

# The impact of poor air quality on health in Birmingham

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## **Health, Wellbeing & the Environment and Economy, Skills and Transport Overview & Scrutiny Committees – 17<sup>th</sup> January 2017**

### **Transport & Connectivity - Evidence submission**

**Is there an evidential link between poor air quality and poor health, what are the main controllable sources of this in Birmingham, and what can be done to improve air quality with a view to improving health outcomes in Birmingham?**

This submission to the Health, Wellbeing & Environment and Economy, Skills & Transport Overview & Scrutiny Committee from Transportation & Connectivity addresses the key lines of enquiry:

- Birmingham has been ordered by the Government to impose charges in 'clean air zones' to cut pollution. What types of vehicle, driving mode, location and fuel system most contribute to the health impacts of road traffic?
- What would be the most effective ways of implementing and operating a 'clean air zone' so as to minimise these burdens?
- What are the potential barriers to clean air zones being implemented widely in the city?

- **Birmingham has been ordered by the Government to impose charges in 'clean air zones' to cut pollution. What types of vehicle, driving mode, location and fuel system most contribute to the health impacts of road traffic?**

## **The Transport Challenge for Birmingham**

As set out in the evidence provided from officers in Environmental Health and Public Health, local road transport is the greatest source of emissions which impact on local air quality and create problems of exposure to concentrations of pollutants at harmful levels. However, the need to address air quality is also set within the context of increased development and employment in the city as described in the Birmingham Development Plan (BDP) which was approved by Cabinet in December 2016 and Full Council on 10<sup>th</sup> January 2017.

By 2031 the population of the city is expected to grow by some 150,000 people. There are currently around 3.3 million daily (Mon-Fri) trips on Birmingham's transport system. These comprise all modes and all purposes. This figure consists of 2.8 million trips made by residents<sup>1</sup> and around half a million from people living outside Birmingham travelling in and out each day. It is estimated that the total demand for travel on our transport system could rise to 4 million trips by 2031.

In the city centre the BDP forecasts 51,000 new jobs and 13,000 new homes in the city centre by 2031, with 75,000 people living in the city centre (an increase of 30,000). This is estimated to create an additional 140,000 daily trips (a 30% increase from 480,000 trips today) to and within the city centre or 56,000 extra vehicles.

Using today's car ownership levels and travel habits then Birmingham's growth could result in an additional 80,000 cars in the City, 200,000 more daily car trips, 100,000 more residents on public transport and 18,000 more public transport passengers arriving in the city centre in the morning peak period.

The BDP sets out that by 2031 Birmingham will be renowned as an enterprising, innovative and green city that has delivered sustainable growth meeting the needs of its population and strengthening its global competitiveness. As a result a number of the policies of the BDP set out the Council's commitment to ensuring that decisions regarding the development of the city have air quality as a key consideration. Policy TP37, Health, sets out that the City Council is committed to reducing health inequalities, increasing life expectancy and improving quality of life through a range of measures including seeking to improve air quality. In support of this and recognising that transport is a key source of emissions, TP38, A Sustainable Transport network, sets out that the development of a sustainable, high quality, integrated transport system, where the most sustainable mode choices also offer the most convenient means of travel, will be supported.

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<sup>1</sup> Birmingham Household Travel Survey, 2011

The Birmingham Connected 20-year strategy for improving the city's transport network to support the growth outlined in the BDP. The strategy included proposals for a Low Emissions Zone in the city centre to improve air quality and help meet commitments to carbon reduction targets, leading to a healthier city. The Clean Air Zone and any additional measures will be developed to ensure they are commensurate with the overall aims of Birmingham Connected and the BDP to deliver inclusive sustainable growth.

Significant reduction in transport emissions are needed if air quality in Birmingham is to be improved. Transport activity and its associated emissions are driven by a wide range of needs and behaviours. The challenge is that many of these attitudes and habits are very deep-rooted and can be hard to change, which means that significant and comprehensive packages of measures will be needed to make a difference in order to reduce emissions and improve air quality.

To support such an integrated approach, the wider benefits of a more sustainable approach to transport need to be promoted, which will include effects in the spheres of air quality, climate change, health, noise, congestion and economic development.

### **Fleet composition**

Table 1 shows the number of licenced vehicles in Great Britain, England, West Midlands and Birmingham in 2015<sup>2</sup>. However, fleet composition provides only a part of the overall picture and there are other considerations in developing an understanding of transport's contribution to air quality.

**Table 1 - Number of licenced vehicles in Great Britain, England, West Midlands and Birmingham in 2015**

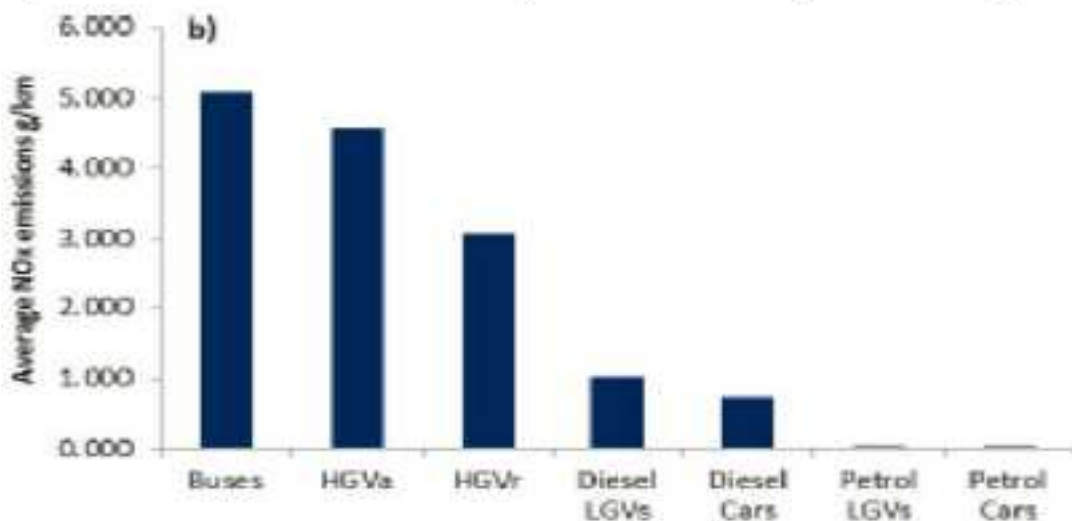
						Thousands	
Region/Local Authority	Cars	Motor cycles	Light goods	Heavy goods	Buses and coaches	Other vehicles <sup>2</sup>	Total
Great Britain	30,250.3	1,230.8	3,633.6	483.4	162.7	706.8	36,467.5
England	25,732.6	1,093.1	3,107.4	418.3	136.4	564.2	31,052.0
West Midlands	2,938.3	104.6	410.2	59.8	14.4	62.3	3,589.7
Birmingham	593.3	10.1	96.8	4.4	5.0	4.5	714.0

The evidence provided to the Inquiry by City Council Environmental Health to the Inquiry demonstrates the contribution of air pollutants from different sources and different types of vehicles (Item 1.1.19).

<sup>2</sup> <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>

Figure 1 shows the vehicle emissions per kilometre by vehicle type for Euro 5/V (the standards in force in 2013)<sup>3</sup>. This demonstrates that per kilometre buses, HGVs and Diesel LGVs emit the highest levels.

**Figure 1 - Vehicle emissions per kilometre by vehicle type for Euro 5/V**

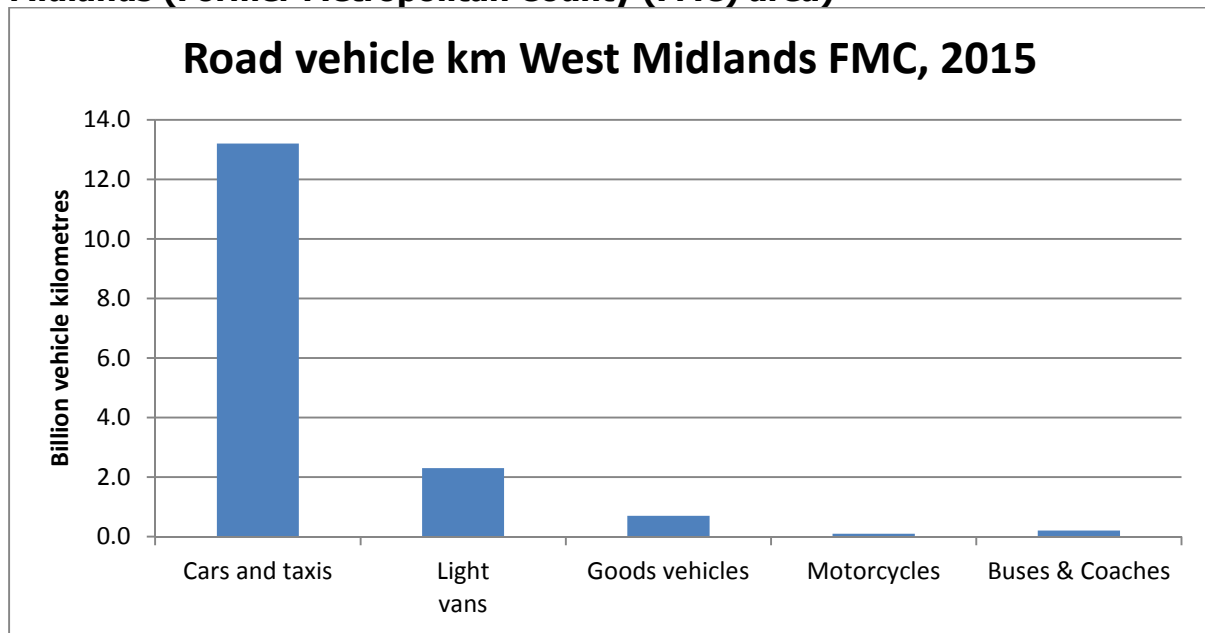


However, the overall numbers of kms typically travelled by each type of vehicle is also a key consideration. Figure 2 shows the vehicle kms travelled by different classes of vehicles in the West Midlands (Former Metropolitan County (FMC) area)<sup>4</sup>. The level of traffic emissions are a function of both the volume of traffic and the mix of vehicle types.

<sup>3</sup> <https://www.gov.uk/government/collections/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2015>

<sup>4</sup> <https://www.gov.uk/government/statistical-data-sets/tra02-traffic-by-road-class-and-region-kms>

**Figure 2 - Vehicle km travelled by different classes of vehicles in the West Midlands (Former Metropolitan County (FMC) area)**



In line with the evidence presented by officers in Environmental Health, the composition of traffic and therefore the level of emissions, will vary from location to location and by time of day. Table 2 shows NO<sub>x</sub> emissions source apportionment for 2 sites in the city centre split by vehicle type. The monitoring undertaken as part of the Low Emissions Towns & Cities Partnership Low Emission Zone Technical Feasibility Strategy<sup>5</sup> demonstrates that on the A38 in the city centre the primary source of emissions is from cars (predominantly diesel) and diesel LGV, whereas the majority of primary NO<sub>2</sub> emitted is predominantly from diesel cars and diesel LGV. In contrast the main sources of emissions vary in other areas of the city centre differ, for example where there are higher volumes of buses, such as Moor Street Queensway.

**Table 2 - NO<sub>x</sub> emissions source apportionment for 2 sites in the city centre split by vehicle type.**

Vehicle Sector	% NO <sub>x</sub> Emissions Suffolk St Qway (AQ Plans)	% NO <sub>x</sub> Emissions Children's Hospital (LEZ TFS)
Petrol cars	12.75	19
Diesel cars	45.61	39

<sup>5</sup> [http://cms.walsall.gov.uk/low\\_emissions\\_towns\\_and\\_cities\\_programme](http://cms.walsall.gov.uk/low_emissions_towns_and_cities_programme)

<b>HGV (combined)</b>	14.44	15
<b>Buses</b>	9.04	9
<b>Petrol LGV</b>	0.25	1
<b>Diesel LGV</b>	17.82	18
<b>Motorcycles</b>	0.08	0

## **Location**

The greatest impact on human health is in urban areas, where air pollution levels are at their highest. Transport is the greatest contributor to urban air pollution, specifically at roadside locations, which is where the highest levels of pollution exist and where significant exposure occurs. This in turn gives rise to a direct health impact associated with the traffic-related pollution. In short the key issues are heavily trafficked routes with adjoining footpaths and properties in close proximity.

Human exposure to air pollution is central to the determination of its health impact, with the severity of this impact depending on the period of exposure, the level of exposure (in terms of concentration) and the number of people exposed. Therefore the health impact of air pollution will vary by location, and the impact on any given individual will vary by that individual's particular level of exposure and as noted above the emissions will also vary as a result of the traffic levels and vehicle mix in one particular area.

However, some research<sup>6</sup> has suggested that occupants of vehicles could be at even higher risk than those at the roadside with bus and taxi drivers exposed to three times more air pollution than anyone else, partly because they spend so much time in the vehicle compared to most other people.

The design and form of the urban environment can also contribute to the level of air pollution e.g. developments can create canyon effects where, depending on meteorological conditions, air pollution can be concentrated as a result of reduced dispersion.

## **Driving Mode**

Eco-driver training encourages gentle acceleration and leaving a larger gap behind the vehicle ahead, reducing the need for braking. NO<sub>x</sub> and particulate emissions are associated with higher engine speeds and loads, so avoiding harsh acceleration can reduce

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<sup>6</sup> <http://www.ehhi.org/reports/diesel/diesel.pdf>

both of these air pollutants. Reducing brake use can also reduce particulate emissions from brake friction materials.

The RAC Foundation<sup>7</sup> report Air Quality and Road Transport report (2014) provides information on a number of studies on the impact of driving behaviour on emissions. It acknowledges that driver behaviour can be the single largest determinant of the emissions and fuel consumption of a vehicle and that most drivers can improve their fuel consumption by up to 15% when taught 'eco-driving' techniques (EST, 2013).

However, research indicates that fuel savings may decline in the longer term, with one study reporting that initial average fuel savings of 10% had fallen to 3% only one year after training (TNO, 2006). Nevertheless, the same study reported that in combination with gear shift indicators (which show a driver when it is most economical to change up a gear), eco-driver training can result in over 4% fuel savings even in the long term. Overall it is likely the eco-driving will generate fuel and associated CO<sub>2</sub> savings of between 5% and 10% (Wengraf, 2012).

Since 2008 Eco-driving techniques have been part of the UK driving test although not as a pass/fail criteria. They are also available as part of the Certificate of Professional Competence (CPC) training for professional drivers (covering HGVs, commercial passenger vehicles and taxis). Eco-driver training was not made a compulsory requirement by the DfT for the CPC due to strong industry opposition.

Eco-training is an element of the Freight Operators Recognition Scheme which the Council is working to adopt. As well as reduced fuel consumption and emissions, the benefits to fleet operators can include reduced engine, gearbox and clutch wear and damage.

## **Fuel**

The main culprit of urban air pollution is diesel engines. Whilst heavy-duty vehicles – buses and lorries – are still the main source of NO<sub>x</sub> emissions, the contribution from diesel cars has increased rapidly over the last decade because of the decision to encourage the uptake of diesels within the national car fleet.

This is a consequence of the focus on climate change and the car industry's response to the European average new car CO<sub>2</sub> emissions targets of 130 g/km by 2015 and 95 g/km by 2021. As a result car manufacturers have shifted production to make more diesel cars, as these are more fuel-efficient than petrol cars. In response the market has chosen diesel, supported by the incentives of reduced fuel cost, lower rates of Vehicle Excise Duty and company car tax incentives, which have both rewarded low-CO<sub>2</sub> options.

However, the problem has been exacerbated by the fact that the official tests by which new vehicles are certified do not reflect real-world driving. This mismatch applies to both

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<sup>7</sup>[http://www.racfoundation.org/assets/rac\\_foundation/content/downloadables/rac\\_ricardo\\_aea\\_air\\_quality\\_report\\_hitchcock\\_et\\_al\\_june\\_2014.pdf](http://www.racfoundation.org/assets/rac_foundation/content/downloadables/rac_ricardo_aea_air_quality_report_hitchcock_et_al_june_2014.pdf)

the emission of air pollutants and to fuel efficiency (and therefore CO<sub>2</sub>), as both are measured on the same cycle.

Technologies such as diesel particulate filters function well under test conditions, but when operating on the road, especially in towns and cities where speeds tend to be lower, there is a risk that they will not 'regenerate', that is the high temperature needed to burn off the collected particles will not be present. This is the case not only with the older Euro standards (Euro 3 and 4) but even the current Euro 5 standard; together, these make up the bulk of diesel cars on the road.

The impact of this has meant much of the assumptions around the improvements provided by newer vehicles have underestimated the level of emissions and makes achieving compliance with air quality legislation even more challenging.

The UK National Air Quality Plan is being updated to take account of updated emission factors developed in light of this issue. This is likely to demonstrate that Birmingham's air quality challenge is even more severe and identify further areas of the UK which are unlikely to achieve compliance with legislation before 2020.

Clearly measures to reduce/improve emissions from diesel vehicles and ultimately a shift to ultra-low/zero emission vehicles would provide the most immediate impact on air quality and are key to addressing the national air quality problem attributable to transport sources.

- **What would be the most effective ways of implementing and operating a 'clean air zone' so as to minimise these burdens.**

A Clean Air Zone is one element of a wider strategy which is required to address transport's contribution to poor air quality. Transport activity is driven by a wide range of needs and behaviours, and has a range of impacts including congestion, air pollution, carbon emissions and road traffic collisions. Consequently there are a wide range of measures and actions that can be taken to influence travel patterns, mode choices and technologies with a view to reducing these impacts.

Many of these measures are not designed primarily to reduce emissions or improve air quality, but are focused on other impacts e.g. reducing congestion or improving road safety; nevertheless, they will often help in the reduction of emissions, and can be enhanced so as to generate greater air quality benefits.

## **Clean Air Zone**

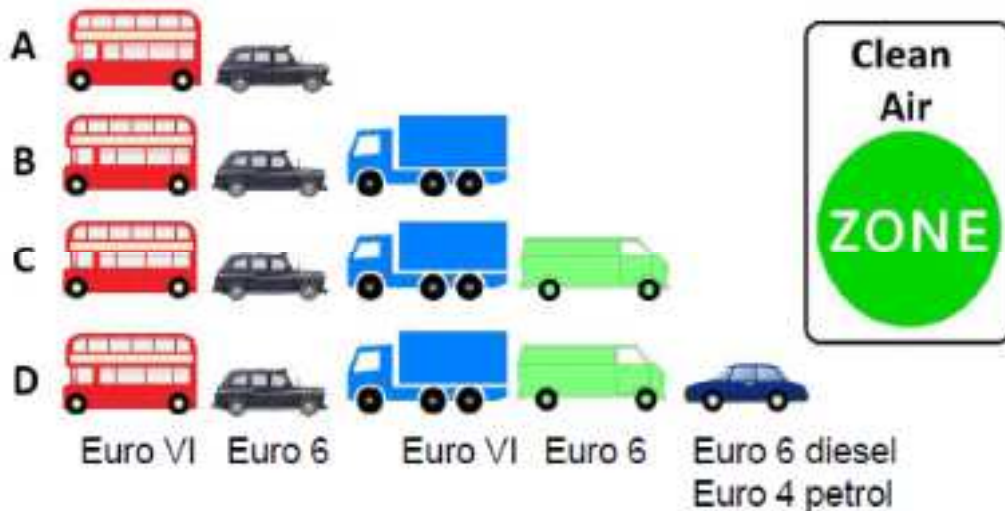
For the five cities with modelled air quality exceedances beyond 2020 outside London, Government is legislating the introduction of Clean Air Zones. Clean Air Zones are areas where only the cleanest vehicles are encouraged (through the use of a charge related to vehicle emission standards) and action is focussed to improve air quality. They are geographically defined areas allowing action and resources to be targeted to deliver the greatest health benefits.

Analysis by Defra for the 2015 UK Air Quality Action Plan suggested that in order to achieve compliance with NO<sub>2</sub> limits before 2020 Birmingham would need to introduce a



Class C Clean Air Zone with additional measures. It is anticipated that these will be a combination of improved signage and rerouting, switching to different forms of transport (e.g. use of Park and Ride), road improvements, and infrastructure for alternative fuels (e.g. support for use of compressed natural gas (CNG)). More detail around what could be additional measures is provided later. Figure 3 shows the various vehicle types that would be included in the different classes of Clean Air Zone.

**Figure 3 – Types of Vehicles included within each class of Clean Air Zone**



The final Clean Air Zone proposal for Birmingham will be determined on the outcome of the Feasibility Study now being undertaken.

### **Clean Air Zone Feasibility Study**

The Council is now preparing a feasibility study which will provide the evidence base for the design and development of the Clean Air Zone which the Council will ultimately implement.

The elements of this Feasibility Study are:

- Traffic and Air Quality modelling to develop Clean Air Zone proposals
- Impact Assessments
- Additional Measures

To support the feasibility study an Automatic Number Plate Recognition (ANPR) Camera survey has recently been undertaken to provide up to date fleet composition data for the city centre. This will allow an understanding of not only the volumes of traffic but also the Euro emissions class of different types of vehicles using different sections of road in the city centre. This data will be used as part of the traffic modelling and air quality modelling process and will allow a realistic baseline assessment of the impact of different types of Clean Air Zone and any required additional measures.

### **Clean Air Zone Traffic and Air Quality modelling**

This study will use traffic and air quality models to help understand the baseline position if no action is taken to address air quality and assess the impacts of different scenarios to understand what is required to achieve compliance with air quality legislation limits.

The scenario testing process will help to determine the geographical extent, potential charging band for the zone, any appropriate additional measures that are required and ultimately the type of Clean Air Zone as set out in Figure 3 above.

The modelling study will also need to take account of any changes to the national air quality action plan due in early 2017 as a result the High Court's ruling which required Defra to update it. This will ensure that air quality models take account of updated emissions factors following the real world emissions testing controversy.

### **Clean Air Zone Impact Assessments**

The final design of the Clean Air Zone in Birmingham will have to ensure that air quality is improved so that Birmingham is compliant with air quality limits by 2020. However, the implementation of the Clean Air Zone will have impacts wider than the reduction of air pollution and it is important to understand these.

As part of the Clean Air Zone feasibility study these wider impacts need to be understood holistically. This will enable the city council to compare Clean Air Zone policy and scheme options and justify the preferred option for delivering the Clean Air Zone. Furthermore, it is vital that the city council has a robust understanding of the impacts of air pollution and any potential Clean Air Zone on the city when communicating with internal and external stakeholders as we progress with the implementation of the Clean Air Zone. The city council has identified that it needs to understand the impact of air quality and the implementation of Clean Air Zone options on:

- health,
- economy and business, and
- equality in the city.

The purpose of the impact assessments will be to identify any issues where for mitigating action might be required at a local/national level in order to ensure that the implementation of Clean Air Zones supports inclusive growth.

The information will also enable targeted communications and engagement to make the issue more commonly understood and raise employee awareness of air quality as an issue and to show what can be done to reduce emissions.

### **Clean Air Zone Additional Measures**

Defra have initially indicated that a Clean Air Zone in Birmingham in isolation is unlikely to be sufficient to achieve compliance and that a number of additional measures will be required. Defra's initial assessment as part of their 2015 Air Quality Action Plan suggested that these additional measures could be a combination of improved signage and rerouting, switching to different forms of transport (e.g. use of Park and Ride), road improvements, and infrastructure for alternative fuels (e.g. support for use of compressed natural gas (CNG)).

As part of the Clean Air Zone feasibility study an assessment of potential additional measures will be produced to identify the most appropriate package of interventions which

would support successful implementation of the Clean Air Zone and achieve compliance in the shortest possible time before 2020.

The Urban Transport Group's Air Quality Toolkit<sup>8</sup> provides a useful overview of the different types of transport measures which could be implemented by local authorities to improve air quality. The table from the document, included at Appendix 1, provides an indication of the costs and the expected level of impact associated with different types of measures. This is useful to demonstrate the breadth and range of potential measures that exist; however, it does not imply that they are appropriate or required for Birmingham.

### **Wider action to address air quality**

It must be recognised that improving air quality cannot be achieved through transport policy and infrastructure measures alone and that air quality is affected by decisions in multiple policy areas and is therefore a shared responsibility across the Council's functions including public health, economic strategy, planning strategy, development control, environmental protection, licensing and public protection, sustainability, energy and procurement.

Further the Council must also work with its strategic partners, stakeholders, businesses and communities to ensure that responsibility and action is taken at the most appropriate levels.

Therefore it is acknowledged that in parallel to the work on the Clean Air Zone, a wider programme of initiatives to address air quality is required which will require delivery and ownership by a range of stakeholders. These could include:

**Table 3 – Air Quality Wider Programme Measures**

<b>Business Support</b>	<ul style="list-style-type: none"> <li>• Awareness raising</li> <li>• Fleet reviews</li> <li>• Access to Finance</li> <li>• Taxi/PHV/SMEs</li> <li>• Jobs &amp; Skills</li> </ul>
<b>Fleet Management</b>	<ul style="list-style-type: none"> <li>• Implement BCC Fleet Review recommendations including CLOCS and FORS</li> <li>• Procurement</li> <li>• Cross Public Sector Replacement &amp; Retrofit Programme</li> <li>• Reduce Use and Vehicle Utilisation Management</li> </ul>
<b>Public Awareness &amp; Behaviour Change</b>	<ul style="list-style-type: none"> <li>• Promoting alternative modes of travel</li> </ul>

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<sup>8</sup> Air Quality in the City Regions: A Transport Toolkit, Urban Transport Group, 2014  
<http://www.urbantransportgroup.org/>

	<ul style="list-style-type: none"> <li>• Working with schools and community organisations</li> <li>• Air Quality Mapping</li> <li>• Birmingham Connected Communication Strategy 'Nudge' Programme</li> </ul>
<b>Public Transport</b>	<ul style="list-style-type: none"> <li>• Fleet enhancements <ul style="list-style-type: none"> <li>○ Euro VI</li> <li>○ Electric</li> <li>○ Hydrogen</li> <li>○ Gas</li> </ul> </li> <li>• Bus Alliance</li> <li>• Rapid Transit</li> <li>• Public Transport Priority Measures</li> <li>• Rail Improvements</li> <li>• Mobility As A Service</li> </ul>
<b>Policy Review</b>	<ul style="list-style-type: none"> <li>• Embedding Low Emission Towns &amp; Cities policy recommendations in: <ul style="list-style-type: none"> <li>○ Land Use Planning</li> <li>○ Housing / BMHT</li> <li>○ Transport</li> </ul> </li> <li>• Update the Air Quality Action Plan</li> </ul>
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Retrofit Standards and Supply Chain</li> <li>• Technology to manage demand</li> </ul>

• **What are the potential barriers to clean air zones being implemented widely in the city?**

The Council's response to the recent consultation on the draft Clean Air Zone Framework asks that the Government ensures that the appropriate level of national support and ambition required to achieve compliance is provided.

Apart from outlining the ability for local authorities to charge polluting vehicles to enter CAZs, there are no additional actions within the framework that local authorities aren't already made aware of through local air quality management best practice that could be contained in a local air quality action plan.

It is the Council's view that the draft framework lacks ambition and does not empower cities in the right way. Going forward the Government needs to set out a stronger plan for improving air quality in the UK. As such, the framework must outline the means by which cities will be able to achieve compliance with air quality legislation as quickly as possible – in line with the High Court's judgement

The current approach on Clean Air Zones puts much on emphasis on action at the local level. However, there are many issues which are directly beyond the influence or control of the City Council. These national level interventions would include but are not limited to:

- Greater action to reduce the usage of diesel vehicles - particularly passenger vehicles – especially where there is a high risk of public exposure to traffic emissions. This should be tackled through mechanisms such as Vehicle Excise Duty

and fuel tax changes as well as considering diesel scrappage schemes or further enhanced incentives to invest in ultra-low emission vehicles or the appropriate retro-fitting technologies.

- Working with vehicle manufacturers to ensure the market responds in an appropriate and timely fashion to the changing consumer/business vehicle requirements that will arise as a result of measures to encourage increased uptake of ultra-low/zero emission vehicles particularly for heavier vehicles over 3.5 tonnes including bin wagons, minibuses, HGVs and buses. There is concern that current production will not enable sufficient change to fleets ahead of 2020.
- The support that is needed from a national level to help transition fleets to sufficiently clean engine technology is significant. The level of support required is greater than the current funds made available through mechanisms such as competitive OLEV grants.
- Adopting a different approach to providing funding for measures that will address air quality. Support needs to be committed to delivering the level of change that is needed where it is needed rather than being made available through a competitive manner that introduces unnecessary uncertainty into the successful achievement of air quality compliance. A significant amount of resource is required for bid development and this is often time and money that is not recovered in the event of an unsuccessful bid.

### **Robust evidence and monitoring**

There is a need for more real time monitoring of what is going on in the real world and to demonstrate the impact of interventions to address air quality. Prediction by modelling, whilst useful, has turned out to have limitations. What happens at a detailed level is important; and the physics, chemistry and social behaviour at this scale are complex.

### **Political support**

A bold vision, commitment, consensus and leadership from national and local government is required to achieve the level of change needed to see real improvements in air quality.

Engagement with key stakeholders from business, industry, academia and communities is critical to ensure that the challenge on air quality is positioned as a major public health issue for which responsibility is shared and not simply regarded as a problem for the City Council or the West Midlands Combined Authority to tackle in isolation through the Clean Air Zone. A joined up city and regional approach is essential.

### **Resources**

It is essential that Government equips local authorities with the necessary financial support (including revenue funding) to deliver the Clean Air Zones and additional measures. Whilst a commitment has been made with regard to the capital costs of developing and introducing the schemes, there continues to be no recognition from Government of the increasing resource drain the Clean Air Zone is having and an additional burden.

The Council has asked the Government to adopt a different approach to providing funding for measures that will address air quality. Support needs to be committed to delivering the level of change that is needed where it is needed rather than being made available through a competitive manner that introduces unnecessary uncertainty into the successful achievement of air quality compliance. A significant amount of resource is required for bid development and this is often time and money that is not recovered in the event of an unsuccessful bid.

There is a great opportunity to use the Clean Air Zone to as a platform for developing and enhancing the green growth agenda with many opportunities for sector development and new job and skills. Prioritisation of resources, for e.g. through Greater Birmingham and Solihull Local Enterprise Partnership will be critical.