the electric vehicles available at the moment; there is a desire by freight companies for further mileage range outside of the urban environment. Therefore, intervention may be needed to prevent this limitation from effecting larger freight companies who are travelling long distances daily. However, this will require charging infrastructure to cope with new demands. There is a large opportunity to adopt such technology on the large scale as long as appropriate charging infrastructure is introduced consecutively.
- 12.25 There is opportunity to support the introduction of the newest technologies across freight companies by providing the appropriate infrastructure capable of supplying the required electricity. The WMCA should look to invest in this infrastructure across the region in order to

⁷² <https://www.scania.com/group/en/scania-takes-lead-with-full-scale-autonomous-truck-platoon>

⁷³ Next Green Car, February 2019, <https://www.nextgreencar.com/electric-cars/statistics/> accessed March 2019

⁷⁴ FREVIEW, https://freview.eu/wp-content/uploads/2017/09/FREVIEW-Results-and-Recommendations-for-Local-Authorities-v_09.pdf (accessed March 2019)

⁷⁵ <https://motortransport.co.uk/blog/2018/10/04/volvo-fe-electric-truck-to-make-uk-debut-at-freight-in-the-city-expo/> and <https://www.commercialmotor.com/news/product/volvo-launches-all-electric-fl-range-urban-operations> and <https://www.commercialmotor.com/news/product/volvo-launches-all-electric-fl-range-urban-operations>

⁷⁶ Commercial Motor, Hayley Pink, 17th April 2018 <https://www.commercialmotor.com/news/product/volvo-launches-all-electric-fl-range-urban-operations> (accessed March 2019)

better support electric vehicle fleets. Existing e-vehicle manufacturers already working in the West Midlands should be presented with the opportunity to contribute to and innovate within the electric freight vehicle sector in the region.

Box 20: Example of Implications of Electric Vehicles ^{77 78}

Within Germany and in particular Berlin there has been a large uptake in electric vehicles however, there is not enough infrastructure to support this increase.

There is a need for fast electric charging points with estimations that 100,000 additional charging points are needed. Berlin, Hamburg and Munich have set aside 14 million euros to fund the needed infrastructure as well as the need for corresponding grid connection and expansion.

The lack of charging infrastructure delayed the adoption of electric vehicles in Germany. In order to allow for further adoption Berlin began implementing newer technology using real time data to address the shortage of public charging facilities.

Freight Consolidation

- 12.26 Freight consolidation is a way in which small shipments or deliveries are combined at consolidation centres situated in central locations to then continue the onward journey in bulk. Integrating the deliveries minimises unnecessary movements, removing excessive HGV journeys and therefore, alleviating additional congestion.
- 12.27 Consolidation centres help to integrate large and small scale deliveries as well as allowing for integration of different travel modes. There is opportunity to reduce HGV journeys by using other methods of travel as well as better organising freight deliveries.
- 12.28 Several consolidation centres already exist across the UK, however these can be multiplied to cover more areas. The benefits of implementing consolidation centres for both shipping companies and retailers mean the uptake of using these facilities would like be high with distribution costs potentially being cut by 20%.
- 12.29 There is opportunity to improve air quality through freight consolidation as the reduced HGV journeys result in a reduction in the amount of greenhouse gases emitted on the UK's roads. There is a need to reduce the amount of empty miles currently being covered by freight trucks as often this last mile is the most expensive.
- 12.30 Expansion of freight consolidation centres are needed to bring the centres closer to consumer which then cuts the transportation miles. Truck space should be utilised to further reduce the amount of vehicles using the roads unnecessarily and negatively affecting the air quality.

Box 21: Example of Freight Consolidation ⁷⁹

Freight Consolidation at Bristol and Bath is in partnership with DHL. Parcels and deliveries from suppliers are dropped off at the Avonmouth consolidation centre which allows the parcels to be organised and sent out more efficiently. DHL uses electric vehicles to deliver in bulk to businesses and those living in Bath/Bristol are meaning the last mile of the delivery is green and does not affect air quality. The consolidation centre helps to more efficiently deliver parcels by grouping those for the same or nearby addresses reducing the amount of miles that the delivery vehicles need to cover. Regulations in Bath prevent vehicles entering the city centre between 10am and 6pm however, the freight consolidation is considered to help reduce vehicle numbers meaning this service is exempt from those restrictions.

⁷⁷ http://nationale-plattform-elektromobilitaet.de/fileadmin/user_upload/Redaktion/AG3_Statusbericht_LIS_2015_engl_klein_bf.pdf

⁷⁸ • <https://www.reuters.com/article/us-germany-autos/germany-to-reach-target-of-1-million-electric-cars-later-than-planned-idUSKCN1LZ29E>

⁷⁹ <https://travelwest.info/freight-consolidation>

Last Mile Delivery

- 12.31 Last mile delivery is an approach to freight deliveries which allows for a percentage of the journeys to be made in a sustainable manner to help reduce congestion and air pollution in urban areas. Often last mile logistics is aided by freight consolidation hubs allowing for a faster delivery service and efficient transport modal changes.
- 12.32 The last mile is often the least efficient section of the journey making up 28% of a products total transportation cost therefore, there are large benefits from implementing guidance and policy regarding last mile logistics⁸⁰.
- 12.33 The adoption of electric vehicles to complete the last mile of the journey is shown to have a major impact on pollution in urban areas as shown in London. From the implementation of clean air zones in low air quality cities the same improvements can be introduced across the UK especially in the AQMA's across the west Midlands.
- 12.34 Electric vehicles are proven to maintain freight delivery efficiency whilst also, accruing zero emission miles. Other trials by major delivery companies have been undertaken including delivery drones tested by Amazon as well as autonomous vehicles to follow the most efficient delivery routes. Amazon have also, focussed on appealing to local van drivers and helping to set up smaller businesses by trying to cut down on the long distance freight chain⁸¹
- 12.35 Large delivery and freight manufacturers around the world are investing into making the last mile more profitable, efficient and sustainable. So, the implementation of certain delivery standards within cities should be achievable as a method of effectively improving air quality within the worst affected areas.
- 12.36 Electric vehicles are a main component in order to make freight deliveries in the West Midlands region more sustainable. However, the use of electric vehicles can be focussed on smaller more specific interventions such as last mile deliveries and equally have a large impact on air quality.
- 12.37 The role of cargo bikes and cycle delivery also needs supporting in the West Midlands approach to urban freight deliveries.

Box 22: Example of Last Mile Delivery ⁸²

Gnewt Cargo (Green New Transport) is a delivery company operating in London with the UK's largest fleet of electric vehicles who deliver zero-emission final mile logistics. Gwent partnered with ASOS to offer green delivery throughout the Capital, with parcels either delivered by electric vans or on-foot porters. The porters operate in the challenging busier road routes to help tackle congestion issues, with this method often being more efficient in deliveries. Gwent has zero carbon emission last miles which has helped reduce the CO₂ emissions by 67% for every parcel that they deliver. The key principle is that parcels are dispatched to a distribution centre in London which are consolidated and despatched into the green transport methods such as electric vans to then be delivered. Through working with ASOS across a six month period Gwent delivered 361,032 ASOS parcels emission free driving 130,000 miles greenly. Therefore, saving 78.6 tonnes of carbon from being released into London.

Land allocations, spatial planning and fuelling strategies

- 12.38 Logistics accounts for 9% of UK Gross Value Added (GVA) so there is a large selection of freight companies potentially looking to implement rail freight into their transport operations or freight consolidation centres to encourage sustainable last mile delivery. Therefore, there are opportunities for WMCA to allocate strategic land to accommodate such facilities.

⁸⁰The evolution of last mile delivery, January 2018 <http://www.hitachi.eu/en-gb/social-innovation-stories/transport/evolution-last-mile-delivery> accessed March 2019

⁸¹What Amazon's last-mile delivery ambitions mean for carriers, Caroline Jenson, January 2019

⁸² • <https://www.gnewtcargo.co.uk/>

12.39 The WMCA need support the effective use of land to promote freight consolidation and distribution centres across the region.

Rail Freight Interchange

12.40 A Strategic Rail Freight Interchange (SRFI) accommodates freight from trains rather than transferring it to road. They are set up to handle large amounts of freight and enable the transfer of this freight between transport modes⁸³. The primary benefit of an SRFI is to allow rail to be the long-haul primary journey with road then used as the secondary local leg of the delivery. This limits road usage which in turn reduces delivery costs to users.

12.41 The West Midlands interchange based south of M6 J12 is set to generate around 8,000 jobs with a variety of skill standards to boost the local and surrounding economy. This SRFI will be linked directly to the West Coast Main Line to allow the regions logistics industry to grow. WMCA should continue to invest in similar schemes as large air quality benefits can be reaped. Transporting goods by rail produces 70% less carbon dioxide and nearly 90% less particulate emissions due to the removal of excessive HGV trips⁸⁴.

12.42 Prioritisation of rail is shown in neighbouring regions in the form of the East Midlands Gateway which incorporates within it a 50 acre SRFI capable of handling 16 trains a day. The intermodal freight terminal will be connected by a new rail line connecting to the Castle Donnington freight line. There is also, new road infrastructure planned to accommodate the growth with the site contributing around 7000 jobs to the local area. The additional planning of surrounding infrastructure shows the idea to develop the opportunity and allow the gateway to deliver what is planned without negatively affecting surrounding areas⁸⁵.

12.43 Rail freight has expanded by 60% over the last decade and the Government continues to encourage policy aimed at reducing road congestion in favour of transport methods that are less polluting⁸⁶. However, with the growth of the rail priority issues need to be addressed by local authorities to unlock the future potential:

- Infrastructure Capacity – address the need for new rail lines for the growing number of freight trains on the network, public and private investment is likely to be needed to best improve the rail network.
- Cost barriers – SRFI's are very costly for freight companies therefore, anyway that the WMCA could support the expansion of more should be investigated to best unlock the potential growth. Such as securing or reserving land for development or introducing additional guidance or policy regarding freight movements with the region.
- Skills and innovation – develop new technologies to make rail more attractive to outside investors as well as developing skills of those in the local area to allow freight companies the opportunity and the appropriate resources to successfully open an SRFI.⁸⁷

12.44 In addition to SRFI's there is a need for the rail industry to consider the potential for better use of rail to bring in construction materials for development in town and city centres.

⁸³ [https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050002/TR050002-000836-Appendix%208%20-%201.%20Consultation%20Boards%20January%20and%20February%2014%20\(Part%201\).pdf](https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050002/TR050002-000836-Appendix%208%20-%201.%20Consultation%20Boards%20January%20and%20February%2014%20(Part%201).pdf)

⁸⁴ West Midlands Interchange, <http://www.westmidlandsinterchange.co.uk/> accessed March 2019

⁸⁵ East Midlands Gateway, [https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050002/TR050002-000836-Appendix%208%20-%201.%20Consultation%20Boards%20January%20and%20February%2014%20\(Part%201\).pdf](https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050002/TR050002-000836-Appendix%208%20-%201.%20Consultation%20Boards%20January%20and%20February%2014%20(Part%201).pdf) accessed March 2019

⁸⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/552492/rail-freight-strategy.pdf

⁸⁷ Rail Freight Strategy, September 2016

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/552492/rail-freight-strategy.pdf accessed March 2019

Box 23: Example of Rail Freight Interchange ^{88 89}

Near to Birmingham city centre there are several operating rail freight interchanges including Freightliner Birmingham which is a 32 acre site just over 1 mile from the city centre. They operate at 12 inland rail sites moving around 770,000 containers each year with over 100 daily services.

ABP Hams Hall Rail Freight Terminal is a 27 acre intermodal rail and road interchange facility which handles over 100,000 sea freight containers a year and is located approximately 8 miles from Birmingham city centre. In 2011 containers transiting ABP's Hams Hall terminal removed the need for over 15,700,000 lorry miles on the UK's roads.

Both sites operate successfully helping to reduce greenhouse gas emissions to then improve air quality.

Box 24: WMCA interventions regarding freight

The WMCA may pursue the following interventions.

M6 Toll

- Manage continued dialogue with Midlands Freeway to evaluate the costs and charging infrastructure for the M6 Toll to specifically increase use by freight to relieve pressure on the M6.

Urban Logistics Management

- Prioritise the adoption of inner city logistics centres, and retention of existing sites, in order to accommodate the changing demands associated with inner city delivery (i.e. rise in internet shopping) and to support the implementation of sustainable last mile delivery.

Freight Technology

- Increase the infrastructure and policy support for the use of Route Optimisation Tools using key indicators and traffic patterns from real time traffic data to reduce the number and length of journeys.
- Work with partners, such as the M6 Toll, to investigate opportunities to implement truck platooning, and use better utilisation of existing and proposed infrastructure and technology to better accommodate freight through traffic in the region.
- Anticipate the growth of freight companies implementing electric vehicles into their fleet and ensure appropriate infrastructure is in place to support this especially in key priority areas.
- Embrace the new electric technology as best as possible and influence urban planning to accommodate electric vehicles otherwise their uptake will not be as successful.
- Continue to work with partners to integrate alternative fuelling infrastructure into the freight and logistics sectors.

Freight Consolidation

- Expansion of freight consolidation centres are needed to bring the centres closer to consumer which then cuts the transportation miles.
- The implementation of delivery standards within cities e.g. only allowing zero emission delivery vehicles to operate between certain times.
- It is acknowledged that freight consolidation is very difficult to implement with businesses/operators reluctant. However, some micro-consolidation could be encouraged through planning policies.

⁸⁸ • <https://www.freightliner.co.uk/rail-intermodal/> (accessed March 2019)

⁸⁹ • <http://www.hamshallrailterminal.co.uk/SD/> (accessed March 2019)

Land allocations, spatial planning and fuelling strategies

- Support the effective use of land to promote freight consolidation and distribution centres across the region.

Rail Freight Interchange

- Integration of rail freight should be prioritised to support central government and commercial aspirations.

Policy Links	Theme Links
Rail Freight Strategy	Planning Coordination Infrastructure Electric vehicles

Table 17: Appraisal Scoring – Freight Coordination

Theme	Local Air Quality		Climate Change (GHG)		Implementation			Total
	Magnitude	Extent	Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	Economy	
M6 Toll	2	2	3	3	1	1	3	108
Urban Freight Coordination	3	2	3	2	1	1	3	108
Freight Technology	2	2	2	3	3	1	3	216
Electric Freight	3	2	2	1	1	1	3	36
Freight Consolidation	3	2	3	1	1	1	3	54
Land allocations, spatial planning and fuelling strategies	3	2	3	2	1	1	3	108
Rail Interchange	2	1	3	3	2	1	3	108

13. Planning Guidance

- 13.1 Planning and development is a core consideration for managing local air quality and emissions now and in the future. The WMCA has a specific role to support and coordinate a regional approach, whereby local air quality and emissions are embedded as a Key Performance Indicator (KPI) as measurable outcomes in all local and strategic planning decisions.

Box 25: Europe's Urban Air Quality: Re-assessing Implementation Challenges in Cities⁹⁰

The European Environment Agency reviewed examples of best practice for local air quality management in ten cities across Europe. The study specifically appraised how tools and methods were used to manage emissions and quantify the resultant effect. The most significant outcome of the study was:

The main challenges found by the cities in recent years during their implementation of air quality improvement measures include how to effectively communicate air quality issues to the public, and how to achieve coherent governance across various administrative levels, in particular in terms of analysing the co-benefits of measures implemented in the areas of climate change, noise, urban planning, and air quality.

The study, therefore, concluded that good communicating and engagement were essential across administrations to ensure consistent goals and priorities.

Planning Coordination

- 13.2 Inconsistency between local authorities may contribute to perceived development bias, where specific types of growth may be encouraged or dissuaded in adjacent local authorities, although the potential effects on emissions may be cross-boundary.
- 13.3 Therefore, a consistent planning and development guidance should be adopted by all local authorities based on recognised best-practice, such as the Institute for Air Quality Management Land-Use Planning & Development Control: Planning for Air Quality⁹¹. This document outlines appropriate assessment thresholds to ensure:
- All proposed schemes are properly screened for potential local air quality effects;
 - The potential effect appraised using a consistent and traceable methodology; and,
 - Resultant effects are used to inform the mitigation strategy.
- 13.4 This guidance is consistent with DEFRA Air Quality Management Technical Guidance LAQM.TG(16)⁹², and complements guidance published by Highways England; DMRB, Volume 11, Section 3, Part 1 'Air Quality'⁹³ and IAN 174/13: Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality⁹⁴. An introductory guide to air quality, such as 'First Steps in Urban Air Quality, A Trees and Design Action Group Guidance Document'⁹⁵ should be provided to all planners to ensure a basic understanding of air quality issues.
- 13.5 Any mitigation applied in accordance with the guidance should be coordinated to support wider aspirations for modal shift and sustainability, as the potential success in the application of such

⁹⁰ European Environment Agency (2018) Europe's urban air quality – re-assessing implementation challenges in cities.

⁹¹ <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>

⁹² <https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf>

⁹³ <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/ha20707.pdf>

⁹⁴ <http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf>

⁹⁵ Ferranti, E.J.S., MacKenzie, A.R., Ashworth K., and Hewitt C.N. 2017. First Steps in Urban Air Quality. A Trees and Design Action Group (TDAG) Guidance Document. UK: London. <http://epapers.bham.ac.uk/3069/>

guidance is demonstrated by Dudley⁹⁶. Therefore, both core and extended controls may be defined using a standard checklist.

- 13.6 It is not necessary for all local authorities to adopt the same document, but to adopt the same principles and, most importantly, to apply the screening and mitigation consistently. This would benefit both the local planning authority that can then draw on support from the WMCA, but also applicants who can operate within a consistent framework across all local authorities.
- 13.7 As discussed in Section 4, many of the constituent and non-constituent local authorities have included actions within their air quality action plans relating to air quality planning guidance and therefore WMCA can assist them in achieving this action.
- 13.8 An area where planning coordination at a regional level could also add value is in the role of planning to encourage transit oriented development.

Financial Contribution

- 13.9 Financial contributions for planning and development are obtained using Section 106⁹⁷ and Community Infrastructure Levy⁹⁸. These mechanisms are intended to compensate the local authority financially for detrimental effects of a proposed scheme, using a defined charging structure.

Damage Cost

- 13.10 Financial compensation for air quality effects have been assigned using the Damage Cost⁹⁹ approach in many areas in the UK, although it should be noted that the calculation methodology is not contained within any adopted or national air quality planning guidance. Damage costs assign a value to emissions where the effects are less than £50 million and do not affect compliance with legal limits on air pollution.
- 13.11 The approach was initially prepared for use by Government to assess the impact of changes to policy with regards to potential air quality impacts, where policies have ancillary air quality benefits and for more general 'scoping analysis' of policy options. There are risks to applying a Damage Cost at a local or regional level (such as by local authorities) as the values do not take into account local or regional effects or variations.

Box 26: West Yorkshire Air Quality & Emissions Technical Planning Guidance¹⁰⁰

The West Yorkshire guidance stipulates that the damage cost should help determine the amount (value) of mitigation that is expected to be spent on measures to reduce the impacts. The calculation requires the use of the most recent Defra Emissions Factor Toolkit to estimate the additional pollutant emissions from a proposed development, whilst the latest Inter Government Department on Costs and Benefits (IGCB) Air Quality Damage Costs were used calculate the resultant damage costs for the specific pollutant of interest. The distance travelled by vehicles is not known, however, the West Yorkshire guidance refers to the National Travel Survey statistics (<https://www.gov.uk/government/collections/national-travel-survey-statistics>) that suggest a 10km journey is considered to be typical.

The following calculation was used to determine the damage cost of the proposed development over a five year period for the pollutants NO_x and PM₁₀:

$$\text{Road Transport Emission Increase} = \Sigma (\text{Estimated trip rate for 5 years} \times \text{Pollutant emission rate per 10 km per vehicle type} \times \text{Damage Cost})$$

- 13.12 Where proposals may have an air quality damage cost over £50 million, the impact pathway approach may be implemented, as it is a more detailed method of valuing air quality changes that considers the outcome from location-specific modelling.

⁹⁶ Black Country Air Quality Supplementary Planning Document (SPD) 2016

<https://www.dudley.gov.uk/resident/planning/planning-policy/local-plan/bcaqspd/>

⁹⁷ http://www.legislation.gov.uk/ukpga/1990/8/section/106?sm_byp=iVV4jJN5nQsJR8Zj

⁹⁸ https://www.planningportal.co.uk/info/200126/applications/70/community_infrastructure_levy

⁹⁹ Defra <https://www.gov.uk/guidance/air-quality-economic-analysis>

¹⁰⁰ West Yorkshire Air Quality & Emissions Technical Planning Guidance <http://www.wakefield.gov.uk/Documents/bins-environment/environmental-health/pollution/air-quality-and-planning-technical-guidance-plan.pdf>

- 13.13 There is limited opportunity for the WMCA to support the use of financial contributions, as they are managed by the local authority. However, there may be an opportunity for the WMCA to develop a 'menu' of options that may be used to define and coordinate contributions so they are consistent and fair across the districts. This would support the development and implementation of the planning and development guidance.

Taxi licensing

- 13.14 Over 5,000 licensed taxis operate in the West Midlands, including Hackney Carriages and private hire vehicles. These vehicles provide an essential role in supporting public transport and ensuring travel choice for a wide range of social groups.
- 13.15 These vehicles represent a specific portion of the regional fleet with a disproportionate emissions contribution due to the high mileage and repeat journeys. This is recognised in the Defra Clean Air Zone framework guidance, whereby a CAZ type C specifically include taxis and black cabs, and differentiates them from private cars.
- 13.16 The effects on emissions and associated damage costs (see Section 5) that may be achieved by operating vehicles with different emissions standards are presented in Table 18, based on a single taxi represented as a diesel car operating at 60 km/hr for 40,000 miles per year. As discussed earlier, these values should be used cautiously, as they are indicative of total societal costs rather than absolute amounts. These data indicate a significant reduction in NO_x emissions, but a relatively smaller change in PM emissions, which are more closely associated to damage costs. Therefore, this indicates considerable reductions that may be achieved across a larger fleet.

Table 18: Taxi Emission Standards Damage Costs

Euro Class	Emissions, kg/40,000 miles		Annual Cost at		
	NO _x	PM _{2.5} *	Low Value	Central Value	High Value
Euro 3	22	3	£214	£1,200	£3,933
Euro 4	15	3	£205	£1,098	£3,536
Euro 5	16	2	£150	£843	£2,767
Euro 6	14	2	£145	£802	£2,614

- 13.17 Furthermore, operators are licensed by local authorities, so there is an existing mechanism to record vehicles and track usage. However, whilst vehicles may be licensed by a single authority, they may operate in adjacent districts, and so there is a recognised concern about how licensing criteria may be applied differently and the implications for managing and tracking the fleet.
- 13.18 Central government is currently in the process of creating a national database to record taxi licensing data for the purposes of air quality management. This database is expected to become operational in 2019 and provide an initial understanding of how taxis are registered across the UK.
- 13.19 With regard to the WMCA role, there is an opportunity to work with the individual districts to align taxi licensing policy with a specific focus on emissions standards.

School Planning

- 13.20 Schools are recognised as specifically important locations for air quality, due to the relatively high sensitivity of children to air pollution that can affect growth and development¹⁰¹.

¹⁰¹ http://www.euro.who.int/en/data-and-evidence/evidence-informed-policy-making/publications/hen-summaries-of-network-members-reports/what-are-the-effects-of-air-pollution-on-childrens-health-and-development?_sm_byp=iVV4jJN5nQsJR8Zj

- 13.21 The operation of schools is effectively a local authority responsibility, although the WMCA has an opportunity to provide essential support and coordination, and provide cross-district engagement with stakeholders, such as bus operators through the existing bus alliance.
- 13.22 The WMCA can provide a tool-box of appraisal and intervention measures based around planning and development for new or existing school development and construction, introduction of green planting and screening, or highway measures that target traffic on the access roads. Provision of resources to support school travel planning would support the development of safe routes for walking and cycling, which will be supported by the travel choice measures.

Box 27: ANPR enforcement near schools¹⁰²

The John Hampden Grammar School in High Wycombe partnered with an ANPR technology provider to implement an ANPR system linked to the CCTV in order to manage site traffic.

The system was not explicitly designed to tackle emissions, but is an example of how it may be used to track vehicles where they access a school property using discrete ingress points, and may be expanded by linking it to an external emissions databases or list of registered vehicles.

Box 28: Air Quality Measures at Schools in London

Several London Metropolitan Borough Councils have trialled a programme of enforcement to close roads near primary schools

- Croydon Council implemented road closures during peak hours near three schools, and installed an ANPR system used to identify vehicles, with an 'advanced access permit' issued to staff, visitors and residents to ensure essential users are not penalised.
- Camden Council installed physical bollards to block road access to St Joseph's Catholic Primary School in Covent Garden during drop-off and collection times.
- Hackney used a 'School Streets' programme to apply fines to vehicles using roads outside two schools.

Air quality was a primary objective for the schemes, along with supporting recognised co-benefits to health and wellbeing in encouraging a modal shift away from cars and towards walking and cycling.

- 13.23 On a larger scale, the WMCA has a remit to represent the district authorities in a national context and to both steer the wider conversation, and to ensure that local or regional concerns are properly recognised in the tools being published by central government.
- 13.24 This conversation would affect the powers that local or regional authorities have to work with stakeholders to tackle emissions, and also to manage how funding is allocated or awarded to implement measures.

Parking Regulation

- 13.25 In large urban areas, parking management can provide an opportunity to directly change how private cars are used, and also influence behavioural change. As discussed in paragraph 11.13, the cost of private car use can be a 'push' factor to instigate behaviour changes in peoples travel choices. The enforcement mechanism is crucial to determine the effects resulting from parking regulation. The West Midlands Strategic Transport Plan 'Movement for Growth' considers the role of parking and states, "There will need to be more coordinated metropolitan parking strategy, led by the new Combined Authority. This will consider how parking pricing and provision can support the objectives of this transport strategy, mindful of the relationship with delivery of improvements to public transport, cycling and walking. It will also need to consider parking standards in new development in relation to levels of public transport

¹⁰² John Hampden Grammar School, Automatic Number Plate Recognition (ANPR) for School Vehicle Management
http://www.prime-digital.com/wp-content/uploads/2017/08/Reference-V1.0.pdf?_sm_a_u_=iVVHkn7q85J7DD4N

accessibility and walking and cycling provision. The metropolitan parking strategy will need to balance the role of car access to centres to support economic vitality, whilst promoting the use of public transport cycling and walking. This is to ensure that private car volumes are not at such levels where the dominance of the car detracts from the quality of the environment of our centres”.

13.26 In terms of potential for opportunities to implement parking restrictions these will be limited where private operators have major facilities, such as free parking that is intended to encourage leisure/spending such as at Merry Hill shopping centre. Therefore, where drivers are penalised for parking at a preferred site there will be redistribution effects as it incentivises alternative parking where it is less expensive or free, leading to longer journeys and increased congestion. Therefore, coordinating regulation and engaging with drivers and site operators will be important to effectively manage the undesirable redistribution effects.

13.27 Therefore, parking regulation should focus on the positive benefits of modal shift and behavioural change, and to ensure that a range of positive measures are aligned with the disincentives to ensure that users are not unfairly discriminated. Given the potential public concern and opposition that may occur due to changes to parking charge regimes, the WMCA would have a responsibility to implement practice guides, including aspirational measures such as increasing adoption through a regional policy or based on user thresholds, such as adoption of EV.

Box 29: City of London Parking Technology¹⁰³

The City of London has adopted the RingGo parking app which uses emissions to apply a variable charge. The parking enforcement system has replaced traditional ticket-based parking meters with the app technology, which allows the owner to register a car to app with a pre-assigned emissions standard, and so it is possible to easily assign a variable charge to penalise high emission vehicles and reward those with low emissions.

Box 30: Parking Information and Novel Use of Technologies¹⁰⁴

The novel use of existing technology has recognised opportunities to improve emissions, and especially where multiple different approaches can be integrated:

- Coventry is trialling a parking app that help drivers to navigate to an available parking space in order to minimise the time spent searching for spaces. This is expected to be beneficial for both congestion and emissions.
- The Utrecht local government tested a policy to apply different parking tariffs for different cars based on their emission standards. This was recognised as a having significant potential, although it was highly sensitive to political priorities, and so requires a consistent political and legislative framework to be successful.

Box 31: Optimising Car Parks in Amsterdam¹⁰⁵

Amsterdam suffers from a severe lack of parking spaces in the city centre – increasing the number of parking spaces might not seem like a good way of improving city centre air quality, but removing the number of cars parked by the side of the road is in order to reduce congestion/improve traffic flow.

Intervention methods to reduce the demand for on-street parking and encourage modal shift include parking permits; permitted drivers making use of commercial parking space; leasing private parking space; incentivising conscientious permit-holders; and ensuring the turnover of permits is quick and efficient.

¹⁰³ RingGo <https://www.myringgo.co.uk/howitworks>

¹⁰⁴ Civitas Promoting the use of clean vehicles through an innovative parking policy <https://civitas.eu/measure/promoting-use-clean-vehicles-through-innovative-parking-policy>

¹⁰⁵ Eltis Shuffling the pack: Optimising car parking in Amsterdam (The Netherlands) http://www.eltis.org/discover/case-studies/shuffling-pack-optimising-car-parking-amsterdam-netherlands?_sm_au_=_lVHKn7q85J7DD4N

Vehicle Idling

13.28 Vehicle idling is a very emotive subject, as this is a specific situation where an emission source is highly visible, and often potentially avoidable through very minor personal action. Situations where idling is apparent includes taxi ranks or cars waiting outside schools, where there may be relevant sensitive exposure of the public. The actual effects on local air quality may be relatively minor, whilst it does represent a behavioural awareness of personal effects.

13.29 The emissions resulting from an idling engine are clearly higher than an engine that is not running. However, the effects on emissions due to turning off an engine are dependent on idling time, ambient temperature, exhaust temperature, oil temperature, exhaust abatement technology, and fuel type¹⁰⁶. For example, a car that has driven for a few minutes on a cold morning would lead to spike in emissions if it were turned off and then on again, whereas a car with a warm engine in summer would have a much smaller spike in start-up emissions due to residual heat remaining in the system. Therefore, the total emissions duration of the idle period can be very complicated, and there is an opportunity for policies to incorporate some scientific understanding:

“There is a real risk of unintended harm, as emissions on start-up (whether warm or cold) often form a substantial part of the total emissions from a vehicle’s journey. A study from the US Department of Energy showed that a vehicle would have to be idling for 10 minutes or three hours to emit as much NO_x or carbon monoxide (respectively) as a single (warm) restart. There is a significant need for more research in this area – particularly on modern vehicles that use substantial levels of exhaust gas after treatment to control emissions.

There is a serious need to tackle air pollution, but to do so effectively will require coherent interdisciplinary engagement and evidence-based policy making.”

Dr Felix Leach, Associate professor of engineering science, Shell-Pocock fellow and tutor, Keble College, University of Oxford¹⁰⁷.

13.30 The heating / cooling curves for engines ¹⁰⁸ indicate how they will cool / heat rapidly, and then more slowly over several hours. This affects how effective abatement controls will be when an engine is idled or turned off, and should be considered as part of any behavioural initiative. The EXEMPT cold start tool¹⁰⁹ is a screening tool based on an older fleet of Euro 2-4 cars, which estimates the proportion of excess emissions due to cold engines based on the period of cooling. The data in Figure 22 indicate how cold emissions for 0-100m of a journey after starting a car are linked to the period when the engine was turned off. These indicate that for older vehicles, the increased NO_x emissions resultant from a cooled engine compared to a hot one can range from approximately 2-10%.

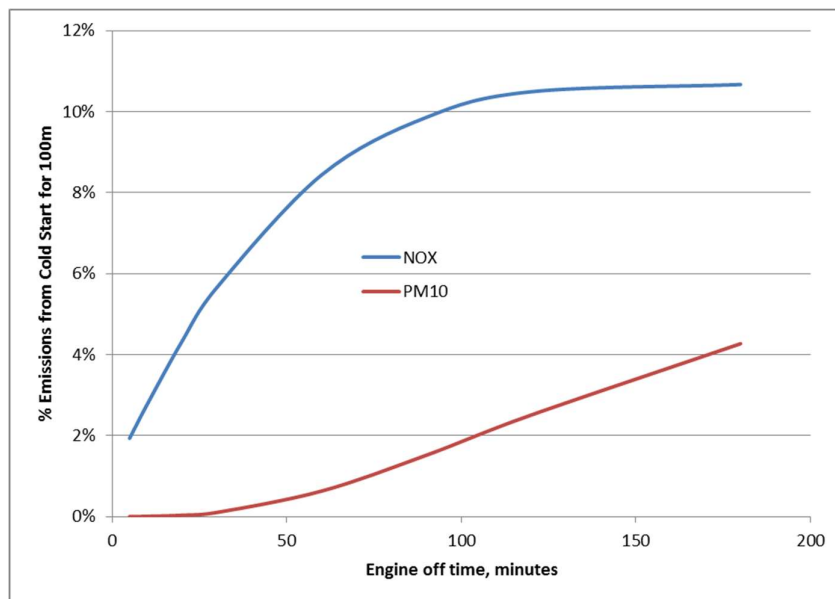
¹⁰⁶ https://www.dieselnet.com/tech/emissions_idle.php

¹⁰⁷ <https://www.theguardian.com/environment/2019/mar/24/dieselgate-and-the-unintended-consequences-of-anti-idling-drive>

¹⁰⁸ <https://uk-air.defra.gov.uk/assets/documents/reports/empire/summary0638.pdf>

¹⁰⁹ <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#exempt>

Figure 22: Emissions from Cold Starts



13.31 The situation is more complex where newer engines may use SCR and EGR abatement controls for NO_x emissions, as these technologies are even more highly sensitive to temperature, and there is an extensive range of engine types and other technologies currently operating in the local and regional fleets; e.g. modern vehicles often use an automatic system to turn off the engine when the vehicle is stopped, although this is managed by the ECU to apply it only when the conditions match the defined operating criteria, and in manual transmission vehicles it requires a neutral gear and handbrake to be applied so is effectively managed by the driver.

13.32 It is also essential to recognise that experience from a number of local authorities that have identified difficulties in enforcing idling regulation¹¹⁰, where behavioural response may be voluntary and based on understanding the benefits. Therefore, whilst beneficial effects may be achievable, any approach to idling management should be implemented with caution to ensure that overall beneficial effects can be achieved, and may be best designed to complement harder measures, such as relocating vehicle and pedestrian access to reduce exposure, or removing the source entirely in the form of road closures around schools.

Box 32: WMCA interventions regarding planning guidance

WMCA can pursue the following interventions

Planning Coordination

- **Coordinate the adoption of consistent development planning guidance for air quality that is consistent across the whole region.**
- **Develop a menu of standard mitigation options for all developments in the West Midlands such as:**
 - **Minimum of one electric vehicle charging point for every home with off-street parking, or a defined proportion of any shared private/commercial parking allocations;**
 - **Submission of a travel plan for any development exceeding a threshold for properties / employees; and**
 - **Links to public transport and non-road alternatives, such as walking and cycling to access essential public amenities (e.g. schools, shops, medical centres) should be a non-negotiable and essential sustainable component of all proposed developments, although in some cases it is recognised it may be subject to local plan examination.**

¹¹⁰ <https://airqualitynews.com/2019/03/07/exclusive-idling-enforcement-branded-not-fit-for-purpose-as-just-a-handful-of-fines-issued-during-2018/>

Financial Contribution

- There is limited opportunity for the WMCA to support the use of financial contributions, as they are managed by the local authority. However, WMCA should develop a 'menu' of options that may be used to define and coordinate financial contributions so they are consistent and fair across the local authorities.
- A key aim would be to ensure the financial contributions are targeted towards the key priority areas and support other interventions outlined in this strategy.

Taxi Licensing

- Co-ordinate a central database for all registered taxis, which will include information about where vehicles are stored overnight.
- Conduct a taxi study to track where the registered taxis operate, using ANPR data. The outcome of this study will inform where infrastructure and other measures to promote the uptake of low emission taxis should be focused, with particular emphases on the key priority areas. Such as:
 - Compliant only taxi ranks, e.g. at train stations. Permits are already required for taxis to use some stations, therefore permits can be issued to compliance vehicles only;
 - Compliant only taxi routes; and
 - Provision of fast and rapid electric charging points
- The on-going study should also monitor the redistribution of older vehicles on the road network.
- Co-ordinate the licensing of new taxis. Currently each local authority sets up their own licensing standards for taxis, with only a few including specific standards for emissions. WMCA should ensure a standard licensing approach across the region which will incorporate strict emission standards, such as:
 - All new registered taxis will be EURO VI
 - Renewal of taxis licences will only be issued for taxis of EURO IV or above
- Various schemes are available to fund the uptake of low emission taxis such as the OLEV Taxi Scheme. Other take-up incentives which WMCA can co-ordinate include:
 - Taxi recognition schemes;
 - ULEV taxi requirements for public sector contracts;
 - Designate a minimum age for licensed taxis, with an initial grace period for existing vehicles, and increasingly stringent standards in the future proposed to be applied according to a timetable.
 - Identify opportunities for grant funds and loans to enable operators to purchase new zero-emission capable vehicles.
 - Work with suppliers and operators to implement trial periods of new zero-emission vehicles to demonstrate capability and promote awareness and support.
 - Ensure suitable EV infrastructure is available where it is required so this is not a barrier to adoption of new technologies, based on where vehicles are registered, parked overnight and operated.

School Planning

- Provide a tool-box of appraisal and intervention measures based around planning and development for new or existing school development and construction, introduction of green planting and screening, or highway measures that target traffic on the access roads.
- Provision of resources to support school travel planning would support the development of safe routes for walking and cycling, which will be supported by the travel choice measures.
- Provide resources to support districts to objectively review the schools inventory and identify opportunities to improve condition. The CA would then work with the authorities to enable measures, with funding support and connecting to suppliers.
- Specific interventions may include:
 - Discussion of vehicle idling as a mechanism to reduce emissions, as this is extremely difficult to enforce, and controls may revolve awareness and promotion.
 - Road closures during drop-off / pick-up

- Schools engagement with staff, governors, pupils and parents
- Planning and development guidance
- Schools inventory auditing to rank priority properties
- Ventilation strategies
- Behavioural surveys to inform route to school.
- In addition to targeting individual school sites, the framework for running schools may be discussed with the individual authorities to identify opportunities to adjust start and end times. This could potentially achieve wider benefits by promoting flexible working for parents, but also risks by disrupting how parents and businesses operate. This approach would require essential funding support for enabling measures, such as wrap-around care, which would make the programme feasible and achievable.
- On a larger scale, the WMCA has a remit to represent the district authorities in a national context and to both steer the wider conversation, and to ensure that local or regional concerns are properly recognised in the tools being published by central government. This conversation would affect the powers that local or regional authorities have to work with stakeholders to tackle emissions, and also to manage how funding is allocated or awarded to implement measures.

Parking Regulations

- Link parking charges to vehicle emission standards, whereby high emission vehicles cost more to park, although it is important to ensure that charges do not unfairly penalise low-earning individuals. Therefore, an adjustment may be made based on a means-test, or the value of the registered vehicle based on the age and list price, which may be analogous to the owners income.
- Preferential parking spaces within a car park, or across multiple car park locations, which would prioritise low-emission vehicles. This may entail relatively simple approach that is similar to dedicated bays for EV or disabled parking, or a more complex live signage and redirection system linked to an ANPR database to control how drivers reach specific car parks.
- Where parking facilities are co-located with modal shift, such as at Park & Rides sites, the charge is often linked to the public transport access; e.g. parking charge includes use a bus service to a town centre. Therefore, there are potentially a range of opportunities to associate emissions and travel choice with charges and regulation.
- Vehicle idling enforcement may be high-profile target to reduce localised emissions, but may benefit from a bespoke implementation that recognised behavioural and technological responses, and may be most effective as a complementary measure.

Policy Links	Theme Links
Low Emission Vehicle Strategy West Midlands Low Emission Town & Cities Programme 2016 - 2021 West Midlands Transport Emission Framework	Travel Plan Park and Ride Electric Vehicles Taxis Emission Standards

Table 19: Appraisal Scoring – Planning Guidance

Theme	Local Air Quality		Climate Change (GHG)	Timescale	Implementation			Total
	Magnitude	Extent			Cost & Feasibility	Inclusion & Accessibility	Economy	
Planning Coordination	3	3	2	2	2	3	3	648
Financial Contribution	1	3	1	2	3	3	2	108

Theme	Local Air Quality		Climate Change (GHG)	Timescale	Implementation			Total
	Magnitude	Extent			Cost & Feasibility	Inclusion & Accessibility	Economy	
Taxi Licencing	2	3	2	2	2	3	1	144
School Planning	1	3	1	2	2	3	1	36
Parking Regulations	1	2	2	1	2	3	1	24
Vehicle Idling	1	3	1	1	3	3	1	27

14. Healthy Streets

- 14.1 People's experiences of using streets help determine whether they decide to walk, cycle and use public transport, how to travel to local businesses or other neighbourhoods to do their shopping, and even influence their decision regarding whether they own a car at all. The quality and ambiance of our streets can therefore drastically change how and whether people use them, with implications for the number of cars on the road (and thus, the amount of air pollution emitted and air quality), the local economy, community cohesion, and whether or not people have active lifestyles. We can use this knowledge to design our streets in a way that fosters increased uptake of sustainable transport, greater pride in and support of local businesses in an area, and influences people to uptake physical activity through more frequent (or longer) walks, strolls and bike rides.
- 14.2 These opportunities may be linked directly to the KPAs (see Section 6) to realise the greatest benefits for health and social inclusion.

Place-making

- 14.3 Planners can capitalise on the positive outcomes of improving people's enjoyment of an area by adopting design and regeneration policies that promote streets as part of discrete and wider communities, and to minimise the effects of the road as a barrier to movement within a neighbourhood.
- 14.4 Upgrades and works to increase road and junction capacity should be reassigned to support long-term modal shift and place making rather than to accommodate increased traffic flow. This may be specifically designed to support and incentivise:
- Modal shift, and prioritisation of non-car travel;
 - Local working and reduced travel to work;
 - The transition of focus from journey time to journey quality; and
 - Local development and regeneration by removing roads as 'barriers' to pedestrian access.
- 14.5 There are co-benefits where improvements in the public realm are targeted towards the most deprived areas, where there may be high levels of inactivity, poor health, low car ownership and low income. Therefore, immediate opportunities are presented to screen the key priority areas for air quality and identify those with residential properties near the road, and consider how they align with local and cross-boundary routes / journeys.

Box 33 Example of Healthy Streets Programme¹¹¹

Transport for London (TfL) have adopted the Healthy Streets approach to improve air quality, reduce congestion and help make London's communities greener, healthier and more attractive places to live, work, play and do business. It is a system of policies and strategies to help Londoners use cars less and walk, cycle and use public transport more. The approach identifies changes needed at three levels: street level, network level, and strategic level. To fund the initiative TfL have reassigned their street spending into a new £2.1bn Healthy Streets Portfolio, which will ensure that all street investments deliver against the 10 Healthy Streets Indicators. These evidence-based indicators are centred around what makes streets attractive places (including clean air, safety, shade and shelter), and working toward these will help to create a more active and attractive city.

¹¹¹ [TfL \(2017\). Healthy Streets for London.](#)

Box 34 Example of Healthy Streets Programme¹¹²

The London Borough of Waltham Forest has launched the 'Enjoy Waltham Forest' scheme. Funded by Transport for London, the scheme has improved cycling infrastructure to create a safer environment for walking and runs a behaviour change programme encouraging residents to use alternative modes of transport to the car. The council have introduced segregated cycle lanes on seven major routes and created 91 'blended crossings' which slow down vehicles as they enter and exit side roads. The council have also closed 43 roads to cars and to minimise the impact on goods delivery to and from local businesses, the council have introduced a zero-emission cargo bike delivery service (Zed). Every train station in Waltham Forest has a secure bike hangar and the council also delivers cycle training to residents as well as launching digital tools to show safe cycling routes.

Shared Space

- 14.6 Shared space is an urban design approach that minimises the segregation between modes of road user. This is done by removing features such as kerbs, road surface markings, traffic signs, and traffic lights. The theory is that, by creating a greater sense of uncertainty and making it unclear who has priority, drivers will reduce their speed, in turn reducing the dominance of vehicles, reducing road casualty rates, and improving safety for other road users. Below flows of 90 vehicles per hour adult pedestrians were prepared to mingle with traffic. When flows reached 110 vehicles per hour, they used the width between frontages as if it were a traditional road, at which point the highway becomes a barrier to free movement.
- 14.7 Shared space design can take many different forms depending on the level of demarcation and segregation between different transportation modes. Variations of shared space are often used in urban settings, especially those that have been made nearly car-free or pedestrianised, and as part of living streets within residential areas.
- 14.8 The goal of shared space is to share priority and use of roads more equally across different road users, to improve the road safety and vibrancy of roads and junctions, particularly ones with high levels of pedestrian traffic, by encouraging negotiation of priority in shared areas between different road users. Therefore, it is important to ensure it is implemented so that drivers do not see these areas as a continuation of the carriageway rather than a change from road to shared space.
- 14.9 Merging highway and pedestrian routes using a dropped kerb and mixed surface textures has been successfully implemented in a number of European cities and has recently adopted in the UK¹¹³. The broad factors associated with this design include:
- Removing the kerb so the road is no longer a barrier dividing the street to pedestrian and cycle traffic.
 - An altering of driver behaviour as vehicles slow down and engage with non-road traffic without the need for additional signage, with particular benefits at poorly designed urban junctions.
 - Prioritising non-road traffic at sensitive locations, such as schools.
 - Potential risks of increased emissions due to congestion effects, which need to be included in the design.
- 14.10 The shared space designs are thought to encourage cycling¹¹⁴ and non-car travel choices, as the design is such that there is no dominant form of transport, the experience for people undertaking other modes of transport is more pleasant. The DfT issued national guidance on shared space in 2011¹¹⁵ defining 'Shared Space' as:

¹¹² <https://www.ashden.org/winners/london-borough-of-waltham-forest#continue>

¹¹³ <https://www.gov.uk/government/news/new-guidance-on-the-design-of-shared-space-streets>

¹¹⁴ <http://www.gmcc.org.uk/2013/05/how-poynton-tamed-its-traffic/>

¹¹⁵ Local Transport Note 1/11 Shared Space, 2011, Department for Transport

“A street or place designed to improve pedestrian movement and comfort by reducing the dominance of motor vehicles and enabling all users to share the space rather than follow the clearly defined rules implied by more conventional designs.”

14.11 However, reviewing the research that underpinned the DfT’s guidance document, Moody and Melia¹¹⁶ found that some of the claims made for shared space schemes were not justified by the evidence, particularly the claims that pedestrians are able to follow desire lines, and that shared space reduces traffic speeds. Their primary research in Ashford, Kent, suggested that in streets with high volumes of traffic, pedestrians are more likely to give way to vehicles than vice versa. Most people within the study sample, but particularly women and older people, found the shared space intimidating and preferred the previous layout with conventional crossings. There are particular concerns surrounding blind and partially sighted people, with the Royal National Institute of Blind People (RNIB) running a campaign against shared spaces. As they rely on coordination and communication between pedestrians and other road users (e.g. making eye contact with drivers), blind and partially sighted people are less able to navigate these spaces. The lack of landmarks such as kerbs can add to these challenges, even for those with Guide Dogs.

Green Infrastructure

14.12 Green infrastructure is defined as a network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities¹¹⁷. An ‘urban forest’ includes features such as parks, green roofs, green walls, verges, street trees, rivers and waterways (often called ‘blue infrastructure’) designed and managed to deliver a range of benefits. It is a type of natural capital¹¹⁸ and a key aspect of cities, towns and villages, and is vital to human health and wellbeing. At the EU level, critically important green infrastructure policies include the Birds and Habitats Directives that underpin the Natura 2000 network of over 27,000 protected areas, the EU Green Infrastructure Strategy¹¹⁹, the Biodiversity Strategy to 2020 (including the 15% restoration target it sets), cohesion policy, and research and innovation policy.

14.13 There is growing evidence of the wide range of social, environmental and economic benefits that green infrastructure can provide. These include:

- Social: increased community cohesion and engagement and associated well-being benefits;
- Environmental: air quality and species diversity (wildlife) benefits; and
- Economic: improved ‘attractiveness’ of an area bringing visitors and increased visitor spend.

Box 35: Green Infrastructure to Combat Climate Change¹²⁰

The Green Infrastructure to Combat Climate Change document is a framework and guidance document developed for use by stakeholders across Cheshire, Cumbria, Greater Manchester, Lancashire, and Merseyside to influence and provide evidence for policy and delivery on their long-term agenda on climate change. This Framework highlights that local level action and planting can be embedded into Local Development Frameworks including Core Strategies and Development Plan Documents, Supplementary Planning Documents and Area Action Plans, as well as proposals for Community Infrastructure Levies. It also needs to be embedded into Sustainable Community Strategies and the work of Local Strategic Partnerships and Local Area Partnerships. This can then help to influence the development of Town and Parish Plans, and emerging Neighbourhood Plans, as well as masterplans for new developments and restructuring.

¹¹⁶ Moody, S. and Melia, S. (2014) Shared space: Research, policy and problems. Proceedings of the Institution of Civil Engineers - Transport, 167 (6). pp. 384-392. <http://eprints.uwe.ac.uk/17937/8/tran1200047h.pdf>

¹¹⁷ Department for Communities and Local Government (2019). National Planning Policy Framework (NPPF).

¹¹⁸ Natural Capital Committee (NCC) (2017). [How to do it: a natural capital workbook](http://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm).

¹¹⁹ http://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm

¹²⁰ http://www.greeninfrastructurenw.co.uk/resources/framework_for_web.pdf?_sm_au_=iVV8sW5nsJRR5kJj

Local Planting

- 14.14 The benefits of green infrastructure (GI) in urban environments are increasingly understood¹²¹. Vegetation has the potential to improve air quality, and can also make urban environments more pleasant by providing shade and texture, as well as altering the micro-climate and retaining moisture. GI is a vital component of creating attractive and accessible places for people to enjoy direct and regular contact with the natural environment.
- 14.15 Where local planting is installed at roadside it can be used to interrupt the exposure pathway and substantially alter the dispersion of emissions by effectively acting as a barrier. The porosity and surface roughness of the planting and substrate will also affect how air moves around and through the planting on a micro-scale, which regulates the rate of deposition and absorption of pollutants. This type of planting also increases ecological connectivity to overcome habitat fragmentation and increase the ability of the natural environment to adapt to climate change.
- 14.16 Studies into pollutant deposition and absorption have disputed the magnitude of the benefits achieved by roadside planting, with it commonly being suggested as a supplementary solution to air pollution rather than a primary solution (which might include measures that focus on the source of air quality problems). However, the majority of studies conclude that the main benefits of GI are reductions in exposure to particulate matter, with less research available on the effect they have on NO₂ concentrations. The primary mechanisms are pollutant removal (by deposition), pollutant dispersal (by barriers, parklands, and increased roughness), and pollution avoidance (by modal shift), and whilst there is good evidence for removal and avoidance, evidence for substantial removal by deposition is inconsistent and highly context dependent.
- 14.17 Local planting can also include more innovative GI features. These include features such as green walls and planting on existing structures, such as buildings and bus stops, otherwise known as 'living walls' or 'vertical greening systems'. These do not disrupt the exposure pathway as effectively as barriers, but can achieve similar co-benefits in terms of enhanced biodiversity, reduced noise, and improved opportunities for surface drainage.
- 14.18 Several modelling studies into the efficiency of planting in reducing air pollution at roadside locations have been undertaken, such as those outlined in Figure 23. This indicates that although GI is usually inferred to be positive, canyon effects can be enhanced or weakened based on the shape of the canopy, where it can be used to separate pedestrians from emissions rather than trap pollution in an artificial tunnel. This highlights the importance of deliberate planning and consistent maintenance of GI features.

Figure 23 Examples of the Potential Dispersion Effects of Green Infrastructure



- 14.19 The efficiency of planting, either as a barrier or a wall, is highly dependent on a number of variables including the species of vegetation, the vegetation coverage, the wind speeds and the shape of road canyons. There are also risks to the implementation of individual schemes, such as preserving sight-lines for drivers and pedestrians, and ensuring that planting (and any associated debris) does not encroach onto the highway. It is therefore necessary to assess the practicalities of any roadside planting schemes to be assessed on a case by case basis.

¹²¹ Hewitt, C. N., K. Ashworth, and A.R. MacKenzie. (2019) Using green infrastructure to improve urban air quality (GI4AQ). Ambio, DOI: 10.1007/s13280-019-01164-3

14.20 The use of GI and planting is broadly supported by National Planning Policy Framework, Local Authority Plans and the Government 25 Year Plan (25 YEP) for the Environment¹²².

Box 36 Example of Local Planting ^{123 124}

A study undertaken by Birmingham and Lancaster Universities captured the trapping of air in street canyons and the chemical reactions which occur that can affect pollutant concentrations, allowing them to distinguish the effects of plants in green walls in street canyons from those in other locations. The study concluded green walls were the most effective at removing pollutants relative to vegetation in other locations and that significant affects could be achieved on a street-by-street basis. The study found that for canyons 100% covered in vegetation, at roadside locations annual mean NO₂ and PM₁₀ could decrease by as much as 40% and 60% respectively. The study also concluded that the success of a green wall varies greatly with different species of vegetation, dependent on their surface properties, and was also affected by the shape of the canyon and wind speeds. The deeper the canyon and the lower the wind speeds increased the chance of pollutant deposition. This study also stated that green walls growing in 'urban canyons' within cities would deliver cleaner air at the roadside and could be implemented without need for large-scale and expensive initiatives. This study was however deemed by some to be limited by the model's reliance on data with only modest experimental support to validate the results.

Box 37 Mental Health Benefits of Green Planting ^{125 126}

Research based on data from the 2010-12 Catalonia Health Survey (in Spain) explored whether the degree of 'surrounding greenness' (defined as features such as street trees or pavement grass along pedestrian walkways of urbanisation) had an impact on mental health. The results suggest that street trees, paths, greenways or gardens represent effective opportunities for mental restoration and stress reduction. The authors also argue that there are significant benefits from 'micro-environments', such as having a view of trees from a window. Similar results were found by research conducted in the Netherlands, which made the case for small-scale infrastructure such as green corridors, urban commons, street trees, and pedestrian and cycling routes.

Regional Planting

- 14.21 Previous studies recognise regional approaches to GI as critical to achieving cross-boundary objectives, building partnerships, and advocating shared outcomes within existing and emerging strategies and structures (e.g. local enterprise partnerships, joint infrastructure plans, climate change and landscape partnerships, transport policy). However, examples of successful regional programmes with measured outcomes are relatively rare.
- 14.22 The large-scale effects of vegetation and planting have been quantified in terms of reduced SO₂, O₃, CO₂, NO_x and particulates, with concurrent measurable economic benefits realised across a regional area. For example using ONS data, as detailed in Box 4 below, vegetation within the seven WMCA constituent authorities removes enough pollutants to avoid health outcomes with a value of over £46 million per year. A study by AECOM for London's National Park City Campaign estimated that London's 8.3 million trees generate £195 million of air filtration services, with around £1.9 billion in climate regulation services produced by London's green spaces in total. identified values of £126 million for 8.4 million trees (AECOM Natural Capital team). This regional study calculates pollutant removal and is carried out at a scale that does not capture the small-scale dispersion effects discussed above, and so the value of urban GI in the CEH report may be an under-estimate.

¹²² <https://www.gov.uk/government/publications/25-year-environment-plan>

¹²³ Birmingham University (Kessler R, <http://ehp.niehs.nih.gov/121-a14/> (accessed January 2016)

¹²⁴ Pugh, T. A. M., A. R. MacKenzie, J. D. Whyatt, and C. N. Hewitt (2012). The effectiveness of green infrastructure for improvement of air quality in urban street canyons. *Environmental Science & Technology*, 46 (14), 7692-7699. DOI: 10.1021/es300826w. Green open access available through PURE/Birmingham Research Portal

¹²⁵ M Triguero-Mas, P Dadvand, M Cirach, et al.: 'Natural outdoor environments and mental and physical health: relationships and mechanisms'. *Environment International*, 2015, Vol. 77, 35-41

¹²⁶ S de Vries, RA Verheij, PP Groenewegen and P Spreeuwenberg: 'Natural environments – healthy environments? An exploratory analysis of the relationship between greenspace and health'. *Environment & Planning A: Economy & Space*, 2003, Vol. 35 (10), 1,717-31

Box 38 Physical health Benefits of Green Planting^{127 128}

Green infrastructure can make an important contribution to health outcomes by absorbing harmful atmospheric pollutants. A recent study by the Centre for Ecology and Hydrology and eftec estimated the monetary value of air pollution removed by green infrastructure within the UK. The value of SO₂, O₃, NO₂, and PM_{2.5} pollution absorption was based on a range of avoided health outcomes: respiratory hospital admissions, cardiovascular hospital admissions, loss of life years, and deaths. For the UK, health outcomes avoided were estimated at over £1 billion per year, providing strong evidence linking green infrastructure to real improvements in air quality and significant health outcomes. For the seven WMCA constituent authorities, avoided health outcomes were valued at over £46 million.

The health benefits from the UK's *urban* green and blue space had an equivalent value of 20% of the estimate for the UK vegetation as a whole, despite only comprising 7% of the UK total land area. This is partly because urban green and blue space reduces air pollution concentrations in neighbouring areas outside of the urban extent, and also because the majority of the UK population live in urban areas, highlighting the particular importance of green infrastructure for air quality improvements in urban settings.

- 14.23 Co-benefits include mental and physical benefits associate with exposure and access to the natural environment and green space, reduced urban heat-island effects, and increased ecological resilience and biodiversity. Economic benefits can arise as an area is seen as more desirable to visitors and existing and future residents.

Box 39 Birmingham Green Living Spaces Plan^{129 130}

Birmingham was the first city in the UK to undertake a comprehensive assessment of GI using the National Ecosystem Assessment approach. The value of ecosystem services delivered by vegetation was estimated at £11.66m per year. A multiple challenge map was created, showing the extent to which the multiple functions of green living spaces are meeting their full potential. This formed the basis of Birmingham's Green Living Spaces Plan, adopted with the Birmingham Development Plan 2031. This Plan introduced seven key principles, that are cross-cutting in their nature to help drive the required integrated approach; to further embed this these seven principles were adopted across the wider planning framework. The plan also included a proposal for creating access to Birmingham's network of rivers and canals, making it the basis for a citywide grid of trails and pathways. Revitalization of the canal system in the city centre has increased visitors who come to enjoy the waterfront atmosphere. Birmingham has declared its intention to be green and sustainable city, and is a leader in making connections between health and nature.

Box 40: WMCA interventions Healthy Streets

WMCA can pursue the following interventions:

Place Making

- Adopt design and regeneration policies that promote streets as part of discrete and wider communities, and to minimise the effects of the road as a barrier to movement within a neighbourhood.
- Upgrades and works to increase road and junction capacity should be reassigned to support long-term modal shift and place making rather than to accommodate increased traffic flow by ensuring non-car travel modes are accommodated in any proposed road upgrades.

Shared Space

- The KRN and local authority roads should be screened to identify where shared spaced

¹²⁷ •CEH and eftec (2017). Developing estimates for the valuation of air pollution removal in ecosystem accounts.

¹²⁸ •ONS (207). Physical (non-monetary) and monetary estimates of pollution absorption by vegetation in 2015 - supplementary information

¹²⁹ Birmingham City Council (2013). Green Living Spaces Plan

¹³⁰ UK NEA (2011). National Ecosystem Assessment

design may be adopted positively;

- The WMCA may work with local authorities and regeneration and planning partners to define how it may be best adopted in the local context.
- The adoption of shared space should be included in future planning and development guidance, and recognised as a viable approach to reassigning road space and promoting complementation aspirations, such as modal shift.

Green Infrastructure

- A policy and supporting guidance template should be adopted in order to advise local authorities, charities, NGOs, community groups and developers how to design green infrastructure to ensure it has a positive effect, similar to the Handbook on Green Infrastructure Planning, Design and Implementation¹³¹ and the Green Infrastructure to Combat Climate Change document.
- Support further research into the benefits of green infrastructure such as those being undertaken at Birmingham University.

Policy Links	Theme Links
	KRN upgrades Modal shift Health contingency Planning coordination Communities

Table 20: Appraisal Scoring – Healthy Streets

Theme	Local Air Quality		Climate Change (GHG)	Timescale	Implementation			Total
	Magnitude	Extent			Cost & Feasibility	Inclusion & Accessibility	Economy	
Place Making	2	3	2	2	2	3	3	432
Shared Space	1	3	1	2	2	3	3	108
Green Infrastructure	3	3	1	2	2	3	2	216

¹³¹ University of West of England (2015) Handbook on Green Infrastructure Planning, Design and Implementation, Edited by Danielle Sinnett, Nick Smith and Sarah Burgess

15. Data Technical Practice Network

- 15.1 There is a need to recognise and adopt new technologies in order to keep up with demands on the West Midlands infrastructure. Therefore, technology will be most beneficial where it can be used consistently across the whole region in a unified approach to ensure the most successful and efficient adoption.

Technical Support

Training & Data Handling

- 15.2 The local authorities have a limited capability and resource to dedicate to local air quality management (LAQM), which includes periodic review and assessment reporting to DEFRA, but also routine maintenance of monitoring equipment and data, and potentially modelling resources. The responsible officers will also maintain oversight for planning and development screening and review process.
- 15.3 The WMCA is ideally placed to provide an objective central resource for technical support and training, to provide objective and consistent advice and links to appropriate guidance or tools, and to enable officers to focus on key deliverable tasks.
- 15.4 The opportunities for training would be identified based on the needs of air quality officers, but also through multidisciplinary needs, where it is recognised that engagement with planning, highways public health, etc, are essential to achieve long-term and sustainable understanding. Therefore training would encompass both technical workshops relating to modelling and emissions, but also wider awareness training and networking to demonstrate how LAQM can be used as a positive driver and KPI.
- 15.5 The data processing services would provide an opportunity for individual local authorities to outsource routine calculation work, such as diffusion tube bias and seasonal adjustments, or automatic analyser data ratification. These are not explicitly onerous tasks, but are undertaken rarely (typically annually) and relieving the officers of this duty would increase the time available to interpretation of the results. This service would complement the work already being undertaken by individual districts and groups, but would also ensure consistency is applied across the whole region and provide the resources necessary to collate and manage large amounts of data in a useful and accessible database that prepares the groundwork for a potential public gateway.
- 15.6 The WMCA would also provide a help-desk role to respond directly to local authorities, and coordinate links to technical specialists within the TfWM and the wider WMCA, key specialists in other districts, stakeholders (such as WM Air) and potentially external suppliers. This is a specifically key role in promoting communication and engagement at a technical and implementation level that will support wider dialogues and ownership of managing emissions.
- 15.7 In summary, the WMCA would coordinate access to technical resources to train, audit and advise district authorities on local air quality management, action planning, annual reporting to Defra, and the installation, operation, processing and interpretation of monitoring data.

Air Quality Monitoring

- 15.8 Air quality monitoring is used to determine baseline conditions, demonstrate compliance with air quality limit values and objectives, and indicate the effects resultant from implementing specific schemes.
- 15.9 The local authorities in the West Midlands operate a significant number of passive and automatic monitoring sites, predominantly to measure NO_x/NO₂ and particulate matter (PM₁₀/PM_{2.5}). DEFRA operate several sites as part of the Automatic Urban and Rural Network

(AURN), which is used to report national compliance, and to inform local air quality management review and assessment.

15.10 WM-Air (the West Midlands Air Quality Improvement Programme) is a 5-year programme of activities led by the University of Birmingham and funded by the UK Natural Environment Research Council to apply existing environmental science expertise to improve air quality and health in the West Midlands region. WM-Air will provide improved understanding of pollution sources and levels in the region, and new capability to predict air quality, health and economic impacts of potential policy measures, in support of local and regional strategies and actions. The WMCA and TfWM are partners in WM Air, alongside major regional stakeholders such as the local authorities, HS2 and the Birmingham & Solihull NHS Sustainability & Transformation Partnership. WM-Air is coordinating installation and operation of novel sensor networks, focussing upon PM_{2.5}, that can be used to supplement and complement the existing passive and reference-method equipment. These monitoring networks represent an opportunity to demonstrate a significant temporal and spatial record, although access can be disparate and uncoordinated across the wider area. Users who are not familiar with the various data-sets, such as the public or non-air quality discipline specialists, may not be aware how the AURN and WM Air are inter-related, or how local bias adjustment and colocation is managed to ensure interoperability.

Emissions Inventory

15.11 An emissions inventory is a database that lists, by source, the amounts of pollutants released into the atmosphere during a given time period, typically one year, within a specified geographic area. Development of a comprehensive emissions inventory is an important component of air quality management. Emission inventories can help to identify the most significant sources of pollutant emissions, facilitate the analysis of temporal and spatial variations in emissions, and provide input data for use in dispersion modelling.

15.12 Emissions inventories may be compiled using many different methods depending on the availability of data and resources. Accurate continuous monitoring techniques are the preferred methods for the measurement of actual emissions from sources. Where the durations of emissions measurements are limited they may be statistically extrapolated to provide annual emissions estimates and monthly summaries. However, continuous monitoring is not usually feasible for main sources and emissions processes. Instead emissions are calculated by combining published emission factors with activity data to estimate emissions.

15.13 An inventory does not explicitly focus on local scale emissions, such as emissions from a discrete road link, but is designed to consider the strategic emissions profiles and to track and report the large-scale trends and patterns across the region. This means it can complement different scales of assessment and reporting to ensure larger effects are properly recognised.

15.14 The EMEP/EEA Guidebook (2016) ¹³²suggests that emission inventories may be suitable for:

- defining environmental priorities and identifying activities responsible for problems;
- setting explicitly objectives and constraints;
- providing information to policy makers and the public;
- assessing the potential environmental impact and implications of difference strategies or plans;
- evaluating the environmental costs and benefits of interventions;
- monitoring the state of the environment to gauge whether targets are being achieved; and
- monitoring policy action / interventions to ensure that the desired effects are being achieved.

¹³² <https://www.eea.europa.eu/publications/emep-eea-guidebook-2016>

Discrete Emission Sources

- 15.15 Small emission sources, such as domestic boilers or Part B industrial installations, may represent relatively minor contributions when considered in isolation, but can be significant across a wide area. These types of cumulative sources are included in an emissions inventory based on a defined profile¹³³, and so may be quantified in terms of regional effects using annual mass emissions or damage costs (see Section 5.33).
- 15.16 Large scale developments, such as those that may be associated with Local Plan allocations specifically represent significant cumulative emission sources with long terms effects in terms of the types of energy demand, and also may have complex interactions in terms of local and regional generation sources. This is complicated further where national policy is involved, such as the Committee on Climate Change (CCC) advice to the UK government to ban the installation of gas heating boilers by 2025 in favour of alternative technologies, such as ground-source heat pumps, to complement increasingly effective building efficiency standards¹³⁴.
- 15.17 Therefore, the emissions inventory may be used to track and project how these cumulative sources affect the regional emissions profile, and inform how adoption of alternative fuels or technologies may be used to achieve tangible benefits. This may specifically support the adoption of district energy systems or energy from waste.

Domestic Solid Fuel Stoves

- 15.18 Domestic wood burning was identified in the UK National AQ Strategy as a potentially significant emission source, although there is limited evidence in the West Midlands region to confidently determine the contribution of pollutants from this source, and how it aligns with public exposure. The WM-Air project will provide some observational constraints (via PM source apportionment) on biomass burning contributions to PM at selected points in the West Midlands.
- 15.19 The local authorities do not currently have resources to properly enforce the sale of non-compliant stoves, or the sale and use of inappropriate fuel. Therefore, the two key opportunities are:
- Use the Technical Practice Network and emissions inventory (see above) to determine the extent of the domestic solid-fuel burning, and the potential contribution this makes to regional emissions.
 - Support the local authorities in raising public awareness through the communications measures (see Section 17) of the legal compliance required, and the potential health effects resultant from solid-fuel burning both outside and inside the home.

Generator Sets & Small Static Diesel Engines

- 15.20 Diesel generator sets (gensets) may be used to provide power for a variety of reasons where it may not be feasible to connect to the main grid, such as construction works, or in large buildings to provide emergency back-up power supplies. They may vary considerably in power generating capacity depending on the requirements.
- 15.21 Where generators are located at ground level they will release exhaust at a low level and are unlikely to achieve efficient dispersion. This will increase the likelihood that members of the public will be exposed to pollutants.
- 15.22 Diesel generators are used in buildings to provide emergency back-up power supplies, and operate when the main power fails (as an uninterrupted power supply) and are tested periodically (typically monthly). Smaller units are also used for construction work and incidental use where a grid connection may not be feasible (e.g. temporary fairs or public events).
- 15.23 These engines effectively start very quickly from cold, and can lead to very high instantaneous emissions of NO_x and PM (as soot), which also limits the efficacy of the abatement technology that may require a high exhaust temperature. Whilst the engines may typically only operate for

¹³³ https://www.london.gov.uk/sites/default/files/domestic_boiler_emission_testing_report.pdf

¹³⁴ <https://www.newscientist.com/article/2194603-ban-gas-boilers-for-new-uk-homes-by-2025-says-climate-report/>

short periods, during this time they will significantly contribute to local pollutant concentrations and the likelihood of breaching the short-time hourly objective for NO₂, as well as contributing to the background pollutant concentrations.

15.24 Therefore, the presence and proposed operating parameters should be included in planning applications, and the local air quality effects clearly presented for consideration to the air quality officer. Where significant effects are predicted to occur, then appropriate mitigation should be implemented in terms of abatement and general design.

Box 41: WMCA interventions regarding a data technical practice network

WMCA can pursue the following interventions:

Technical Support

- **Coordinate access to technical resources to train, audit and advise local authorities on local air quality management, action planning and annual reporting to Defra as well as the installation, operation, processing and interpretation of monitoring data.**
- **Collate and curate monitoring data in a central portal, along with clear information about how, where, when and why data is collected as well as quality control information to ensure the data is used and interpreted correctly. The data would ideally be presented as an interactive GIS and data selection, with regards to user requirements and understanding.**
- **Provide ad-hoc advice to local authorities regarding local air quality management.**

Emissions Inventory

- **Operate a strategic regional emissions inventory, to objectively record and report major emission sources, such as road, rail, air, domestic, industrial and energy, and to project future conditions. This may also be used to inform and validate long-term strategic strategies and 'war-game' intervention scenarios.**
- **The inventory would be used to report local (e.g. NO_x) and regional (e.g. CO₂) pollutants, and provide essential links to public health planning and economic assessment.**
- **The inventory should be continuously updated and improved by identifying specific source groups and undertaking validation exercises, such as domestic emissions audits, to ensure emission rates are accurate and verifiable, as well as being linked to real-world trends. This will ensure it is robust and accurate.**

Discrete Emission Sources

- **Consider the potential impacts of non-permitted industrial, commercial and domestic emission sources over the lifetime of a development, with regard to projected energy demand,**
- **Identify where specific emission sources should be included on planning applications and ensure appropriate mitigation.**
- **Work with partners to identify potential gaps in the emissions inventory and evidence baseline, such as contributions from wood burning stoves, and implement a programme to collect data.**

Policy Links	Theme Links
Defra's Local Air Quality Management Review and Assessment procedures	Planning guidance Air quality monitoring Emissions inventory Public engagement Communication

Table 21: Appraisal Scoring – Technical Practice Network

Theme	Local Air Quality		Climate Change (GHG)	Implementation			Total	
	Magnitude	Extent		Magnitude	Timescale	Cost & Feasibility		Inclusion & Accessibility
Technical Support	1	1	1	1	3	1	1	3
Emissions Inventory	1	1	1	2	3	1	1	6

16. Technology & Innovation

- 16.1 The design and adoption of new technology is rapidly changing how air quality and emissions are monitored and managed; low cost sensors are increasingly being used to complement the more complex reference methods in order to track and share useful data. Online resources are increasingly mobile and targeted towards increasing engagement and empowerment. Travel choice and MaaS is changing how and why people travel, with access to zero-exhaust emission vehicles, electric bikes and application of high-tech solutions to exhaust abatement.
- 16.2 Furthermore, the region has technical and commercial capabilities represented by groups such as the Birmingham and Warwick University behavioural science networks, and the Birmingham University environmental observatory. There are also world-class companies, such as Jaguar-Land Rover based in the region, who actively engage with opportunities to test and implement novel technologies. The Future Mobility Zone was designated in 2018 to capitalise on transport innovation in the region, and has been specifically recognised in the DfT Future of Mobility: Urban Strategy¹³⁵ as an aspirational example of good practice.

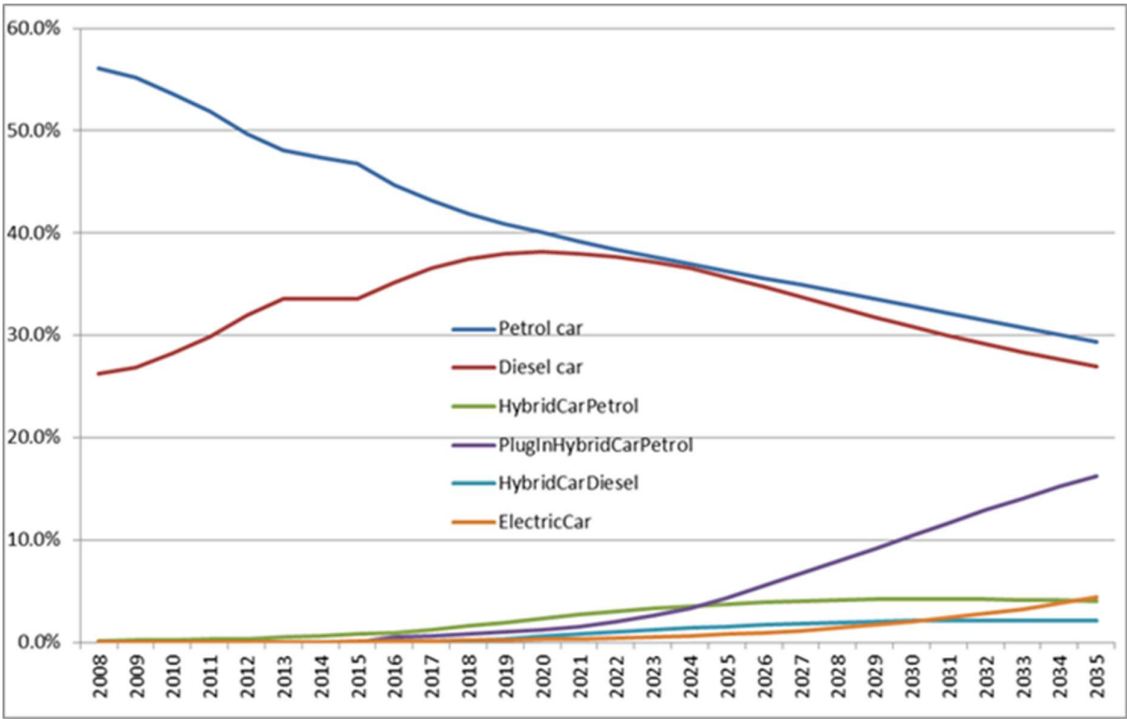
Adapting to Fuel and Energy

- 16.3 Fuel technology projections are an intrinsic part of planning for the adoption and management of new transport technology, where planning must recognise opportunities to promote and enable those technologies with beneficial effects, and discourage risks. For example, diesel fuel was promoted by central government due to the CO₂ savings, but relatively recent understanding of the increased local air quality effects have led to a revaluation of this approach.
- 16.4 A diverse fuel technology can also have benefits in terms of a robust supply chain by avoiding single-source dependency. However, there may be costs related to the adoption of multiple supply frameworks. Therefore, the projections may be used to indicate how the major fuel sources may be best adopted to ensure long-term resilience, whilst promoting low emission options and essential links to energy and technology supply chains, and long term development and procurement planning.
- 16.5 Figure 24 is extracted from the EFT projections for cars (v8.0.1)¹³⁶, and assigns peak-diesel to 2020, with both petrol and diesel fuelled cars then declining in parallel to reflect an uptake of hybrid. The specific fast growth of PHEV may be optimistic with the loss of the grant for this vehicle-type in early 2019, although the industry expectations are for the overall trend to shift towards a broadly 30% split for each of the major fuel-types in 2030. It should be recognised this is based on the national fleet projections, and does not consider the age-breakdown, which is increasingly complex due to effects such as a year-on-year decreased depreciation of older diesel vehicles, which have seen increased demand in Q1 of 2019 due partly to a lack of new diesel options being offered by manufacturers.

¹³⁵ <https://www.gov.uk/government/publications/future-of-mobility-urban-strategy>

¹³⁶ <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

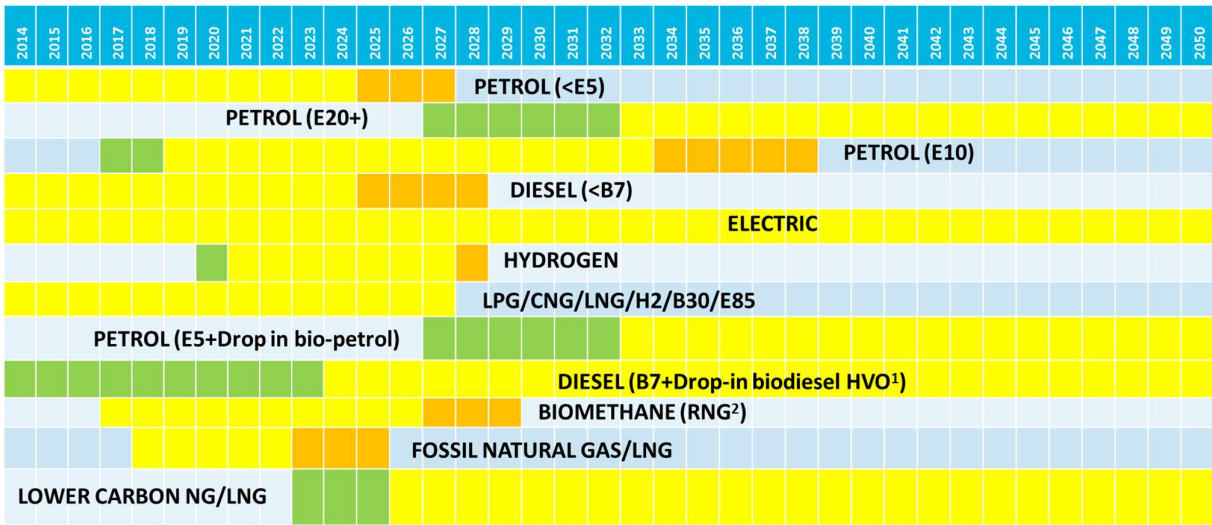
Figure 24 EFT v8.0.1 Fleet Fuel Composition Projections



Source: EFT v8.0.1

- 16.6 The projections summarised in Figure 25 indicate that as we approach mid-2020’s fossil-derived petrol and diesel will decrease, whilst electric will continue to be a strong component. However, as Bio-fuels become more prevalent to it is expected that new engine technology allow us to further develop ICE as low-carbon and low-emission, such as compression-ignition petrol engines alongside significant adoption of micro-hybrid and energy harvesting. Therefore, in the short and medium-term it is expected the fleet will represent a very complex mix of fuels and technologies.
- 16.7 The WMCA should ensure it has a good understanding of emerging technologies and market adoption, and ensure that appropriate policy and infrastructure is placed to support this.

Figure 25 Projected Fleet Fuel Composition

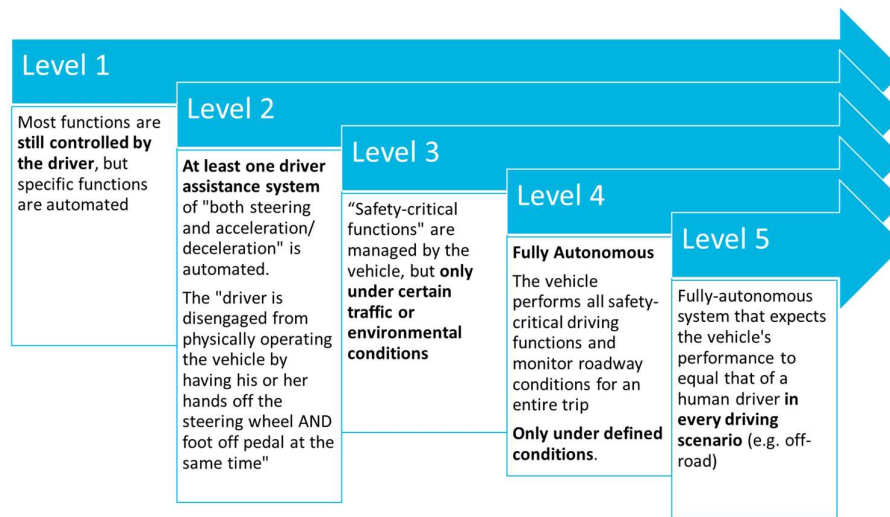


Source: AECOM Review, 2018

Autonomy

- 16.8 The growth of autonomous transport technology has received a significant amount of publicity from manufacturers and columnists, although the West Midlands Future Mobility programme review¹³⁷ recognises that adoption has been more complex, and the implementation cautious due to both technological and legislative realities.
- 16.9 An Autonomous car or Unmanned ground Vehicle (AUV) is a transporter that is capable of sensing its environment and navigating without human input. Connected Autonomous Vehicles (CAVs) are connected to the environment and other vehicles to improve efficiency and safety, where the technology gap is bridged using Connected and Intelligent Transport Systems (CITS). Figure 26 outlines the convention for the different levels, although research indicates that Level 3 and 4 may be impractical in real-world conditions due to a loss of driver focus, and so current commercial applications in the UK are focussing on Level 1 / 2 in the short-term. Level 5 is a long-term aspiration, where the WMCA may specifically fulfil a role through facilitation and enabling uptake with new infrastructure.

Figure 26 Types of Autonomy



- 16.10 With consideration to the limits of technology, transport operators must consider the effects on emissions and local air quality that may arise through the increased use of personalised transport solutions (Uber, taxis and private licenced cabs), and how they can promote and validate policies, impacts and encouragements to use EVs and new technologies. The questions that arise include:
- Where will the CAV operate, and will this be mainly defined strategic routes, such as motorways, or controlled urban roads, and how will they integrate with traditional vehicles.
 - How will the operation of CAV be represented in the emissions profiles, where they operate at very high, or very low speeds, and what fuel types will be used?
 - How will CAV be used, where we may expect increased use of personalise transport. Will users routinely drive further because of increased working and use opportunities in connected vehicles, and will they contribute to a change in way public transport is accessed?
 - Where CAV lead to increased monetisation and personalisation of transport, will this contribute to increased traffic and a larger number of short journeys, but with fewer total number of vehicles in the fleet?

¹³⁷ <https://midlandsfuturemobility.co.uk/>

Connected Intelligent Transport Systems

- 16.11 With reference to the development of AUVs and autonomy discussed above, the adoption of connected vehicles and Intelligent Transport Systems (CITS) is a realistic short-term and aspiration, and long-term development opportunity. This type of system is starting to emerge by linking regional transport control systems (e.g. SCOOT), individual vehicles communications and information displays (e.g. online sat-nav), and vehicle emission controls¹³⁸.
- 16.12 CITS is agnostic in terms of fuel type or vehicle classification, and can be scalable and modular, so may be used for specific fleets (e.g. buses) or part of a volunteer-led private vehicle management system.
- 16.13 The future of CITS is not yet clearly defined, although it clearly supports a range of technology aspirations, and provides essential bridges between different levels of communication, control and autonomy. Therefore, the WMCA should monitor how this is being implemented and identify early opportunities to link partner organisations and provide enabling infrastructure to maximise the benefits.

Box 42: WMCA interventions regarding technology

The WMCA may pursue the following interventions, which are essential to ensure a robust approach to supporting the adoption of emerging technologies and ensuring appropriate infrastructure are resource are in place to support projected changes.

Adapting to Fuel and Energy

- The WMCA should ensure it has a good understanding of emerging technologies and market adoption, and ensure that appropriate policy and infrastructure is in place to support this.
- The WMCA needs a flexible and cautious recognition of how new technologies are adopted, and to specifically ensure the socioeconomic effects are properly monitored to that unforeseen detrimental effects are identified as soon as possible.

Autonomy

- The WMCA should maintain a non-partisan strategic oversight and awareness of these fast-moving trends, to work with partners and stakeholders to understand what trends are likely to represent significant future considerations, which may have limited application, and how the regional and local authorities can respond and adapt.
- Technology champions should be appointed to identify connections between innovations and real-world applications, and to actively engage with stakeholders and suppliers. The champions will represent a communication framework for suppliers and innovators to work with the WMCA to track opportunities and build partnerships.

Connected Intelligent Transport Systems

- The WMCA should monitor how this is being implemented and identify early opportunities to link partner organisations and provide enabling infrastructure to maximise the benefits.

Policy Links	Theme Links
Future of Mobility: Urban Strategy Local Industrial Strategy	Emerging technology Innovation

¹³⁸ <https://ts.catapult.org.uk/project-accra/>

Table 22: Appraisal Scoring – Technology and Innovation

Theme	Local Air Quality		Climate Change (GHG)	Implementation			Total	
	Magnitude	Extent	Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility		Economy
Adapting to Fuel and Energy	1	1	1	3	1	3	1	9
Autonomy	1	1	1	3	1	2	1	6

17. Public Engagement

- 17.1 Public engagement and awareness is used to garner support through understanding, and also to encourage personal ownership and responsibility. The WMCA has a specific role to provide branding, training and awareness for key stakeholders, and to support local authorities by accepting strategic responsibility for the leadership role.
- 17.2 Effective engagement can include aspects of different types of consultation, and so it is important to have a clear concept of the objective; e.g. awareness, opinions, behaviour. The different pathways for consultation and engagement can include:
- **Consulting:** a formal process of collecting feedback on proposals (for example, to shape policy)
 - **Engaging:** a participatory process of involving a person or group in a subject, seeking their views or encouraging them to act (see example below).
 - **Informing:** telling people about something (e.g. cities such as Madrid, Milan, Paris and Vienna use social media and/or smartphone apps to communicate air quality issues)

Box 43 Examples of Consultation, Engagement and Information

Example of a consultation on air quality policy	Example of engagement to raise awareness and collect data	Example of a Public Exposure Information App
<p>The mayor of London has declared a 'public health crisis' that triggered a public consultation in 2017 and received 18,126 responses.</p> <p>Key aspects:</p> <ul style="list-style-type: none"> • Spearheaded by a high-profile political spokesperson (Mayor of London) • Placed in the context of a "public health crisis" • Phased approach – initial consultation on a range of proposals followed by a number of specific consultations on formal proposals • Use of infographics and diagrams to illustrate the need for a new policy 	<p>The Curious Noses air quality monitoring project was undertaken in Flanders, Belgium, May 2018, and engaged 20,000 citizens to measure air quality near their home.</p> <p>Key Aspects:</p> <ul style="list-style-type: none"> • Project launched by well-known Flemish personalities via a large media campaign that included a promotional video appearing on TV • Claimed to be biggest ever citizen investigation into air quality (20,000 citizens selected from 50,000 applications) • Selected citizens sent low-cost air quality monitoring devices to install across their houses, schools or businesses. Device included two diffusion tubes and recorded the mean concentration of nitrogen dioxide (NO₂) over one month (May 2018) • 90% of samples passed quality control, enabling the creation of a detailed map of air quality across Flanders (including cities and the countryside) and providing a direction for future research 	<p>The app developed by British Safety Council and the Environmental Research Group at King's College London have developed a mobile app to help outdoor workers avoid exposure to London's air pollution and reduce pollution related deaths.</p> <p>Key aspects:</p> <ul style="list-style-type: none"> • Companies apply to use the professionals-only app, which combines air quality data with the worker's GPS signal to calculate "location-specific air pollution exposure over the user's working duration" • Data generated by the app will inform users about the risks of operating near to traffic producing diesel and petrol fumes, and assist with job scheduling • Once exposure crosses a certain limit app will message the user to suggest tips for reducing exposure, (i.e. taking breaks, using a pop-up barrier or seeking alternative routes)

Public Health

17.3 The core objective of reducing emissions and improving local air quality is to improve the quality of life and achieve benefits to health and well-being. The societal health effects due to exposure to air pollution have been quantified as more than £20 billion annually in the UK, and recent studies have indicated that 8.8 million deaths globally per year can be attributed to air pollution, in Europe it has been attributed to 790,000 annual deaths and in the UK it is linked directly to 64,000 deaths and more than 29,000 indirect deaths¹³⁹.

¹³⁹ Jos Lelieveld et.al. (2019) Cardiovascular disease burden from ambient air pollution in Europe reassessed using novel hazard ratio functions, European Heart Journal, Volume 40, Issue 20, 21 May 2019, Pages 1590–1596

- 17.4 The health effects are not distributed equally, and often disproportionately affect societal groups with limited income or other constraint, and are least able to respond to either poor air quality, or the interventions that are introduced to tackle it. For example, electric vehicles are promoted to improve poor air quality, although these are relatively more expensive to purchase than a petrol/diesel car, and those members of society who could benefit from the local air quality improvements are least likely to be able to afford to buy one.
- 17.5 The NHS, A&E, ambulance services and GP surgeries will experience the direct effects of air quality on health, due to either long-term chronic exposure, or short-term acute exposure during major pollution episodes. Therefore, it is essential that the NHS is engaged with the WMCA to measure the effects of interventions and to ensure they are targeted towards the most vulnerable social groups.
- 17.6 Public Health England also has a key role in representing and engaging with health professionals and liaising with stakeholders, public authorities and the public. This is an essential role to ensure engagement and understanding, and to provide independent oversight
- 17.7 Therefore, the WMCA can track the societal and health benefits that may be associated with both targeted air quality interventions, but also as indirect outcomes from other schemes. The data in Section 4 identifies the sensitive areas in the region, where specific opportunities and risks may be present, with regard to changes in air quality. These are considered to be Key Priority Areas, and should be identified as a component of the screening stages to ensure the health effects are properly identified and used to inform appraisal, detailed design and mitigation.

Public Notifications

- 17.8 Targeted engagement and information is essential for individuals to make informed and knowledgeable decisions. Therefore, access to accurate and unbiased data about pollution episodes can be used by key sensitive groups to alter their own behaviour appropriately, and to respond to significant events. This would support individual empowerment and enabling improved travel choice.
- 17.9 Engagement should be tailored for maximum impact by choosing a few key messages and clearly defined audiences (e.g. business/commuters, freight, schoolchildren). Access to information may be using text, email and new or novel media and messaging tools, so it is accessible as possible.
- 17.10 It is essential to recognise that access to information is not sufficient in isolation for the users to make an informed decision, as this assumes a pre-existing level of knowledge and understanding. Therefore, to achieve the greatest benefit the users must be provided with support in the form of individual travel planning, and basic advice and recommendations to reduce individual exposure.

Box 44 Example of a Public Information Campaign to Inform and Engage¹⁴⁰

The Friends of the Earth's charitable group operate a national Clean Air Campaign providing infographics, and statements of fact and ambition in a user-friendly and accessible way. The web portal is a main access point for users and comprises:

- User-friendly, responsive webpage that presents information in a clear and ordered way
- Mix of media: interactive graphics, video
- Clear calls to action (e.g. donate now)
- Focus on data and citizen science with a [Clean Air Kit](https://friendsoftheearth.uk/clean-air) sub-project, to provide individuals are grass-roots organisations access to suitable equipment and support.

- 17.11 The success of many campaigns will hinge on their reach, which can be enhanced by effective promotion. This can include, but is not limited to:

¹⁴⁰<https://friendsoftheearth.uk/clean-air>

- Using local press/media – especially for editorial rather than news releases
- Social media campaign – with messages and visuals tailored to channel
- TV adverts
- Radio campaigns – work particularly well to target commuters during peak times
- Working directly with community groups in target areas – cities such as Antwerp and Paris have both created dedicated spaces for citizens to test air quality and try out new technologies. This multi-disciplinary approach to tackling air quality issues creates a sense of buzz around the topic
- Producing “communication toolkits” that can be shared with partner organisations and tailored by them (see, for example, the Clean Air Day case study above)

17.12 The area of community working lends itself well to technology-based engagement. For example, a number of regions have developed apps that citizens can use to sign up for air pollution alerts and find low air pollution routes (e.g. London’s CityAir app¹⁴¹). There are also a number of services that allow users to sign up for air quality SMS alerts (e.g. airTEXT¹⁴²). Some cities in Europe (e.g. Antwerp) have an alert service that contacts all citizens when air quality is (or is expected to be) low¹⁴³.

Box 45 Example of working directly with community groups

StadLab2050 works with local schools in Antwerp as part of the Pure Air project to operate a pilot project for public engagement and citizen science until summer 2020:

- Five primary and secondary schools in Antwerp were selected (from 25 applications) to work with the school team, pupils, parents and the neighbourhood in 2019 to improve the air quality at their school
- Support from multiple sources: the city, air quality experts and the urban laboratory Stadslab2050 as part of the European ‘Clean Air Project’
- Set up experiments to find out the best methods to improve air quality (i.e. education, design, infrastructure, technology)

17.13 Public engagement initiatives should be supported by other programmes that are already in-place, or discussed in this document. These should focus on Travel Choice to enable users to make informed decisions, where the effectiveness of such systems is dependent on the procedures and preparation, and discussed below in Health Contingency Planning section as part of a step-wise procedure shown in Figure 27.

Figure 27 Alert Response



17.14 The advice should include a basic amount of evidence-based information, to reassure the users and ensure they engage and trust the provider. This would complement a tool-box of responses that can empower the users to make decisions that build on the individual travel planning advice. Such a toolbox may include:

- Route planning to avoid busy roads;
- Live traffic data;

¹⁴¹ <https://www.cityoflondon.gov.uk/business/environmental-health/environmental-protection/air-quality/Pages/New-CityAir-App.aspx>

¹⁴² <https://www.airtext.info/signupsmsvoice>

¹⁴³ https://ec.europa.eu/futurium/en/system/files/ged/5_ua-paq-communication_toolkit_on_communicating_on_air_quality_and_health.pdf

- Responses tailored to the types of pollution, such as particulate or ozone, as this may alter the potential exposure pathways;
- Projected episode occurrence, to inform when aerobic activities may be best avoided;

Box 46 Example of a public information campaign to change behaviour¹⁴⁴

The annual national UK Clean Air Day campaign is a core event to increase the profile of local air quality management, and includes useful tools to increase personal awareness and engagement, and support local action to change emissions and exposure:

- Toolkit of resources available to allow individuals and groups to amplify key messages (including guidelines on local event planning)
- Engagement concentrated in a single day; recurrence and regularity allow for deepening relationships with stakeholders and improving year on year
- Single day of action facilitates press coverage
- Clear branding

Health Contingency Planning

- 17.15 Public health management is a core objective for air quality management and emissions reduction, due to potential health response to acute and chronic exposure to pollution.
- 17.16 Contingency planning encompasses plans that are prepared to respond to significant air quality events, such as sustained pollution episodes due to meteorological or climatological conditions. There is uncertainty how conditions will respond to climate change effects in the short, and long-term, future and so contingency plans would increase readiness for a potential increase in hospital emissions that may arise.
- 17.17 Plans would utilise prepared triggers to coordinate an approach encompassing local authority public health services, schools, GP surgeries, sheltered accommodation, NHS ambulance and primary care trusts. The plans may encompass several responses, including preparation for a potential increase in respiratory admissions, and notifications through an alert system so individual measures can be implemented for individuals to reduce their exposure.
- 17.18 Hospital admissions could be reduced should people be enabled to respond effectively to alerts about air quality. However, data from airAlert has indicated that a significant number of people needed to be participating and taking appropriate action to avoid 1 admission over 6 years for Chronic Obstructive Pulmonary Disease (COPD), with larger number of participants to achieve measurable reductions of asthma incidents¹⁴⁵.
- 17.19 Therefore, successful effects require more than providing access, but also to ensure the information is used appropriately. The WMCA should create a working group that represents stakeholders to represent public health groups who will disseminate coordinated information, and ensure a consistent response is implemented amongst primary health providers.

Monitoring and Validation

- 17.20 Air quality monitoring and meteorological data is essential to validate and verify a regional prediction network. This would be undertaken in collaboration with existing monitoring carried out through LAQM in cities across the region, and new measurements being undertaken by a range of parties including the WM-Air project, outlined in Section 5.
- 17.21 Furthermore, the effectiveness of a public information system must be continuously monitored to ensure it is accessed by the most vulnerable social groups, and that it provides useful information that can be, and is, acted upon. There have been numerous examples of alert programmes that have not achieved tangible benefits due to poor long-term adoption.

¹⁴⁴ <https://www.cleanairday.org.uk/Default.aspx>

¹⁴⁵ King College, <https://www.kcl.ac.uk/lsm/research/divisions/aes/research/ERG/research-projects/airAlert>

Therefore, the whole system should be periodically audited and updated to reflect usage statistics with an ambition to achieve defined indicators and thresholds, such as the number of regular users.

17.22 The WM Air network and overall engagement programmes may also be enhanced with citizen science programmes, such as the Barbican project, coordinated by for Change and the City of London, where residents managed a passive monitoring network for 12-months in 2017¹⁴⁶.

Box 47: WMCA interventions regarding public engagement

The WMCA may pursue the following interventions.

Public Health

- Coordinate communication between key stakeholders to ensure tools and information are effectively shared.
- Assign resources to track public health using local air quality and exposure as an indicator.

Public Notifications

- Routinely publish information about air quality such as developing an app to share this information
- Publish and manage tools to ensure sensitive individuals have access the most useful information
- Work with key stakeholders to define an alert response and provide the necessary tools to empower individuals to change behaviour to reduce exposure.

Health Contingency Planning

- Create a working group that represents stakeholders to represent public health groups who will disseminate coordinated information, and ensure a consistent response is implemented amongst primary health providers. This will ensure information is not only accessible but also to ensure the information is used appropriately.
- Link the public health and notifications interventions to focus on front-line health management so that information is freely available, and that a range of proactive and reactive responses can be implemented to reduce hospital admissions.

Monitoring and Validation

- Work with WMAir and other air quality and health monitoring partners to record and report how exposure changes with time, and to feed back into the management and alert programmes.

Policy Links	Theme Links
	Communication Monitoring Technology

¹⁴⁶ http://mappingforchange.org.uk/2017/04/mapping-for-changes-barbican-project-in-the-crowd-and-the-cloud/?_sm_byp=iVVs7HjsTWMK7P77

Table 23: Appraisal Scoring – Public Engagement

Theme	Local Air Quality		Climate Change (GHG)		Implementation			Total
	Magnitude	Extent	Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	Economy	
Public Heath	1	3	1	2	3	3	1	54
Public Notifications	1	3	1	2	3	3	1	54
Health Contingency Planning	1	3	1	2	3	3	1	54
Monitoring and Validation	1	3	1	3	3	3	1	81

18. Funding

- 18.1 Improving air quality has typically been perceived as costly, in terms of capital and maintenance, as well as potential social upheaval or disruption in the case of significant infrastructure schemes. Therefore, understanding the funding mechanisms and opportunities may alter, or refine, the implementation of a proposed scheme.

Funding Coordination

- 18.2 The WMCA has a unique political and logistical opportunity in the region to provide non-partisan and holistic oversight, and so is able to recognise common funding themes in terms of availability and applications. Specifically, the WMCA is ideally placed to link funding applicants to suitable partner organisations to increase the robustness of applications, and also to ensure that multiple applications can be coordinated to increase the success rates and overall potential benefits.
- 18.3 The funding coordination would also ensure that applications are tracked and quantified using a consistent toolkit of indicators and measurables, which would inform the level of support the WMCA would be obliged to provide. For example, anticipated changes in air quality could apply the damage cost approach to indicate the potential effects and to represent a normalised approach to scoring and determining the level of support made available.
- 18.4 The innovation to directly sponsor drivers to switch to alternative and public transport exemplifies how the West Midlands is focussed on attracting funding and support from central government to pilot innovative new systems (see Box 48).

Box 48 Future Mobility Grant: Switch from Private Car to Public Transport ¹⁴⁷

The Future Mobility Grant is a £20M fund that is part of the Future of Mobility Grand Challenge, which is intended to improve the way people, goods and services move now and in the future. This fund is being used for a trial in the City of Coventry to sponsor drivers to give up their car in return for a grant of between £2,000-3,000 that may be used for public transport, electric car hire and cycle schemes. The funds would be provided using a travel card or smartphone app for use with approved travel choices. This trial is intended to determine how much money an individual requires before they make permanent, long-term changes to their travel routines, habits and patterns, and is starting with a core group of approximately 100 people to take part over a period of two to three years.

The TfWM transport innovation team support this initiative, which, if successful, will be extended to the whole of the West Midlands with additional funding sought from private companies including bus and train operators. Ultimately, a successful demonstrator would enable a nationwide implementation.

"We want to make it quick, easy and cheap for everyone to travel around the region by creating a range of reliable alternatives to private car ownership ... We're confident we can prove the concept in the West Midlands and show the rest of the UK the way forward."

Andy Street, Mayor of the West Midlands

Funding the Strategic Vision

- 18.5 The prioritisation metrics applied to funding are generally part of the wider objectives of the respective funding source, so whilst individual schemes may have a specific priority outcome, it is possible to link back to growth and productivity related objectives. For example, the Transforming Cities funding is currently a significant funding source for local authorities, which

¹⁴⁷ <https://www.tfwm.org.uk/news/drivers-could-receive-credits-to-ditch-their-cars-under-20m-future-mobility-plans/>

identifies productivity as the primary goal, with wider priorities (including air pollution) identified subsequently¹⁴⁸.

- 18.6 There is a trend to promote Benefits Realisation Management from SOBC stage through FBC, detailed design, construction and operation is placing the wider array of benefits/outcomes at more to the forefront of the agenda, and central government are starting to recognise that the core outcomes may be enhanced and supported by a wider array of outcomes.
- 18.7 A potential restriction of major schemes, in terms of local air quality, is how the outcomes of discrete work packages (e.g. a junction improvement) are intrinsically linked to the funding KPIs. This can lead to essential environment review and oversight being missed or undervalued in order to achieve the primary objectives and stated deliverables of individual schemes.
- 18.8 Therefore, there is an opportunity for a strategic vision that recognises air quality and emissions as a priority would provide a high-level hook to ensure that it is properly screened and appraised early in the project.
- 18.9 Furthermore, consideration may be made to review how major schemes measure success, and so change the focus from individual scheme deliverables to recognise how a long-term or wider spatial effect may be supported. This may effectively lead to lower success measurable on an individual basis, but would achieve much greater coordinated benefits in support of the strategic vision; e.g. a junction improvement may not achieve the aspired journey time reductions, but will support increased road capacity and introduction of alternative travel as part of a longer route once it is incorporated into a larger programme.
- 18.10 The risks to this approach are represented in the funding framework that may not recognise the opportunities presented by more holistic indicators. Therefore, the CA should prepare the necessary support mechanisms to ensure the concept is properly defensible and clearly beneficial.

Lobbying

- 18.11 The Combined Authority framework introduced by the Local Democracy, Economic Development and Construction Act 2009¹⁴⁹ was intended to coordinate responsibility and opportunity to implemented delegated functions more effectively than the pre-existing local and central government framework.
- 18.12 The WMCA has a role to recognise regional risks and opportunities and to use the devolved powers to support wider beneficial outcomes. Therefore, it has a unique position from which to lobby central government to either support regional aspirations, or to enable the WMCA to perform tasks through allocation of devolved powers.
- 18.13 Specific opportunities could be though the use of regional air quality management, which would intersect the existing local air quality management (LAQM) framework, and separate the local authorities from key central government services such as the Joint Air Quality Unit (JAQU). This would ensure regionally and locally awareness is incorporated into the appraisal and reporting process, and avoids the limitations presented by a centralised reporting regime.
- 18.14 Similar regional authority may be assigned to managing and reporting GHG and tackling climate change, and would accompany appropriate funding and authority to effectively implement measures based on targeted local knowledge.
- 18.15 Feedback from stakeholders during the research has indicated a growing ambition to be bolder in this area and from this research and identify high impact, difficult to implement inventions that could be unlocked after successful lobbying of Government and form future Devolution Deals.

¹⁴⁸ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786857/transforming-cities-tranche-2-applications.pdf

¹⁴⁹ <https://www.legislation.gov.uk/ukpga/2009/20/contents>

Box 49: WMCA interventions regarding public engagement

The WMCA may pursue the following interventions.

Funding Coordination

- Objectively screen funding applications against strategic objectives;
- Align applicants, providers and stakeholders to maximise the efficiency and potential outcomes from applications;
- Provide resources to support individual applications in terms of language, measurable, review, etc. and ensure applications are of a consistent high quality.

Funding a Strategic Vision

- Local and regional air quality and emission will be embedded at multiple levels of funding criteria to ensure it represents a core deliverable, and that bespoke evidence-based indicators are defined to maximise the potential benefits and minimise the risks for individual schemes.

Lobbying

- Adopt a pro-active role in representing regional interests with regard local air quality management, and promoting opportunities to implement a regional and local focus.

Policy Links	Theme Links
	Funding Planning Guidance Communication

Table 24: Appraisal Scoring – Funding Coordination

Theme	Local Air Quality		Climate Change (GHG)	Implementation				Total
	Magnitude	Extent		Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	
Funding Co-ordination	1	3	1	2	3	2	3	108
Funding the Strategic Vision	1	3	1	1	3	2	3	54
Lobbying	1	3	1	2	3	1	1	18

19. Summary

Prioritised Interventions

- 19.1 The objective scoring procedure for each intervention has identified the most viable opportunities to implement Actions with tangible benefits for emissions and associated social and economic measures.
- 19.2 Table 25 provides a summary for the scoring of sub-theme and a total using the methodology as described in Section 7. An average for each theme has then been calculated to identify which themes, actions should be developed for taking into consideration both benefits for air quality (local and regional) as well as implementation.
- 19.3 To provide additional detail, the scores for potential air quality effects have been calculated and for implementation separately.
- 19.4 The most highly scoring themes and sub-topics were as follows:
- Bus Upgrade
 - Bus upgrades to Euro VI and ultra-low emission buses
 - Refuelling infrastructure for zero emission buses
 - Travel Choices
 - Public transport MaaS
 - Commercial MaaS
 - On-demand buses
 - Travel plans
 - Highway Planning and Coordination
 - KRN upgrades
 - Changing travel behaviour
 - Healthy Streets
 - Place making
 - Green infrastructure
 - Freight Co-ordination
 - Freight technology
- 19.5 One further sub-theme was identified for which actions should be developed as, although the theme itself scored low, this specific sub-theme achieved the highest overall score.
- Planning guidance
- 19.6 The results were further interrogated to identify interventions that received scores as they were biased towards effective implementation, but would achieve low effects on emissions. From this, sifting, the following sub-topics were identified:
- Funding co-ordination
- 19.7 These actions are to be developed, coordinated and monitored by the WMCA and partners.

Table 25: Intervention Scoring and Prioritisation

Theme	Category	Local air quality		Climate Change (GHG)		Implementation			Scores			
		Magnitude	Extent	Magnitude	Timescale	Cost & Feasibility	Inclusion & Accessibility	Economy	Theme Average	Total	Emissions Only	Implementation Only
Bus Upgrade	Bus Upgrades for Euro VI and Ultra-Low Emission Buses	3	3	3	1	1	3	2	141	162	27	6
	Refuelling Infrastructure for Zero Emission Buses	3	3	3	1	1	3	3		243	27	9
	Assignment of Buses to Routes	3	3	1	1	2	1	1		18	9	2
Travel Choices	Cycling and Walking	1	3	1	3	3	3	1	142	82	3	27
	PT MaaS	2	3	2	2	3	3	2		432	12	36
	Commercial MaaS	2	3	2	2	3	2	2		288	12	24
	On-demand Buses	1	3	1	3	3	3	2		162	3	54
	Ride Hailing	1	2	1	3	3	3	1		54	2	27
	e-Bikes	1	2	1	3	2	3	2		72	2	36
	Park and Ride	3	2	3	2	1	3	1		108	18	6
	Ticketing	2	3	1	2	3	3	1		108	6	18
	Car Clubs	1	1	1	1	3	2	2		12	1	12
	Electric Vehicles	2	3	2	2	2	1	2		96	12	8
	Travel Plans	2	3	2	1	2	3	2		144	12	12
Highway Co-ordination and Modal Shift	KRN Upgrades	3	3	3	2	1	2	3	160	324	27	12
	Changing Travel Behaviour	3	3	3	2	1	3	2		324	18	6
	Traveller Information	2	2	1	2	2	3	1		48	4	12
Planning Guidance	Planning Coordination	3	3	2	2	2	3	3	83	648	18	36
	Financial Contribution	1	3	1	2	3	3	2		108	3	36

	Taxi Licensing	2	3	2	2	2	3	1		144	12	12
	School Planning	1	3	1	2	2	3	1		36	3	12
	Parking Regulations	1	2	2	1	2	3	1		24	4	6
	Vehicle Idling	1	3	1	1	3	3	1		27	3	9
Healthy Streets	Place Making	2	3	2	2	2	3	3	252	432	12	36
	Shared Space	1	3	1	2	2	3	3		108	3	36
	Green Infrastructure	3	3	1	2	2	3	2		216	9	24
Data Technical Practice Network	Technical Support	1	1	1	1	3	1	1	5	3	1	3
	Emissions Inventory	1	1	1	2	3	1	1		6	1	6
Technology and Innovation	Adapting to Fuel and Energy	1	1	1	3	1	3	1	8	9	1	9
	Autonomy	1	1	1	3	1	2	1		6	1	6
Public Engagement	Public Health	1	3	1	2	3	3	1	61	54	3	18
	Public Notifications	1	3	1	2	3	3	1		54	3	18
	Health Contingency Planning	1	3	1	2	3	3	1		54	3	18
	Monitoring and Validation	1	3	1	3	3	3	1		81	3	27
Freight Coordination	M6 Toll	2	2	3	3	1	1	3	105	108	12	9
	Urban Logistics Management	3	2	3	2	1	1	3		108	18	6
	Freight Technology	2	2	2	3	3	1	3		216	8	27
	Electric Freight	3	2	2	1	1	1	3		36	12	3
	Freight Consolidation	3	2	3	1	1	1	3		54	18	3
	Land allocations, spatial planning and fuelling strategies	3	2	3	2	1	1	3		108	18	6
	Rail freight Interchange	2	1	3	3	2	1	3		108	6	18
Funding Coordination	Funding Co-ordination	1	3	1	2	3	2	3	60	108	3	36
	Funding the Strategic Vision	1	3	1	1	3	2	3		54	3	18
	Lobbying	1	3	1	2	3	1	1		18	3	6

GHG; Greenhouse Gases. NB: Green cells indicate high scores and red low scores.

Measuring Success

- 19.8 Measuring the success, or understanding the failure, of a project is essential to provide evidence of long-term change, and to support funding opportunities.
- 19.9 The effects resultant from interventions to improve air quality can be quantified directly, using ambient monitoring (see WMAir), or using defined KPIs to record and report linked facets of a scheme or project. The benefit of using indirect measurable and indicators is to remove the effects of noise and interference, such climatological effects, or cumulative impacts from multiple programmes; e.g. roadworks occurring concurrently with an intervention scheme.
- 19.10 In terms of local air quality and exposure, the WHO publish guidelines on indoor and outdoor air quality¹⁵⁰. These are generally considered to be the most robust targets, as they are derived from human health effects, although there is no 'safe' threshold of exposure to air pollution and these thresholds should be treated as a minimum target.
- 19.11 For example, recent 40% annual growth in adoption of the West Midlands Swift payment systems mean that it currently enables over 40m trips and over 200,000 regular users each year. This metric would be a suitable means of directly measuring the effect of a scheme, where the effects on emission may be extrapolated.
- 19.12 Therefore, KPIs should be defined with an understanding of the potential local air quality effects; e.g. reduced congestion may lead to changes in speed, which should refer to the indirect relationship between speed and emissions for the affected fleet composition. In this way, it is unnecessary to expend a significant amount of additional effort or resources to track effects.

¹⁵⁰ <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/policy>

Appendix A : National Policies

Clean Air Zone framework for England

The Clean Air Zone framework for England was published in May 2017¹⁵¹. This framework sets out the principles local authorities should follow when setting up Clean Air Zones in England. The Framework explains the approach that should be taken by local authorities if they are introducing a zone to improve air quality, and the types of measures that should be included, to ensure consistency of approach across all regions.

Clean Growth Strategy

The UK government published the “Clean Growth Strategy” in October 2017, in which it outlines proposals for decarbonising all sectors of the UK economy through the 2020s¹⁵². The Strategy explains how the whole country can benefit from low carbon opportunities, while meeting national and international commitments to tackle climate change. This Strategy is also intended to complement the Industrial Strategy, Air Quality Plan and Environment Plan.

The National Planning Policy Framework

The National Planning Policy Framework (NPPF)¹⁵³ outlines the Government’s planning policies for England. The NPPF sets out a presumption in favour of sustainable development which should be delivered with three main dimensions: economic; social and environmental (Paragraphs 7 and 14). The NPPF aims to enable local people and their councils to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities.

Policies and objectives which are of particular relevance to air quality include:

- Paragraph 109, states that:
“The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, or noise pollution or land instability...”
- Annex 2 of the NPPF defines ‘Pollution’ as:
“Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust steam, odour, noise and light.”
- Paragraph 124, stating that:
“Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.”

The NPPF sets out the framework upon which all Councils determine their planning policy, and as such is relevant to all the Councils in the LCR.

¹⁵¹ Defra (2017) Clean Air Zone Framework Principles for setting up Clean Air Zones in England
<https://www.gov.uk/government/publications/air-quality-clean-air-zone-framework-for-england>

¹⁵² HM Government (2017) The Clean Growth Strategy Leading the way to a low carbon future
<https://www.gov.uk/government/publications/clean-growth-strategy>

¹⁵³ Department for Communities and Local Government, (2019), National Planning Policy Framework, the National Archives

Planning Practice Guidance (2014)

The Planning Practice Guidance (PPG) ¹⁵⁴ was launched on the 6th March 2014 and provides additional guidance and interpretation to the Government's strategic policies outlined within the NPPF in a web based resource that is regularly updated. The PPG goes on to note that air quality assessments submitted in support of a planning application should include the following information:

- The existing air quality in the study area (existing baseline);
- The future air quality without the development in place (future baseline); and
- The future air quality with the development in place (with mitigation).

The guidance also advises that the planning application should proceed to a decision with appropriate planning conditions or planning obligations if a proposed development (with mitigation) would not lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or fail to comply with the regulation of the Conservation of Habitats and Species Regulation 2010¹⁵⁵.

HGV Road User Levy

The Dept. for Transport (DfT) published the consultation document for '*Reforming The HGV Road User Levy: Call For Evidence*' in November 2017¹⁵⁶. In this document, the DfT specifically recognises local air quality and climate change as key factors in managing freight and congestion, and introduces the proposed plans for a long-term strategy for zero emission road transport expected in March 2018.

The document also summarises previous projects, trials and funds that were intended to reduce vehicle emissions from freight:

- The DfT Freight Data Feasibility Study, 2008, considered the practicality of a vignette scheme.
- DfT published a Modal Shift Benefit Values study in 2009
- The Lorry Road User Charge project (LRUC), a report by Campaign for Better Transport, completed in 2010
- The Low Carbon Truck Trial, co-funded by DfT, the Office for Low Emission Vehicles (OLEV) and Innovate UK (formerly the Technology Strategy Board), ran between 2012 and 2016
- HGV Emissions Testing 2015-2016
- £20m Low Emission Freight and Logistics Trial 2017-2018
- Longer Semi-Trailer (LST) Trial was launched in 2012

¹⁵⁴ Department for Communities and Local Government, (2014); Planning Practice Guidance (PPG).
<http://planningguidance.planningportal.gov.uk>

¹⁵⁵ The Stationery Office Limited, (2016) The Conservation of Habitats and Species Regulations 2010

¹⁵⁶ Dept. for Transport (2017) Reforming The HGV Road User Levy: Call For Evidence
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661814/reforming-hgv-road-user-levy.pdf

Appendix B : Mortality Rates associated with Particulate Matter

Figure 28: Fraction of male mortality associated with particulate matter in the West Midlands

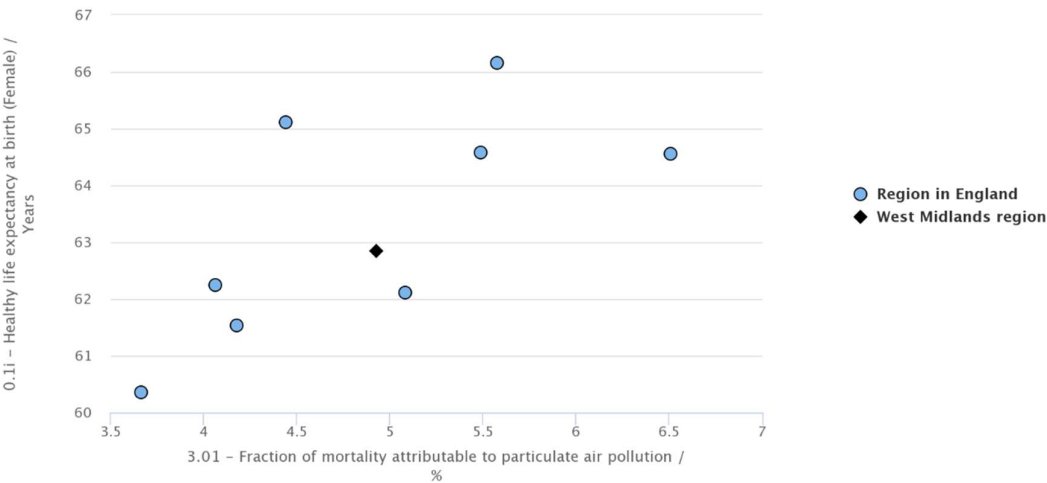
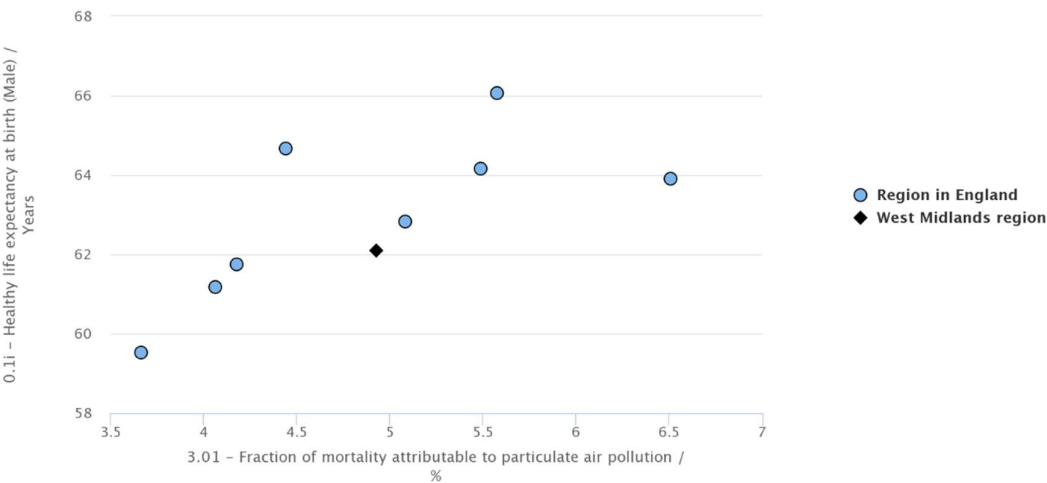


Figure 29: Fraction of male mortality associated with particulate matter in the West Midlands



Appendix C : West Midlands Combined Authority Region Strategies

WMCA Strategic Economic Plan

The West Midlands Combined Authority Strategic Economic Plan sets out the vision for the region and the actions that will help deliver these objectives. There are 8 main priorities listed in the document including securing transformational environmental technologies.

Throughout the document there is an emphasis on environmental change with the goal, by 2030, to produce 40% less direct carbon emissions by improving efficiency through implementing new technologies. It is suggested that this innovation is already available in the West Midlands with universities such as Birmingham and Aston leading the way in development through the programmes below;

1. Birmingham University leads the UK hub for Quantum Technology of sensors and metrology
2. Aston, Warwick and Birmingham Universities are 3 of 6 partners in the Energy Research Accelerator
3. The European Bioenergy Research Institution is based at Aston

The key message is to build upon the regions strengths in order to reach the long term goals of;

- Less CO₂ emissions
- Less air pollution – higher air quality
- Less waste

The document focuses on a new approach of collaboration in order to make changes and improvements to the environment and quality of life for those living in the West Midlands. The West Midlands is a leader in intelligent mobility so, the adoption of a policy framework incentivising these environmental changes should unlock high levels of growth in the region.

In order to reach these aspirations the document states that the region must innovate in low carbon technologies and implement these across the public and private sectors. Also, programmes should be set up to re-use materials amongst businesses reducing the amount of waste going to land fill. It is highlighted that in the short term, implementing electric vehicles and improving the provision of electric charging points will provide benefits. It cites further the importance of considering long term planning and the future use of hydrogen cell technology as well as developing a skilled workforce capable of driving this innovation.

Movement for Growth – Strategic Transport Plan

The Movement for Growth West Midlands Strategic Transport Plan sets out the over-arching goal to build on existing infrastructure and work such as the West Midlands Low Emissions Towns and Cities Programme (LETCP) in order to improve air quality within the region.

The vision for the document, alongside national targets, is to reduce emissions by 80% when compared with 1990 levels with the aim of doing this by 2050. Currently within the West Midlands; 25% of all emissions are from transport and could be controlled meaning there is scope for improvement.

The document highlights the issues caused by poor air quality such as respiratory problems, emphasising the need for change.

Several objectives are listed within the transport plan, one of which specifically relates to tackling climate change by ensuring decreases in greenhouse gases (ENV2). Measures needed to reach this particular objective are set out throughout the document and are listed below;

- Adoption of policy to provide new road capacity alongside public transport improvements giving those working and living within the West Midlands more choice on how to travel
- Accelerate the introduction of ultra-low emission vehicles in the region by co-ordinating planning alongside delivery of ultra-low emission vehicle infrastructure
- Smart mobility through innovative technology which would allow for better traffic management capabilities and more advanced integrated travel in the region
- Making vehicles greener by using technology with the aim of zero emission vehicles
- Last mile logistics involves changing the way deliveries are made by Re-timing, Re-routing, Re-moding and Reducing deliveries to align with Birmingham City Council's strategy of a Green travel district.
- Potential of an area wide implementation of 20mph speed limits in residential areas, supporting the idea that less fuel use and changing gear less benefits the environment

The document focusses on the need to have a co-ordinated approach to responding to air quality targets through the effective management of road traffic alongside innovation in vehicle and road infrastructure technology. There is also a focus on monitoring progress of emissions in order to monitor progress to reaching the goals.

Movement for Growth: 2026 Delivery Plan for Transport

The Movement for Growth 2026 Delivery Plan for Transport focusses on the idea that the West Midlands is at the heart of the strategic road network with a high volume of traffic travelling through the region daily, which has a direct effect on air quality.

The document highlights several schemes that are already in progress/adopted which could be used as examples across the region;

- Construction of a hydrogen fuel facility at Tyseley which could act as a catalyst for the new generation of ultra-low emission vehicles including a new bus fleet.
- Intelligent mobility programme in Coventry to deliver a Smart City, delivering highly accurate travel information to support highways operation allowing more free flowing travel
- Clean Air Zones; these would alter the way people travel using the current transport network

Throughout the strategy there is guidance on potential plans that could improve air quality including;

1. Developing a live performance dashboard to improve strategic and operational decision making as well as track the impacts of traffic on air quality.
2. Where new transport schemes could be redesigned or effective mitigation implemented should be considered if it will improve air quality
3. A defined ambition of improving air quality should be embedded in policy informed by a greater understanding of potential impacts of individual schemes

It is considered that if traffic is kept moving then this reduces the number of miles travelled on the network and therefore, improves air quality. In addition, the document highlights the fact that the Mayor and the WMCA's constituent members for air quality and transport delivery will ensure air quality remains a focus in all transport delivery decisions.

WMCA Annual Plan 2018/2019

The West Midlands Combined Authority Annual Plan sets out both short and long term aspirations in relation to improving air quality within the West Midlands. Throughout the document there is a clear message that the public transport must be fit for the 21st Century, addressing air quality issues.

The WMCA alongside local partners are developing a long term plan on tackling air quality whilst also working with Local Authorities on short term aspirations. It is clear that although this plan is produced on annual basis it looks to go beyond short term compliance and instead tackle a wider range of pollutants in order to meet SEP 2030 targets.

Within the Annual Plan there is a focus upon improving the bus standards with the main goals being;

1. Provide additional investment in environmentally friendly vehicles or zero emission buses
2. Act upon the West Midlands low emission bus delivery plan which will see 468 bus retrofits meaning 20% of the bus fleets emissions will be improved and introducing 20 zero emission hydrogen buses by March 2019
3. Increase bus engine standards on tendered bus services to push for change across the bus network
4. Use the powers of the bus services act 2017 to implement local action in order to tackle air quality issues

The document highlights the need to review the infrastructure and investment needed to ensure the West Midlands has the appropriate skills, infrastructure and energy supply to support the implementation of low emission vehicle technologies. Similarly, local strengths in clean growth sectors of transport should be utilised in order to meet the ambition to have the UK's first Combined Authority clean growth industrial strategy.

Throughout the plan there is the ambition to monitor progress through a performance management framework which would operate alongside the Joint Air Quality Transport Action Plan; to see the impacts of the changes implemented.

West Midlands Industrial Strategy

The West Midlands Combined Authority Industrial Strategy acknowledges that within the region there is an overreliance on the road network which results in poor air quality in some areas.

Throughout the document there is recognition that the West Midlands is at the centre of transport innovation within the UK, giving the region platform for testing and developing solutions to the future of mobility. It is emphasised that resilience and integration of transport systems are critical to improve accessibility and air quality while reducing dependency on fossil fuels and reducing vehicle emissions. The importance of developing emerging talent to meet demands of new technologies is also, deemed highly important.

The industrial strategy outlines the idea that a natural capital approach needs to be embedded in new investments and strategies, this would encourage the use of more innovative solutions which are likely to better tackle urban challenges like air quality.

Several objectives are referred to throughout the document relating to improving air quality including;

- Implementation of a fully integrated transport system
- Introduce a strategic action plan for the West Midlands, to help unlock new clean growth opportunities
- Work with the private sector to accelerate charging infrastructure for zero emission vehicles

West Midlands Freight Strategy

The West Midlands Combined Authority Freight Strategy identifies the current situation of freight transport; being a major contributor to carbon emissions. It is considered that freight has a wider impact therefore; changes by one region alone will not necessarily have a widespread impact. Similar to the Movement for Growth Transport Plan this strategy has the same environmental objective of decreasing greenhouse gases (ENV2)

Within the document there are several objectives that focus on improving air quality;

- New technologies
- New ways of managing current infrastructure
- New strategies

The introduction of new technologies such as zero emission vehicles is repeated throughout the document as this is likely to have a large effect on emissions and air quality associated with freight deliveries. Also, the idea of platooning semi-autonomous vehicles is a technological innovation which could directly impact the freight industry. The document focusses on real time in order to find smarter solutions to logistics such as managed motorways to alleviate congestion or smart hybrid technology which allows goods vehicles to switch to an electric mode when passing through an area of poor air quality.

Clearly, the way current infrastructure is managed can influence how efficiently freight movements operate, as highlighted in the strategy. Simple changes in the structure of the supply chain of freight can have a large impact on emissions. In addition more monitoring of HGV mileage on the UK network including a modal switch to rail would have a large impact on carbon emissions. The document identifies low emission zones as an effective way to reduce freight emissions in the areas with the poorest air quality.

The freight strategy sets out the programme of urban logistics management which will support the introduction of low emission delivery systems, which should effectively help the UK reach the targets of cutting carbon emissions by 34% by 2020. The document focusses on clean air zone research to help determine the future plan alongside initiatives such as;

- Vehicle emission based restriction
- Make more use of the M6 Toll – making traffic flows more reliable
- Freight operator recognition to encourage improving environmental performances

TfWM Strategic Vision for Bus

The Transport for West Midlands Strategic Vision for Bus document sets out the key challenges and targets for the bus network within the region. It identified that single occupancy cars are a major contributor to pollution especially due to congestion caused by standing traffic, which the bus system also contributes to. Therefore, the bus sector is a key focus for tackling poor air quality.

The document sets out aspirations for *“A world-class integrated, reliable, zero emission transport system”*.

Within the strategy there is a focus on technological advances to deliver a smarter bus network, in the hope of decreasing the number of single occupancy car trips which would improve air quality. To improve the bus network there is the plan to;

1. Through the Advanced Quality Partnership introduce minimum vehicle emissions to improve the fleet
2. Continue with the bus retrofit programmes
3. Welcome the introduction of the Birmingham Clean Air Zone as an essential tool for buses
4. Innovation of bus fuel technology to make it more efficient

5. West Midlands Bus Alliance challenges partners to meet improved standards

The document aims to improve air quality and reduce emissions to lessen the impact of the bus network on the natural environment. Throughout, it focusses the need to accelerate the transition of buses to zero emission vehicles with the aim of achieving the cleanest bus fleet in any metropolitan area in the UK.

West Midlands Low Emission Bus Delivery Plan

The West Midlands Low Emission Bus Delivery Plan outlines how urban air quality must be improved; the West Midlands Transport Emissions Framework signifies the importance of this in the transport agenda. This document sets out the framework for how air quality will be improved by offering guidance and support in the transition of the bus fleet towards zero/low emission vehicles.

Throughout the document it highlights the fact that improving local air quality is the primary objective however, it does acknowledge that a low carbon fuel supply will be important to meet UK decarbonisation targets. The plan emphasises the fact that nitrogen dioxide levels and particulate matter levels are exceeded in some authority areas; with 6 of the 7 districts being Air Quality Management Areas.

The delivery plan recognises several new and developing technologies that could be introduced in order to have a positive effect on air quality;

- Alternative fuel investigation, looking at fuels which will be efficient, sustainably and good for the environment
- The wider benefits of Sprint buses
- Investigate and research different types of hybrid buses
 - ➔ Plug in electric hybrids which use both battery and electric operated motors
 - ➔ Flywheel hybrids recover and store kinetic energy from deceleration phases which can be re-used to ease acceleration
 - ➔ GPS assisted diesel hybrid uses on board GPS to turn off the diesel engine when entering poor air quality hotspots, driving in electric mode for these sections of the route
 - ➔ Hydraulic hybrids use gas accumulators that store energy during braking and hydraulic pump motors to provide secondary motive powers

Throughout the Bus Delivery Plan it identifies recommendations and ways in which the technologies listed above will be implemented most effectively including through the introduction of integrated strategies to ensure good communication of opportunities. Also, there is detail of additional funding in the form of the Clean Bus Technology Fund of £12 million for bus upgrades aimed at improving air quality and the Low Emission Bus Scheme which supports low emission buses and the infrastructure needed to support their implementation.

Further, there is the potential to set up an award scheme, to acknowledge ongoing efforts to make clean bus routes and potential for developing a clean bus fund in the West Midlands from Bus Service Operators Grant (BSOG) payments and distribute these accordingly to the most progressive operators.

WMCA/TfWM Transport Plan 2017/18

The West Midlands Combined Authority/Transport for West Midlands Transport Plan has a similar message to that portrayed within the West Midlands Low Emission Delivery Plan in that bus improvements are key in providing solutions to environmental challenges.

The document considers integrated transport to be crucial to addressing congestion and air quality but acknowledges areas for policy development include air quality.

Throughout the Transport Plan there are several solutions outlined which are in progress or are to progress;

1. Between 2017 and 2020 all buses will be at Euro V standard or better
2. Encourage alternative travel arrangements such as buses by improving the service available. Bus alliance is providing new vehicles, clean engines and new fuel technologies to improve the service available. Deliver zero emission buses to address air quality and the carbon footprint of the transport network also, delivering 22 hydrogen fuel cell buses and the appropriate infrastructure by 2020. The Low Emission Bus Delivery Plan sets out the area to be prioritised for deployment of low emission buses to minimise further negative effects.
3. Improved accessibility to park and ride through Sprint and increased car parking spaces at rail stop etc. Sprint to be higher quality and greener
4. Look at technical solutions to environmental problems such as supporting introduction of very low or zero emission delivery systems for freight

TfWM Congestion Management Plan

The Transport for West Midlands Congestion Management Plan outlines the new powers of the Mayor and WMCA shared with Local Authorities to manage congestion, air quality and road safety. The document acknowledges the fact that road traffic accounts for 65% of NO₂ emissions which contributes to greenhouse gas emissions and a reduction in air quality.

The message of the document is that congestion must be tackled through improved road capacity at key locations to help minimise negative effects on the environment and air quality across the region.

Within the plan there is a basic strategy to be followed in order to have a positive impact on the reduction of congestion which involves;

- Increase road capacity
- Improve efficiency of the roads
- Manage demand by changing travel behaviour
- Link this plan to the Air Quality Plan
- Re-mode, Re-route, Re-time, Remove strategy towards freight deliveries

Throughout the document there are also similarities in air quality policy with the other summarised strategies such as;

1. To monitor the Key Route Network and identify areas for future investment on this network with a focus on improving air quality
2. Make better use of the M6 Toll to help manage congestion and look at scope for further freight movements as stated in the West Midlands Freight Strategy; creating environmental benefits
3. Innovation of new technologies to improve road efficiencies and therefore reduce emissions
4. Co-ordination of resources and knowledge through a resilience, communication and engagement strategy

The congestion management plan highlights the idea that all parties must work together to maximise opportunities and allow the establishment of long term changes to travel behaviour. This will allow for a reduced impact on the environment and an improvement in the air quality within the West Midlands region.

West Midland Key Route Evidence Report

The West Midlands Key Route Network (KRN) Evidence Report has the same vision as that set out in the Strategic Economic Plan with regard to improving the quality of life through improved air quality in

the region. The document outlines the fact that there are 6 air quality management areas along the KRN and that this along with the SRN poses significant risks to achieving the overarching vision.

Throughout the document there is a reference to consistency and an agreed approach amongst the different constituent members of the WMCA in order to have a positive effect on air quality. Hence why the report references National policy regarding air quality, highlighting the fact there is an increasing low emission vehicle demand. Therefore, in order to improve air quality the infrastructure for low emission vehicles needs to be implemented across the WMCA meaning there is potential for expansion of these facilities.

Within the report there is a focus upon the current levels of NO₂ concentrations being high across the KRN area and it is considered that in order to enable growth, air quality and health must be approved along the key route network. It is suggested in the report that buses are the most important mode for reducing congestion and improving air quality within the West Midlands region.

Proposed West Midlands Low Emissions Vehicle Strategy

The proposed West Midlands Low Emission Vehicle Strategy sets out the Low Emissions Town and Cities Programme (LETCP) which is funded by Defra through a grant scheme. The main aim of this programme is to enable collaborative working across the region in order to tackle road emissions which are the principle cause of air quality issues.

It is considered that the cause of poor air quality is mainly due to diesel vehicle emissions not reducing fast enough. The strategy outlines the fact that there is no quick way to tackle these problems however, through co-ordinated activity and development of policies, air quality improvements in the region can be made.

The main message of the document is that through acceleration of implementing cleaner vehicles fuels and new technologies, air quality improvements can be made alongside the reduction of congestion and emissions.

Throughout the strategy there are clear similarities to other previously summarised documents; within this strategy in particular there is a collation of air quality targets and visions for the West Midlands region. This strategy has three main themes;

- Evidence for Change – Focusses upon the current and future air quality issues and outlines the technical feasibility of low emission zones and voluntary clean air zones
- Creating a Low Emission Future – outlines the need for policy and guidance to encourage the uptake of cleaner vehicles, fuels and new technologies with appropriate infrastructure to support implementation.
- Low and Ultra-low Emission Vehicles and Infrastructure – sets out the plan to embrace cleaner vehicle technology and infrastructure as well as developing metropolitan wide policies. It encourages the acceleration of time scales to adopt cleaner buses through the West Midlands Low Emission Bus Delivery Plan and The Bus Alliance.

The document considers significant vehicle emission reductions and improved air quality can be delivered even though the region in the near future may face a large amount of challenges.

Black Country Ultra Low Emissions Strategy

The Black Country Ultra Low Emissions Strategy sets out similar policies and aims to those set out in documents outlined above. It seeks to provide an integrated approach to address transport related emissions and improve air quality within the West Midlands region.

The document highlights the fact that a Best Practice Air Quality Planning Guidance document has been produced as part of the LETCP which then resulted in production of a recently adopted Black Country Air Quality Supplementary Planning Document to align the policies with regard to air quality.

Throughout the strategy there is a clear focus upon the promotion of low emission vehicles in the West Midlands region highlighting several initiatives that are to progress or that have already been adopted;

- Adoption of the Swift card allowing multi-modal sustainable travel
- Clean Bus Technology Fund to install equipment to reduce bus emissions
- Coventry and Birmingham Low Emission demonstrator introduced over 100 available electric charging points in the cities
- Trials of the first pure electric buses

Appendix D : Local Authority Local Plans

Table 26: Examples of policy themes in the West Midlands Local Authorities' Local Plans

	Economy		Green infrastructure, place-making & energy			Health and Wellbeing/ environment			Transportation				
	Accessibility / Connectivity	Efficient use of space	Strategy / Development	Energy	Amenities	Transport	Strategy	Strategy	Freight	Public	Rail	Cycle / Walking	Road Management
Birmingham City	Y		Y		Y	Y		Y	Y	Y		Y	Y
Coventry City	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Dudley Metropolitan Borough	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y
Sandwell Metropolitan Borough	Y		Y		Y	Y	Y	Y		Y		Y	Y
Solihull Metropolitan Borough	Y		Y	Y								Y	
Cannock Chase District	Y		Y			Y		Y					
North Warwickshire Borough	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y
Nuneaton and Bedworth Borough	Y	Y	Y	Y	Y		Y	Y					
Redditch Borough	Y	Y	Y				Y	Y		Y			Y
Stratford-on-Avon District		Y	Y	Y			Y	Y					
Tamworth Borough			Y		Y		Y	Y					
Warwick District	Y	Y	Y	Y	Y		Y	Y			Y		

Appendix E : Local Authority Air Quality Action Plans

Table 27: Examples of action themes within each local authority's action plans

	Low Emission Zone	Development of Red Route Network	New roads/road management	Policy on Air Quality and planning	Increase number of park & rides	LA procuring low emission vehicles	Alternative refuelling infrastructure	Improvement of public service fleet	Upgrading taxi fleet	Extending public transport links	Promoting adoption of ULEV	General Transport Infrastructure	Policy enforcement/regulation	Promotion of walking/cycling	Car share	Freight Strategy
Birmingham City	Y	Y	Y	Y	Y	Y	Y	Y				Y				
City of Wolverhampton			Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	
Coventry City			Y	Y	Y					Y				Y	Y	
Dudley			Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y
Sandwell			Y	Y				Y	Y		Y		Y	Y		
Solihull			Y					Y		Y	Y		Y	Y		
Walsall		Y	Y	Y				Y		Y		Y	Y	Y		
Cannock Chase District			Y	Y				Y					Y	Y		Y
North Warwickshire																
Nuneaton and Bedworth			Y	Y				Y				Y	Y	Y		Y
Redditch				Y			Y		Y			Y	Y	Y	Y	
Rugby			Y					Y								Y
Stratford-on-Avon District				Y												
Tamworth				Y									Y	Y		
Warwick District			Y	Y	Y		Y	Y	Y			Y		Y	Y	Y

Appendix F : Local Air Quality Management

Air Quality Management Areas

Table 28: AQMAs within the West Midlands

Local Authority	AQMA	Description	Pollutant
Birmingham	Birmingham AQMA	The whole borough.	NO ₂ Annual and PM ₁₀ daily Mean
Bromsgrove District Council	Lickley End AQMA	A number of residential properties surrounding the M42/A38 junction	NO ₂ Annual Mean
Cannock Chase	CCDC AQMA 2	A5 Watling Street between Churchbridge Traffic Islands and the District boundary with Walsall. Effectively continuing the existing AQMA to include all of the A5 within the district.	NO ₂ Annual Mean
Cannock Chase	AQMA3 (Five Ways Island)	A5190 Cannock Rd, Heath Hayes between the junction with Heath Way and the district boundary with Lichfield District Council. B4154 Hednesford Rd between the junction Brownhills Rd, Norton Canes, Hayes Way, Heath Hayes. Wimblebury Rd	NO ₂ Annual Mean
Coventry	Coventry City-Wide AQMA	An area encompassing all land within the administrative boundaries of the city of Coventry.	NO ₂ Annual Mean
Dudley	Dudley AQMA	The Dudley Borough AQMA includes the whole area covered by the Dudley Borough Boundary. 9 areas where the annual mean objective for nitrogen dioxide have been identified and these will provide the focus for the new air quality action plan.	NO ₂ Annual Mean
East Staffordshire Borough Council	Burton-Upon-Trent AQMA No.1	An area of Burton-Upon-Trent along Derby Rd, Derby St, part of Princess Way Roundabout, Horninglow St, Horninglow Rd, Bridge St, Wellington St, part of Borough Rd, part of Wellington St roundabout, part of Waterloo St and part of Byrkley St.	NO ₂ Annual Mean
East Staffordshire Borough Council	Burton-Upon-Trent AQMA No.2	An area encompassing St Peters Bridge roundabout and part of St Peters St in Stapenhill in Burton-upon-Trent.	NO ₂ Annual Mean
Lichfield District Council	A5 Muckley Corner AQMA no.1	An area encompassing the Muckley Corner Roundabout on the A5 along with a number of surrounding buildings.	NO ₂ Annual Mean
Lichfield District Council	AQMA No.2	A38, Wall Island to Alrewas	NO ₂ Annual Mean
North Warwickshire Borough Council	Coleshill AQMA	The area of Coleshill bounded by Stonebridge Road, Coleshill Heath Road, the M42 Motorway, M6 Motorway and junction 4 of the M6.	NO ₂ Annual Mean
Nuneaton and Bedworth	Leicester Road Gyratory AQMA	An area of Nuneaton centred on the Leicester Road Gyratory system and incorporating sections of the Leicester, Old Hinckley and Weddington Roads.	NO ₂ Annual Mean
Nuneaton and Bedworth	Midland Road/Corporation Street AQMA	Centred on Midland Road and Corporation Street but also includes parts of Central Avenue and Manor Court Road	NO ₂ Annual Mean
Rugby	Rugby AQMA (NO ₂)	The area covers the whole urban area of Rugby	NO ₂ Annual

Local Authority	AQMA	Description	Pollutant
		bounded by the southern boundary with Daventry District Council, A5, M6, minor roads to the west of Long Lawford, A45 and M45.	Mean
Sandwell	Sandwell AQMA	An area encompassing the whole Borough of Sandwell.	NO ₂ Annual Mean
Stratford on Avon District Council	Studley AQMA	An area encompassing part of Alcester Road, Studley.	NO ₂ Annual Mean
Stratford on Avon District Council	Stratford upon Avon District Council no 1 2010	The whole town of Stratford upon Avon and some surrounding areas	NO ₂ Annual Mean
Tamworth Borough Council	Two Gates Dosthill	Two Gates Dosthill	NO ₂ Annual Mean
Walsall	Walsall AQMA	An area encompassing the whole borough (relating to both annual and hourly NO ₂ objectives).	NO ₂ Annual and Hourly Mean
Walsall	Chuckery AQMA (PM ₁₀)	An area encompassing a number of properties around Nutmeg Grove, near the junctions of Beacon Street and Lincoln Rd in Chuckery, Walsall.	PM ₁₀ Daily Mean
Wolverhampton	Wolverhampton AQMA 2005	The City of Wolverhampton.	NO ₂ Annual and PM ₁₀ Daily Mean
Cannock Chase	Cannock Chase AQMA	An area encompassing the A5 Watling Street between the junction with the A34 Walsall Road and the district boundary with South Staffordshire, and the stretch of the A460 Wolverhampton Road between the junction with the A5 Watling Street and the district	NO ₂ Annual Mean
Warwick	Leamington Spa AQMA	An area of South Town, Leamington Spa, centred on High Street, Clemens Street and Bath Street.	NO ₂ Annual and Hourly Mean
Warwick	Warwick AQMA (Amended 2008)	An area in the centre of Warwick, encompassing properties along High Street, Jury Street, Bowling Green Street, Theatre Street, Northgate, The Butts, Smith Street, Church St and part of Saltisford, and also including a number of nearby properties. This	NO ₂ Annual and Hourly Mean
Warwick	Warwick Road (Kenilworth) AQMA	An area encompassing all properties along Warwick Road, Kenilworth between the junctions with Station Road and Waverley Road.	NO ₂ Annual Mean
Warwick	Warwick Coventry Road	The area covers the east side of Coventry Road from the junction with St. Johns / Coten End, incorporating 2-4 Coventry Road and Montgomery Court, properties fronting on to Coventry Road only	NO ₂ Annual and Hourly Mean
Warwick	New Street (Kenilworth) AQMA	An area encompassing all properties fronting New St, Kenilworth from the junction with Bridge St/Fieldgate Lane up to (and including) No.17 New Street.	NO ₂ Annual Mean
Wyre Forest District Council	Welch Gate AQMA	A short section of Welch Gate from the junction with Dog Lane running south west to north east to a point level with number 84 Welch Gate	NO ₂ Annual Mean
Wyre Forest District Council	Kidderminster Ring Road AQMA	An area encompassing part of Kidderminster Ring Road in the vicinity of Horsefair and Coventry Street	NO ₂ Annual Mean

Nitrogen Dioxide Monitoring

Table 29: NO₂ Continuous Monitoring Station Data for 2016 in the WMCA

Site ID	Local Authority	X	Y	Concentration / $\mu\text{g m}^{-3}$
Birmingham Tyburn Roadside	Birmingham	411577	290491	43
Birmingham Tyburn	Birmingham	411592	290440	29
New Hall	Birmingham	414574	296724	16
Stratford Road	Birmingham	408820	284591	37
Bristol Road	Birmingham	404545	283020	25
Moor Street Queensway	Birmingham	407435	286891	50
Acocks Green	Birmingham	411649	282207	21
Birmingham A4540 Roadside	Birmingham	408506	286470	43
DMBC1	Dudley	394291	290460	22
DMBC2	Dudley	394243	284626	39
DMBC3	Dudley	395761	290575	34
DMBC4	Dudley	389134	286893	55
Birmingham Rd (Oldbury)	Sandwell	399857	289392	39.8
Wilderness Lane (Great Barr)	Sandwell	403956	294855	26
Haden Hill	Sandwell	395755	285493	14
Bearwood Road OPSIS	Sandwell	402202	286229	41
West Bromwich Roadside	Sandwell	400521	291541	34
M6 Motorway Junction 9	Walsall	399932	296644	47.5
Walsall Alumwell	Walsall	399386	298210	29.5
Wolverhampton Road (A454)	Walsall	400429	298701	41.8
Bloxwich Lane	Walsall	399183	298809	41.1
Woodlands School	Walsall	398036	300872	18
Walsall Ring Road	Walsall	401590	299014	30.8
Lichfield Street	Wolverhampton	391654	298782	39
Penn Road	Wolverhampton	390374	296775	42
Stafford Road	Wolverhampton	391261	302199	33
Willenhall Road	Wolverhampton	394754	298429	31.0
St Peter's Square	Wolverhampton	391362	298934	29.0
HHMS auto	Cannock Chase	401392	309954	24.2
AQM2	Nuneaton and Bedworth	436850	292260	36.2
AURN1	Warwick	431943	265730	21.4
CM1	Warwick	428263	264877	31.7
AURN2	Warwick	431271	266404	20.4

Bold indicates an exceedance of the annual average objective value

Underlined indicates an increased risk of exceedance of the 1-hour average objective value

Table 30: Summary of NO₂ Diffusion Tube Data for 2016 in the WMCA.

Local Authority	Number of Locations	Number of Locations Measuring an Exceedance of the Annual Mean NO ₂
Birmingham	54	38
Coventry	49	28
Dudley	49	23
Sandwell	97	19
Solihull	0	0
Walsall	0	0
Wolverhampton	54	11
Cannock Chase	17	6
North Warwickshire	11	0
Nuneaton and Bedford	37	2
Redditch	4	0
Shropshire	103	7
Stratford-on-Avon	18	1
Tamworth	14	0
Warwick	53	15

Particulate Matter Monitoring

Table 31: PM₁₀ Continuous Monitoring Station Data for 2016 in the WMCA.

Site ID	Local Authority	X	Y	Concentration / $\mu\text{g m}^{-3}$
Birmingham Tyburn Roadside	Birmingham	411577	290491	16
Birmingham Tyburn	Birmingham	411592	290440	14
Birmingham A4540 Roadside	Birmingham	408506	286470	14
DMBC1	Dudley	394291	290460	17
DMBC2	Dudley	394243	284626	19
DMBC3	Dudley	395761	290575	18
Birmingham Rd (Oldbury)	Sandwell	399857	289392	15
Haden Hill	Sandwell	395755	285493	12
Primley Avenue	Walsall	399530	297956	17.3
Lichfield Street	Wolverhampton	391654	298782	19
Penn Road	Wolverhampton	390374	296775	20
Stafford Road	Wolverhampton	391261	302199	19
Willenhall Road	Wolverhampton	394754	298429	18
St Peter's Square	Wolverhampton	391362	298934	16
HHMS auto	Cannock Chase	401392	309954	21.1
OSR1	Rugby	449029	276315	11.3
AURN1	Warwick	431943	265730	15.4
AURN2	Warwick	431271	266404	15.7

Table 32: PM_{2.5} Continuous Monitoring Station Data for 2016 in the WMCA.

Site ID	Local Authority	X	Y	Concentration / $\mu\text{g m}^{-3}$
Birmingham Tyburn Roadside	Birmingham	411577	290491	12
Birmingham Tyburn	Birmingham	411592	290440	11
Birmingham A4540 Roadside	Birmingham	408506	286470	17
Acocks Green	Birmingham	411649	282207	10
DMBC2	Dudley	394243	284626	12.6
Haden Hill	Sandwell	395755	285493	5
Primley Avenue	Walsall	399530	297956	9.9
M6 Motorway Junction 9	Walsall	399932	296644	11.9
Wolverhampton Road (A454)	Walsall	400429	298701	10.8
Bloxwich Lane	Walsall	399183	298809	10.2
Lichfield Street	Wolverhampton	391654	298782	8
Willenhall Road	Wolverhampton	394754	298429	9
St Peter's Square	Wolverhampton	391362	298934	12
Foxlands Avenue	Wolverhampton	388841	295174	8
OSR1	Rugby	449029	276315	5.6
AURN1	Warwick	431943	265730	10.5
AURN2	Warwick	431271	266404	9.7

