A Study on Air Quality in Brent

On Behalf of Clean Air for Brent

Imperial College London
MSc Environmental Technology
Calvin Chan, Tiffany Cheung, Adeline Loo, Violet Ross
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Authors can be contacted via Clean Air for Brent.
Clean Air for Brent can be contacted via cafbrent@gmail.com or www.cleanairforbrent.wordpress.com
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<th>Description</th>
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<tbody>
<tr>
<td>AFA</td>
<td>Ark Franklin Primary Academy</td>
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<tr>
<td>AQ</td>
<td>Air Quality</td>
</tr>
<tr>
<td>AQAD</td>
<td>Air Quality Action Days</td>
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<tr>
<td>AQAP</td>
<td>Brent council’s Air Quality Action Plan 2017-2022</td>
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<tr>
<td>AQMA</td>
<td>Air Quality Management Areas</td>
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<tr>
<td>AQFA</td>
<td>Air Quality Focus Areas</td>
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<tr>
<td>AQAA</td>
<td>Air Quality Action Areas</td>
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<tr>
<td>AMS</td>
<td>Automatic monitoring station</td>
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<tr>
<td>BAME</td>
<td>Black, Asian, Minority, Ethnic</td>
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<td>CAfB</td>
<td>Clean Air For Brent</td>
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<td>CBPR</td>
<td>Community Based Participatory Research</td>
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<tr>
<td>CoE</td>
<td>Church of England</td>
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<tr>
<td>CIL</td>
<td>Community Infrastructure Levy</td>
</tr>
<tr>
<td>CR</td>
<td>Chamberlayne Road, Brent</td>
</tr>
<tr>
<td>DfT</td>
<td>Department for Transport</td>
</tr>
<tr>
<td>GLA</td>
<td>Greater London Authority</td>
</tr>
<tr>
<td>HHS</td>
<td>Harlesden High Street, Brent</td>
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<tr>
<td>LAQN</td>
<td>London Air Quality Network by King’s College London</td>
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<tr>
<td>LIP</td>
<td>Local Implementation Plan</td>
</tr>
<tr>
<td>LNP</td>
<td>Liveable Neighbourhoods Programme</td>
</tr>
<tr>
<td>LEBZ</td>
<td>Low Emission Bus Zones</td>
</tr>
<tr>
<td>LEN</td>
<td>Low Emission Neighbourhood</td>
</tr>
<tr>
<td>LSE</td>
<td>London Sustainability Exchange</td>
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<tr>
<td>MAQF</td>
<td>Mayor’s Air Quality Fund</td>
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<tr>
<td>MTS</td>
<td>London Mayor’s Transport Strategy</td>
</tr>
<tr>
<td>NCIL</td>
<td>Neighbourhood Community Infrastructure Levy</td>
</tr>
<tr>
<td>NOx</td>
<td>Nitrous oxides</td>
</tr>
<tr>
<td>PM</td>
<td>Particulate matter</td>
</tr>
<tr>
<td>SAF</td>
<td>Strategic Assessment Framework</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, weaknesses, opportunities and threats</td>
</tr>
<tr>
<td>TfL</td>
<td>Transport for London</td>
</tr>
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Abstract
With the ultimate aim of improving the air pollution problem in the London borough of Brent, this project proposes and evaluates recommendations using solid evidence from case studies. It also identifies applicable funding schemes for the recommendations to assist the recently-formed voluntary community group, Clean Air for Brent, with practical means to tackle air pollution in the borough. Chamberlayne Road in Queens Park ward and Harlesden High Street in Harlesden ward are the case study areas chosen to illustrate Brent issues. In terms of air quality, key issues include the continuous exceedance of the EU’s nitrogen dioxide (NO2) annual limit of 40 μg/m3 in both wards, mainly due to road traffic. Furthermore, both areas exhibited unsatisfactory road quality with many potholes, limited space and faded markings, making it neither comfortable nor safe for road users. A survey for the study also shows that the majority of vehicles are diesel: known to emit more pollutants. Regarding these major problems, this project has drafted five recommendations: community engagement projects, placemaking, vehicle technology upgrading, delivery optimization, and improving air quality monitoring to enhance data collection. Each of these recommendations has their own applicable funding schemes. Finally, the project uses a Strategic Assessment Framework and SWOT analyses to evaluate the proposed recommendations in accordance to achieving overarching goals within the Mayor of London’s Transport Strategy Goals.

1.0 Introduction
Air pollution, specifically particulate matter (PM) and nitrous oxides (NOx), is widely renowned for its negative associations with human health, such as cardiovascular disease, respiratory diseases and lung cancer (RCP, 2016). Waltons (2015) has estimated that the impacts of PM2.5 and NOx cause an average loss of life expectancy by 9 and 16.25 months respectively, leading to 40,000 premature deaths in the UK annually, costing in excess of £20bn (RCP, 2016).

Brent Borough has seen repeated exceedances of NO2 and PM10 in recent years. Because of this, Clean Air for Brent (CAfB) are seeking suggestions for wider action and applicable funding schemes to aid them in proposing holistic action to address poor air quality (AQ). However, as a relatively young organisation where members are local residents, they are limited by the lack of resources. Simultaneously, the local council is constrained by the lack of funding as indicated in Urban Flow et al. (2016), which has prevented additional action.

This research has been developed by Imperial College London students on the MSc Environmental Technology degree course, on behalf of CAfB.

The aim of this report is to assist CAfB to improve AQ in Brent Borough. The objectives to achieve this are shown in Figure 1.
1.1 Background

1.1.1 Clean Air for Brent

Formed in 2017, CAfB is a young organisation with 8 members on the steering group and a mailing list of 275 Brent residents (Appendix A). The organisation has come about through a collaboration of residents’ associations, community groups and individuals with 4 distinct aims (Figure 2):

![Figure 1: Project Objectives.](image)

1. Build evidence-base for case study areas
2. Make recommendations to improve air quality and analyse options
3. Identify suitable funding schemes for CAfB or council to implement proposed recommendations

Their strength as an organisation lies in being a motivated community with real concern for improving air pollution in the borough. However, as a new organisation action is limited due to lack of funds and of an established presence within the public sector or civil society.

1.1.2 Brent Council’s Strategy

In order to gauge where there may be room for improvement and to ensure there is no overlap it is important to understand the council’s strategy and future initiatives to improve AQ in the borough.

The council has a number of existing schemes and initiatives to tackle air pollution. These include:

- No Idling Campaign, March 2017 (LRSC, 2017).
- Air Text, a pollution alert system for residents (Brent Council, 2018e).
- Guidance for dust control and non-road machinery requirements on construction projects (Brent Council, 2018e).
→ Regeneration projects to improve public enjoyment of urban spaces with increasing pedestrianisation efforts.
→ Declaration of Air Quality Management Areas to the Mayor where AQ standards or objectives are not being met (Appendix B).
→ Four Air Quality Action Areas identified as “key areas of concern, planned development and/or regeneration zones” (Ricardo Energy and Environment, 2016) (Appendix C and D).

The future of Brent’s AQ strategy is outlined in the Air Quality Action Plan (AQAP) 2017-2022, which states that AQ mitigation will focus on namely “local energy generation, construction and road transport” (Brent Council, 2017a). The AQAP has 24 actions to reduce air pollution,

Table 1: Points included in the AQAP 2017-2022 (Brent Council, 2017a)

<table>
<thead>
<tr>
<th>Construction and Buildings</th>
<th>Community</th>
<th>Delivery and Freight</th>
<th>Exposure Reduction</th>
<th>Cleaner Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reduce emissions from construction and new developments</td>
<td>- Promotion of air quality action days, tools for pollution mapping and journey planning</td>
<td>- Investigate virtual loading bays for Ultra Low Emission vehicles</td>
<td>- Identification of Low Emissions Neighbourhoods (LENs) in Air Quality Action Areas - potentially with a 5 year lead up time</td>
<td>- Increase number of electric vehicle (EV) charging points and promote the uptake of EV cars</td>
</tr>
<tr>
<td>- Reduce emissions from waste treatment facilities</td>
<td>- Continue the no idling campaign and ensure schools join Transport for London’s travel planning programme</td>
<td>- Investigate feasibility of freight consolidation for council deliveries</td>
<td>- Target high pollution areas for building green infrastructure such as green barriers and trees</td>
<td>- Increase the uptake of low emission vehicles in the borough fleet</td>
</tr>
<tr>
<td>- Increase energy efficiency on council estates</td>
<td>- Replacement schemes and awareness training to reduce emissions from boilers</td>
<td></td>
<td></td>
<td>- Encourage car clubs to increase the number of EV in their fleets</td>
</tr>
</tbody>
</table>

2.0 Report approach - Methodology

2.1 Case Study Selection

A case study approach is a practical way to tackle AQ at a local level. The two case study areas, both located in the southeast of the borough, were selected to best illustrate air quality issues in contrasting areas of Brent, namely the section of Chamberlayne Road within Queen’s Park ward, and Harlesden High Street of Harlesden ward.
At the outset, Queen’s Park was selected as residents’ associations and environmental groups covering the area had initiated CAfB. This established a strongly motivated local community who share a desire to help improve AQ in the area. Chamberlayne Road within Queen’s Park ward was selected as our first case study area because it has become a traffic corridor providing a connection between Central London and the North Circular, making it one of the busiest roads in Queen’s Park ward (Urban Flow et al, 2016). About a third of Chamberlayne Road, which is 0.9 miles in length is unclassified road, meaning that it is meant for local traffic only per the Department for Transport’s road classification definitions.

Chamberlayne Road is within Brent Council’ Air Quality Management Areas and has been so for many years now. There are two schools along Chamberlayne, meaning AQ improvements are crucial since children are particularly susceptible to pollutants, having less-developed immune systems.

Secondary information was then collected for Chamberlayne Road, Queen’s Park ward and Brent borough as a whole to scope and understand the area. This was predominantly sourced from online publications by Brent Council. However, it was realised that the demography and socio-economic status of Queens Park ward does not reflect the Brent average, in terms of a substantially higher median income and a lower proportion of Black, Asian and Minority Ethnic population (Brent Council, 2014a; Brent Council 2014b; Brent Council, 2014c).

It was decided that a second case study area should be used to help introduce contrast into the study. Harlesden ward was focused on because it reflects a less affluent element in the profile of Brent borough as a whole. It is an area of lower median income and a higher proportion of 0 - 4 year olds (Brent Council, 2014a; Brent Council 2014b; Brent Council, 2014c). Harlesden is also identified as an Air Quality Focus Area by the Greater London Authority (2016a). To narrow the focus, Harlesden High Street was selected as the second case study area, since it is the main street within the ward, similar to Chamberlayne, and experiences heavy traffic and congestion. The High Street is part of the major radial artery A404, the Harrow Road, and the section through the shopping centre has been re-configured twice in recent decades. The second re-design completed in 2016 includes a northbound-buses only section from the Jubilee Clock to Tavistock Road, the latter now being one-way only westbound while Manor Park Road is part one-way and part two-way. There are two primary schools both within 200 meters of the High Street. Whilst we have NO2 diffusion data for High Harlesden High Street up to 2016, we are not aware of any monitoring of before and after pollution levels on the re-configured sections of the High Street, though it is possible that TfL funds related to air pollution were used to finance the scheme.

The selection of two case studies provides the opportunity to respond to CAfB’s concern with the wider Brent community, contributing to three of their four main goals focused on community engagement and awareness raising. A two case-study focus also allows for comparison between areas giving context and a wider understanding of challenges faced in the borough. It would also help to recommend effective interventions regardless of average household income levels in the area.
2.2 Council’s Action in Case Study Areas

The upcoming actions to be made by Brent Council were compiled from their recent publications on projects regarding the two case study areas. These were taken into account to ensure that recommendations are complementary to the council's strategy and to avoid repetition.

2.3 Site Visits and Surveys

Site visits were carried out on several occasions at both case study areas. On 7 February 2018, an initial site visit was carried out at in Queen’s Park ward around Chamberlayne, to record observations and photograph the case study area. Briefings from CAfB Steering Group members also took place, covering monitoring in which local groups had been involved and an explanation of how the organisation came together in 2017.

Subsequent site visits at Chamberlayne were also conducted on 14, 15 and 21 February 2018 where road traffic surveys were completed. These surveys concentrated around peak traffic flow during the weekdays in the morning and evening rush hour, when people commute to work. For each 30 minute session, the northbound or southbound traffic was recorded according to vehicle type to explore the distribution of traffic flow and the characterization of the vehicle fleet. The categories included (i) cars, vans and powered bikes, (ii) buses, (iii) heavy goods vehicles, and (iv) bicycles.

Data from the road traffic surveys were then converted to hourly traffic flow separately for the morning and evening, and then compared to the hourly average of three-hour morning (0700 - 1000) and evening (1600 - 1900) peaks, derived from the 2016 traffic count data for the annual average daily flow for all unclassified roads in the UK (Department for Transport, 2016).

Where possible, the origin and destination of vehicles, as well as their fuel type were also surveyed to help identify whether traffic flows are attributed to through traffic. 70 vehicles were surveyed along Chamberlayne Road and 60 along Harlesden High Street. The survey was conducted, when vehicles were stationary, concurrently with vehicle counts.

On 21 February 2018, a survey on land use and potholes along Chamberlayne was also carried out. The land use survey helps to build a clearer picture of activities in the area and highlights areas of greater exposure, particularly by more vulnerable groups. The pothole survey is able to act as an indicator of the amount of heavy traffic since it is a contributing factor in its formation, as well as road safety for cyclists (Meon, 2018). Potholes with a diameter of >3cm, regardless of depth, were accounted for in the survey.

The abovementioned surveys were also carried out on Harlesden High Street on 21, 22, 23 and 26 February 2018. Relevant data was compared with data from the Department of Transport (2016).
2.4 Air Quality

Data regarding AQ, namely the annual mean of NO\textsubscript{2} and PM, was collected for the two case study areas. All data collected were secondary in source, looking at published data by Brent Council, public databases such as London Datastore and London Air Quality Network (LAQN).

These sources conducted monitoring using diffusion tubes, measuring NO\textsubscript{2} as well as automatic chemiluminescent monitoring, measuring NO\textsubscript{2} and PM\textsubscript{10}. Both Chamberlayne and Harlesden High Street have a diffusion tube site and are managed by local site operators and interpreted by Gradko International Ltd Laboratories, undergoing a general bias adjustment (London Borough of Brent, 2017). On Chamberlayne, the Ark Franklin Academy (AFA) primary school host a Brent monitoring station which is part of the LAQN run by King’s College London. Where it was not possible to obtain data on Harlesden High Street itself, sources from adjacent roads were used. The closest automatic air monitoring station, was located at John Keble CoE Primary School on Crownhill/Manor Park Roads.

2.5 Funding Schemes

Funding sources from the local authority, Greater London Authority and Transport for London are the focal point. Factors addressed include the aim of the scheme, a brief summary of its criteria, the time frame open for applications.

2.6 Recommendations

In terms of recommendations to help improve AQ in Brent, ideas are mostly drawn from case studies, especially if they have received funding for AQ improvements. Additionally, international success stories and suggestions from local residents will be considered. Where possible, associated costs will, too, be quantified based on previous case studies.

The recommendations identified are then assessed using a SWOT analysis which highlights the strengths, weaknesses, opportunities and threats of the suggested schemes. They are also evaluated against the Strategic Assessment Framework (SAF) which is a multi-criteria assessment tool developed by Transport for London (2010) in accordance with the Mayor’s Transport Strategy (MTS). In addition, gaps in data or information which is necessary for funding applications will also be established in order to determine steps for CAfB to take in the near future to advance their cause to better local AQ.

3.0 Results

3.1 Demography of Residents

Table 2 below presents a brief summary of the residential demographics in Brent, Queens Park ward and Harlesden ward. The most noticeable differences are as follows:

a) Harlesden has a slightly higher percentage of 0 - 4 year olds in the area, compared to Queens Park.
b) Both Harlesden and Queens Park have a smaller population percentage above 65 than the Brent average.

c) Queens Park has a much lower BAME Population percentage as compared to the Brent average.

d) The median household income of Brent is very different when compared to both Harlesden and Queens Park. Chen et al (2011) showed that individuals with a higher income could be more concerned with environmental issues, applicable for Queens Park.

Table 2: Residential demographics of Brent, Queens Park and Harlesden. Adapted from: [1] Brent Council (2014a), [2] Brent Council (2014c) and [3] Brent Council (2014b)

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<thead>
<tr>
<th></th>
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<tr>
<td>Population (in 2011)</td>
<td>311,215</td>
<td>15,281</td>
<td>17,162</td>
</tr>
<tr>
<td>Median Age (in 2011)</td>
<td>32</td>
<td>34</td>
<td>31</td>
</tr>
<tr>
<td>Number of 0 – 4 year olds (in 2011)</td>
<td>22,446</td>
<td>1,140</td>
<td>1,645</td>
</tr>
<tr>
<td>% of 0 – 4 year olds (in 2011)</td>
<td>7.21%</td>
<td>7.46%</td>
<td>9.59%</td>
</tr>
<tr>
<td>Population percentage under 18 (in 2011)</td>
<td>22.6%</td>
<td>19.8%</td>
<td>29.1%</td>
</tr>
<tr>
<td>Population percentage above 65 (in 2011)</td>
<td>10.6%</td>
<td>8.8%</td>
<td>7.96%</td>
</tr>
<tr>
<td>Men to Women ratio (in 2011)</td>
<td>1.01</td>
<td>0.962</td>
<td>0.965</td>
</tr>
<tr>
<td>Black, Asian and Minority Ethnic (BAME) Population Percentage (in 2011)</td>
<td>63.7%</td>
<td>37.0%</td>
<td>67.0%</td>
</tr>
<tr>
<td>Median Household Income (in 2014)</td>
<td>£31,601</td>
<td>£41,423</td>
<td>£23,977</td>
</tr>
</tbody>
</table>

Health-wise, 17% of Brent’s population described their health as fair, or worse (Brent Council, 2015b). Asthma was described by NHS Brent Clinical Commissioning Group & London Borough of Brent (2015) as the “most common long-term” childhood condition. The number of hospital admissions due to asthma was 223.4 (per every 1000 people) in Brent, which is higher than the average admissions (202.4 per 1000 people) in England due to asthma (Public Health England,
2017). Additionally, respiratory diseases (including asthma) are the third major killer in Brent, responsible for about 15% of deaths in the borough (Brent Council, 2015b). Although smoking is the primary cause of respiratory diseases in Brent, this rate is worsened by the heavy air pollution in the area (Brent Council, 2015b).

3.2 Land use and activities in the area

Chamberlayne Road
The Road is a two-way linear corridor largely characterised by a mixture of solely residential properties, and three-story buildings with shops and restaurants located on the ground level, and residential apartments in the upper stories (Figure 3a). About two thirds of Chamberlayne is used solely for residential purposes and on-street parking areas are provided.

Two schools are situated on Chamberlayne: Manor School, a primary school for students with special educational needs, and Ark Franklin Academy (Department for Education, 2017). Another school, Princess Frederica, lies 0.2 miles west of Chamberlayne, while the large Queen’s Park Community School lies a similar distance to the east. Other special features on Chamberlayne include a three churches and a cinema, highlighting air potential exposure areas. The Moberly Sport and Education Centre is currently under construction until Summer 2018 (Westminster City Council, 2017).

Harlesden High Street
The High Street is characterised by buildings which are two to four stories tall. Land use is mixed as shops on the ground levels are retail and restaurants whereas residential flats are located on upper floors. The northern section of the High Street has recently been restricted to buses, cycles and pedestrians as part of a £5m scheme to improve the local environment and reduce congestion.
mentioned above. Towards the southernmost portion of the High Street, land use becomes more residential in nature (Figure 3b). Along the road, there are also more areas for on-street parking than on Chamberlayne.

There is a nursery, Little Angels Nursery, for children 2 to 5 at the northern section of the street within the Methodist Church premises and two St Michael’s nurseries, one at John Keble School and one at All Souls church (Day Nurseries, 2018). Also, two primary schools lie within 200 meters of the High Street: John Keble Church of England Primary School and Furness Primary School. Additionally, there are two churches with ancillary premises, the Methodist Church within the buses-only section and All Souls, C of E, where it begins but outside the restricted area.

3.3 Roads

As traffic is the largest cause of air pollution in the borough of Brent (Brent Council, 2017a), an assessment of the roads is an important consideration.

Chamberlayne Road

This corridor is unclassified and linear, stretching for 0.9 miles with a single carriageway in both directions (Figure 4a). As shown in Figure 4a, the northern section heads towards Willesden and then on to Neasden and the North Circular. The southern short – 0.05 miles - section of Chamberlayne is identified as a B-road (B450), linking up to B413 Kilburn Lane heading towards central London or west towards Harlesden and Harrow.

Figure 4a: CR (left)
Figure 4b: HHS (right)
Findings from our site visits demonstrated a number of key issues:

➔ Uneven pavements offering little space for pedestrians.
➔ Limited green infrastructure perhaps due to the lack of space.
➔ 66 potholes with the greatest concentration in the southern section along cycle route 45.
➔ Unclear bicycle lanes with markings that disappear and reappear.
➔ Congestion ‘pinch points’ caused by parking areas and large vehicles.

Harlesden High Street
The High Street is roughly 0.6 miles in length, encompassing an A road, B road and unclassified, one-way, buses and cycles only section (Highlighted in red, Figure 4b).

The southern section from Willesden Junction Station to the Park Parade crossroads is the A404 which leads either towards the North Circular or south towards central London. The pavements were of good quality, with uneven surfaces in places but few cracks and around 9 potholes. 5 cycle docks were seen.

The High Street separates from the A404 at a crossroad. This middle section has no cycle docks due to limited space, but pavements were good to average in quality, with an exception at the junction to The Croft - slabs were raised, posing a hazard. There was 1 pothole and 2-3 loading bays in the area. Other than the bays, there is no available parking.

The regeneration project, completed in 2016 created the buses and cycles only zone to decrease car use and improve the public realm for pedestrians (Black, 2014). The zone allows buses at any time and loading between 4pm-10am but no other motor vehicle access. There were around 20 cycle docks installed. However, site visits have noted issues with road quality along the semi-pedestrianised section. In particular the paving has been dented and loosened significantly by vehicle weight particularly in front of the bus stop, on the side of the road where cyclists tend to cycle. As a result there are more than 15 potholes, some stretching over 25 meters. Figure 5 below shows the damage in front of the bus stop.¹

¹ Since the report was completed on 28th March 2018 the semi-pedestrianised section of Harlesden High Street has been repaved.
3.4 Cycle networks

Figures 6a and 6b below show the cycle routes in Harlesden and Queen’s Park wards.

The number 45 cycle route runs through the south of both wards. It arrives at Chamberlayne in the south from the Grand Union Canal where the road is in very poor condition with many potholes, limited space and faded markings, making it neither comfortable nor safe for cyclists (Figure 7). Congestion means that cyclists are weaving in and out of traffic or cycling down the middle of the road often, as there are no lanes.
There is signage for the quiet route towards Kensal Green but the designated route along Ilbert Street towards Paddington has no signs/markings and the pavement is raised so cyclists have to dismount to switch to this route.

Route 45 arrives on the High Street from Palermo Road and Furness Road shown on the bottom left corner of Figure 6a. The route only goes along the high street for 100 to 200 meters before joining the one-way route to Acton along Tubbs Road or Nightingale Road. The road quality on these streets is severely degraded and are normally congested. As observed in rush hour, bikes come from many directions and although signs are clear through Harlesden markings are faded and do not encourage drivers to provide space or slow down as shown in Figure 8 below. From Figure 8 it is clear that some of the best markings are in Kensal Green ward.

Figure 7: Cycle route 45 taken outside the AFA on 14 February 2018 at 9am.

Figure 8: Quality of markings along route 45 in Harlesden, Kensal Green and Queens Park wards.
The London Cycle Guide suggests a number of quiet routes for cyclists and can be ordered online for free (TfL, 2018a). The routes are away from major roads and are significantly safer for cyclists due to a reduced likelihood of casualties and reduced air pollution (GLA, 2012). However, in both wards most of the quiet routes are not signposted, which does not provide awareness to cyclists of their existence.

3.5 Modes of transport

In comparison to the 2001 Census, the 2011 Census found that despite a 10% increase in the number of households within Brent, there has been a 27% increase in vehicle-less households from 37,287 to 47,417 (Brent Council, 2012). The average number of cars within Brent decreased by approximately 10% from 0.88 to 0.80 cars or vans per household.

Nevertheless, the proportion of people commuting daily using a car or van is at 16% for Queen’s Park and 22% for Harlesden, translating to 1,383 and 1,536 people respectively. Other road transport includes buses, the main transport mode for 31% of people in Harlesden (2,131 people), but less popular in Queens Park, accounting for 16% (1,388 people). Queens Park ward also sees the greatest number of people in Brent who cycle to work (639 people), as opposed to Harlesden ward (241 people). 27% of people in Harlesden use trains to commute to work, while a higher percentage of the population (42% or 3001 people) in Queen’s Park uses trains, possibly due to the higher connectivity of Queen’s Park.

3.6 Car ownership

According to the 2011 Census, the ward with the highest proportion of households which have access to at least one car or van in Brent is Queen’s Park at 53% of 6,274 households. In contrast, Harlesden is one of the wards with the highest proportion of households to have no access to a car or van at approximately 65% of 6,654 households. Both wards are in the south of Brent. However a broader view of the north-south differences of car ownership in the borough reveal that south Brent has a lower rate of car ownership than the north by a third. The north has a higher rate of ownership of more than one car per household.

There is no further data on what fuels these vehicles utilise. It is assumed that the petrol, diesel and alternative fuel (hybrids and electric) vehicles reflect the general market share of petrol, diesel and alternative fuel vehicles in the UK - 59%, 36% and 5% respectively (SMMT, 2018a)

A site visit to Queen’s Park ward on 7 February 2018 between 9-12.30am, highlighted strong smells of vehicle exhaust fumes along Chamberlayne, and numerous heavy goods vehicles and light commercial vehicles. The latter was also seen parked on adjacent residential side streets. It is important to realise that the majority of such vehicles have diesel engines, which could increase local NOx and PM levels (SMMT, 2018b).
3.7 Traffic flow

On site visits to both study areas congestion during rush hour was often at stand still - a cause of more emissions (Figure 9 and 10).

![Image](image1.png)

**Figure 9:** Congestion on CR outside the AFA. Taken on 14 February 2018, 8.30am

![Image](image2.png)

**Figure 10:** Congestion at the entrance to the HHS pedestrianised section. This photo was taken at 11am on Saturday 3 March 2018.

3.8 Survey Results

70 vehicles were surveyed in stand-still traffic, during the midweek morning rush hour on Chamberlayne. On Harlesden High Street, 60 vehicles were surveyed during the midweek morning and evening rush hour. Drivers were asked their origin, destination and vehicle fuel type.

**Vehicle Fuel Type Survey Results**

Our surveys revealed that most vehicles traveling through the case study areas were diesel vehicles - 62.9% in Chamberlayne and 42% in Harlesden High Street. Diesel is known to contribute substantially more NOx, PM$_{10}$ and PM$_{2.5}$ concentrations when compared to petrol (Figure 11 and 12; Brent Council, 2017a; Nieuwenhuis, 2017).
These values are higher than the average percentage of diesel vehicles in the UK market 36% (Figure 13). The proportion of petrol vehicles for both Chamberlayne (22.9%) and Harlesden High Street (40.7%) was less than the proportion in the UK fleet (59.0%).

Figure 11: Pie chart showing fuel type of vehicles surveyed on Chamberlayne. (authors’ own figure)

Figure 12: Pie chart showing fuel type of vehicles surveyed on Harlesden High Street (authors’ own figure)

Figure 13: Average vehicle fuel type in the UK market (Adapted from SMMT, 2018a)

Origin and destination (O&D) Survey Results
For Chamberlayne, Figure 14 shows that 64.3% were through-traffic where both O&D of journeys are outside the borough. 25.8% of vehicles started or ended their journey in Queen's Park Ward,
therefore not classed as through traffic. The largest proportion of overall vehicles were moving within Brent, highlighting the need for holistic traffic reduction schemes.

For Harlesden High Street, Figure 15 indicates that 55.3% of vehicles surveyed were through-traffic; a similar situation to Chamberlayne. 20.4% of vehicles started or ended their journey in Harlesden Ward. Unlike Chamberlayne, the largest proportion of these vehicles were coming from outside the borough. Only one vehicle started and ended the journey in Harlesden.

Figure 14: Origin-destination data of vehicles surveyed on Chamberlayne (Authors’ own figure)

Figure 15: Origin-destination data of vehicles surveyed on Harlesden High Street (Authors’ own figure)

More survey data is in Appendix E.

Traffic count surveys have also shown that the average total number of motor vehicles which travel one-way, along Chamberlayne and Harlesden High Street per hour during the peak travel periods are substantially higher in traffic volume than the typical UK road. It is evident that higher volumes of traffic occur during the evening rush hours between 1600 and 1900 than compared to the morning at 0700 to 1000 (See Table 3).

For both case study roads, traffic volumes witnessed in the surveys are typically two times higher than the average UK road. The traffic volume of Chamberlayne is almost three times higher than
the average evening peak hour traffic count. This is particularly concerning since Chamberlayne is an unclassified road, designed to withstand only local traffic (Department for Transport, 2012). However, as the O&D survey results have demonstrated, it is primarily through traffic passing along the case study road.

Table 3: Average peak hour motor vehicle traffic of Chamberlayne and Harlesden High Street compared to all UK roads. Adapted from [1] Department for Transport (2017)

<table>
<thead>
<tr>
<th>Peak Hour Traffic Times</th>
<th>All UK Roads¹</th>
<th>Chamberlayne Road</th>
<th>Harlesden High Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>0700 to 1000</td>
<td>170</td>
<td>361</td>
<td>337</td>
</tr>
<tr>
<td>1600 to 1900</td>
<td>185</td>
<td>516</td>
<td>300</td>
</tr>
</tbody>
</table>

3.9 Bus Transport

Bus routes and passenger journeys indicate the number of buses in the case study areas, helping determine roadside exposure to air pollution, where people are most vulnerable (GLA, 2012). Table 4 shows the bus routes as annual passenger journeys in the case study areas.

There are circa 11,304 daytime bus services, attached to 7 bus routes, operating on Chamberlayne weekly and a total of 8 bus stops. When the night services are added to daytime ones, total services operated weekly on this road is circa 12,000.

The average number of passenger journeys for a London bus route is 5,425,200 per annum. Table 4 shows that of the 6 Chamberlayne bus routes, number 52 has the highest annual passenger journeys - 7,999,744 – across its entire London route service (GLA, 2013). A small fraction of these passenger journeys are made on the Chamberlayne section of route.

Harlesden High Street has a total of 9 bus routes and 4 bus stops. Of the 9 Harlesden High Street bus routes, and at 17,153,879 (GLA, 2013), number 18 has the highest annual passenger journeys across its entire London route service. The higher number of bus routes and bus usage at Harlesden could be due to the relative inaccessibility of Willesden Junction and Harlesden train stations to Harlesden residents, but generally the buses appear to be heavily used, not least by schoolchildren at peak times.
Table 4: Bus routes as annual passenger journeys in case study areas 2012/13 (GLA, 2013)

<table>
<thead>
<tr>
<th>Chamberlayne Road bus routes</th>
<th>Annual Passengers Journeys (2012/13)</th>
<th>Harlesden High Street bus routes</th>
<th>Annual Passengers Journeys (2012/13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>6,589,032</td>
<td>18</td>
<td>17,153,879</td>
</tr>
<tr>
<td>28</td>
<td>6,162,534</td>
<td>187</td>
<td>2,677,332</td>
</tr>
<tr>
<td>52</td>
<td>7,999,744</td>
<td>206</td>
<td>1,866,566</td>
</tr>
<tr>
<td>187</td>
<td>2,677,332</td>
<td>220</td>
<td>7,261,990</td>
</tr>
<tr>
<td>302</td>
<td>4,990,182</td>
<td>226</td>
<td>3,312,812</td>
</tr>
<tr>
<td>316</td>
<td>4,767,237</td>
<td>228</td>
<td>1,944,081</td>
</tr>
<tr>
<td>452</td>
<td>4,820,340</td>
<td>260</td>
<td>5,475,069</td>
</tr>
<tr>
<td></td>
<td></td>
<td>266</td>
<td>9,455,740</td>
</tr>
<tr>
<td></td>
<td></td>
<td>487</td>
<td>2,028,904</td>
</tr>
</tbody>
</table>

Site visits demonstrated that there are periods of significant overlap of buses, sometimes 1-2 minutes between each other, despite schedules indicating an 8-10 minute wait during peak hours. In Figure 16, three #18 buses were right behind each other on the A404 section heading into Harlesden.

Figure 16: Three #18 buses waiting at the bus stop on the A404 section. Photo taken 3 March 2018.
3.10 Air quality data

The Air Quality Annual Status Report for 2016 for Brent has summarized the annual mean NO2 concentration monitored at their own diffusion tube monitoring sites. The capture rate of data for Harlesden High Street and Chamberlayne Road is 75% and 84% respectively. The data table can be found in Appendix F. The automatic monitoring station (AMS) data is from LAQN, in conjunction with Brent Council (data in Appendix G).

![Annual Mean NO2 Concentrations for Harlesden High Street](image)

Figure 17: Annual Mean NO2 Concentrations for Harlesden High Street (Adapted from London Borough of Brent (2017) and LAQN, 2018d). Italicized numbers represent that the data catchment rate for that year did not meet the targeted rate of 75%. Blanks in data represent a lack of data measured for that year.

Figure 17 above shows the annual mean NO2 concentrations for Harlesden High Street. Noticeably, the diffusion tubes show a higher reading than the AMS readings. This can be due to 2 reasons, firstly that the data capture rate for AMS did not meet the 75% target for 3 out of 6 years, while the diffusion tube capture data is slightly more reliable with a catchment rate of at least 75%. The second reason would be because diffusion tubes are inherently less accurate than AMS, as diffusion tubes can be influenced by local disturbances, typically causing overestimation (DEFRA, 2018). Even though the AMS have a lower result than that of the diffusion tubes, the results show that the annual NO2 concentration in Harlesden High Street has been exceeded 82.5% of the time when measured.
Figure 18 above shows the annual mean NO2 concentrations for Chamberlayne. Although the differences between the results are less extreme, they cannot be compared similarly as there is only 1 years’ worth of data for AMS. Still, the annual NO2 concentrations have been exceeding the EU limit. The dip in NO2 concentrations between 2013 and 2015 can be explained by the presence of utility and roadworks taking place on Chamberlayne, which led to bus and other traffic being diverted away from this road for lengthy periods of time.

Ultimately, most results indicate that initiatives by Brent Council to reduce emissions seem to be ineffective in lowering annual mean NO2 concentrations. The exceedances for NO2 can be attributed to vehicle traffic, since road transport contributes 49% of total emissions in the UK and is the largest source of NOx (DEFRA, 2004). A quarter is attributed to diesel vehicles in particular, especially when driving slowly (DEFRA, 2004).
Figure 19: Annual Mean PM$_{10}$ Concentrations for the case study areas, using automatic monitoring station data. (Adapted from LAQN, 2018d). Italicized numbers represent that the data catchment rate for that year did not meet the targeted rate of 75%. Blanks in data represent a lack of data measured for that year.

For PM$_{10}$ concentrations, only data from automatic monitoring stations are available (Figure 19). For HHS, the Annual PM$_{10}$ EU Limit has not been exceeded thus far. There is inconclusive evidence for Chamberlayne. The lack of exceedance of PM concentrations may be attributed to diesel particulate filters in vehicles that filter PM from exhaust gas, while still enabling NO2 to escape (gov.uk, 2013). Nevertheless, measures for reducing air pollution should still be considered even for Harlesden High Street as current concentrations exceed WHO Guideline limits majority of the time. It is vital that the UK strives towards the lower limit levels of the WHO, especially for PM, to make aware the danger that air pollutants pose towards humans and the environment (Date, 2018). There is currently no PM$_{10}$ monitoring in Queen’s Park, highlighting a key area for improvement.

There is also a lack of monitoring for PM$_{2.5}$ concentrations for either street, despite strict guidelines set by the EU (annual maximum concentration of 25 µg/m3) and increasing evidence that PM$_{2.5}$ can affect tissues deeper in the body (de Nazelle, 2018). Overall, the scarcity and lack of dependency of the results, especially from automatic monitoring stations, emphasise the need for a more robust database.
3.11 Council’s action in case study areas

a) GLA-led AQ audit trails for 50 schools
In October 2017 the Mayor’s office selected 50 schools with high exposure levels to pollutants to undergo an AQ audit (GLA, 2017a). Two schools included on the list are in Brent and both are on or close to the two case study areas:

- Ark Franklin on Chamberlayne
- John Keble CofE Primary School - 100m from Harlesden High Street, part of “Harrow Road” radial artery.

Suggestions for the schools include moving school entrances and play areas to reduce exposure to busy roads; ‘no engine idling’ schemes which these schools have already begun; and green infrastructure such as ‘barrier bushes’ to help to filter toxic fumes (GLA, 2017a). Please see Appendix H for all suggested measures.

The reports will be finalised in late spring by the GLA but in the meantime, the council intends to start work reviewing and implementing recommendations for the audit schools and will also review a “checklist for eventual rollout to other schools in Brent” (Appendix I).

b) Increasing EV charging stations
As well as announcing plans to install 30 free-standing, fast-charging points at 24 locations in the borough (Brent Council, 2018a), there are further plans by the council for rapid EV charging stations to be set up in 2018, which includes 7 Station Terrace in Kensal Rise, Queen’s Park ward, and 29 Station Road in Harlesden ward. The Council is planning for 100-120 charging points installed by 2019 within lamp columns with the locations chosen according to residential demand (Brent Council, 2018a). See Appendix J for funding information on these schemes.

c) Regeneration and road maintenance work
The Highway Capital Scheme Programme has ~£3.6m funding allocated for 2017/18. The year’s plans include major and minor pavement reconstruction; major road resurfacing; preventative maintenance; improvements to the public realm, and renewal of road markings (Brent Council, 2017e).

Funding was secured for Chamberlayne regeneration in March 2016 and Brent Council commissioned Urban Flow, Deck Social and BDP to improve road design with input from community and technical stakeholders (Urban Flow et al, 2018). The majority of changes focus on placemaking and includes the removal of street clutter, planting of greenery and plans to

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2 The Mayor of London’s School Air Quality Audits were published on 24 May 2018. These include two Brent primary schools - Ark Franklin in Kensal Rise – audit report link here: https://bit.ly/2knrMY1; and John Keble in Harlesden – link here: https://bit.ly/2x8CN8R. Work on this study was completed by 28 March 2018 and it could not be adjusted to encompass the school audit recommendations.
restructure the carriageway in the hope that this will lead to fewer “pinch points” which affect bus movements, ultimately leading to congestion (Urban Flow et al, 2018).

The council has stated in correspondence that Harlesden High Street is an area of focus for AQ improvements in the borough due to its high emissions levels highlighted in a diffusion tube study in 2016 (Ricardo Energy and Environment, 2016). The council has stated that it is a key focus for AQ improvement efforts and they “have started work to identify possible locations for Low Emission Neighborhoods and other targeted action in these areas” (Appendix I).

d) Expanding the cycle network

The Brent Cycle Strategy 2016-2022 laid out plans to improve cycling connectivity within Brent and across neighbouring boroughs so that the population sees cycling as “a good option for everyday travel” (Brent Council, n/d). Figure 20 is a map of the proposed cycle facility network from the Brent Cycle Strategy 2016-2022.

![Proposed cycle facility network](image)

Figure 20: Map of the proposed facility network from the Brent Cycle Strategy 2016-2022. Routes that are not currently operating have been highlighted in red. Adapted from Brent Council (Brent Council, 2017b).

In January 2018, the GLA approved north-west London’s first major cycle route of 5km long, connecting Wembley, Stonebridge Park and Willesden Junction near Harlesden (GLA, 2018d).

In terms of cycling rental schemes, a pilot scheme of dockless bicycle hires, rented through apps on smartphones will operate for a year, completely funded by the operator (Brent Council, 2018b).
4.0 Funding Schemes

4.1 Low Emissions Neighbourhood (LEN)

A LEN is an area-based scheme available through the Mayor’s Air Quality Fund (MAQF) that encompasses a variety of measures to reduce air emissions (Greater London Authority, n.d.a).

The primary objective of a LEN is to improve AQ in the area, through decreasing transport emissions by:

➔ Pedestrianizing areas and improving cycle lanes to provide and encourage non-vehicular transport alternatives and enhance levels of physical activity

➔ Improved traffic management

The broader aim of the LEN is to allow for urban regeneration and to boost the local economy (Greater London Authority, n.d.).

5 LENs were announced around July 2016 in Marylebone, City Fringe (Shoreditch), Barbican, Greenwich Town Centre and Ilford Junction (Greater London Authority, 2018b). These LENs were awarded £1 million each in funding from the MAQF received by boroughs over the three-year length of the project. For all cases match funding was achieved.

The LEN application and bidding process is currently closed, as the existing plans are still being implemented and their success measured. However, MAQF applications for other schemes will reopen in summer 2018 (Greater London Authority, 2018b).

As CAfB provided an extensive list of questions with regard to the LEN, Appendixes K, L and M outlines the application requirements for the LEN.

Table 5 below presents a list of pros and cons regarding the LEN application in the case study areas:
Table 5: Pros and cons of a LENs scheme in both case study areas.

<table>
<thead>
<tr>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large amount of funding available</td>
<td>Match funding – would Brent Borough be able to procure a large amount of match funding?</td>
</tr>
<tr>
<td>Brings businesses and the community together</td>
<td>The LEN tackles problems through pedestrianizing areas, which may not be applicable to case study areas because they are areas that mainly focus on transport</td>
</tr>
<tr>
<td>Harlesden is an Air Quality Focus Area and will be prioritized in the application</td>
<td>The LEN application caters more towards areas with high levels origin destination, but the issue with our case study areas are through traffic.</td>
</tr>
<tr>
<td>Active community in Queens Park Ward may aid the application process</td>
<td>Current evidence base is not reliable enough and data is insufficient for application</td>
</tr>
<tr>
<td>It is uncertain as to whether the LEN would be effective as it is a relatively new concept and implementations are still ongoing. Effects of the implementations are relatively unseen</td>
<td></td>
</tr>
</tbody>
</table>

The largest problem with applying for the LEN in the case study areas would be that the LEN does not focus on through traffic, which results show are key issues in both case study areas. As a result, this report has also compiled alternatives for funding.

4.2 Mayor’s Air Quality Fund (MAQF)

The MAQF is a £20m fund spread over 10 years aimed at improving AQ in the London boroughs. Previous programmes include large and small projects such as school workshops on AQ, LEN schemes and trans-borough partnerships aiming to reduce local car use. The third round of bidding opens in summer 2018 for projects to commence in April 2019. (GLA, 2018b). Although only a London borough or council can apply, an organisation can suggest a scheme to the council to put forward in their bid (GLA, 2018b).

Suggested pathways to improve AQ include:

- Education on AQ for the wider London population
- Building green infrastructure to reduce public exposure to air pollution
- Training for borough officers to improve AQ monitoring and implementation
- Promotion of match funding to maximise investment
- An evaluation of projects to “learn from and build on” the first two rounds of MAQF (TfL, 2015).
Preferable areas are the 187 AQFAs and/or Opportunity Areas defined by the GLA. There are six AQFAs in Brent including Harlesden High Street which received funding from the MAQF for the regeneration project in 2014.

In terms of application requirements please refer to Appendices K to M.

4.3 Neighborhood Community Infrastructure Levy (NCIL)

This fund, allocated by Brent council, comes from a levy on new developments in Brent. 15-20% of CIL receipts generated in each CIL Neighbourhood have to go towards Neighbourhood projects and the last round in January 2017 saw £3 million divided between 6 areas (Brent Council, 2017g).

The council has split Brent into five Neighbourhoods to “streamline” the running of the system. Chamberlayne Road falls into Kilburn area and Harlesden High Street into Harlesden. Appendix N provides a map of the boundaries.

A project can vary in scale and the fund can go to the council itself to deliver a project put forward, or alternatively, local community groups if the council believes they can deliver the projects themselves (Brent Council, 2017f).

Aims of the fund are to decrease street crime, making the streets cleaner – including pollution reduction and to better manage transport (Brent Council, 2017h). Within this scope the fund is directed towards the following types of projects:

➔ Public realm infrastructure
➔ Roads and other transport facilities
➔ Schools and other educational facilities
➔ Parks, open space, and sporting and recreational facilities
➔ Community & cultural infrastructure
➔ Renewable energy and sustainability infrastructure (Brent, 2017i).

There are two submissions each year and the dates for the 2018/19 submissions have not yet been released. The timeline for the allocation of the 2017/18 round of funding is shown below in Table 6.

Table 6: CIL Allocation - Summary Timeline (from Brent Council, 2017j).

<table>
<thead>
<tr>
<th>Date</th>
<th>Neighbourhood CIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Jun 2017</td>
<td>1st Round Neighbourhood project proposals and shortlisting</td>
</tr>
<tr>
<td>1 Dec 2017</td>
<td>2nd Round Neighbourhood project proposals and shortlisting</td>
</tr>
<tr>
<td>Apr 2018</td>
<td>Publish available funds and spend</td>
</tr>
<tr>
<td></td>
<td>Process Review</td>
</tr>
</tbody>
</table>

As the focus of the fund is not purely AQ and public health, application requirements are project specific. Please see Appendix O for the application requirements.
4.4 The London Mayor’s Transport Strategy (MTS)

The main aim of the MTS is to make London zero emissions by 2050. There are a few funding opportunities where local community schemes seem to be a key areas of focus, however, these must be applied for by a London borough. Included are the Local Implementation Plan fund and the Liveable Neighborhoods Programme through the Healthy Streets fund.

4.4.1 Local Implementation Plan (LIP)

Each borough must submit a LIP every year outlining how it will deliver the MTS along with the annual spending budget. Funding is provided for local level schemes that the council may implement if its aims help improve transport and meet the zero emissions target. Funding is allocated for the following projects:

- Principal road maintenance and bridge strengthening
- Corridors, neighbourhoods and supporting measures using a formula from London Councils and the London Technical Advisory Group (LoTAG)
- Traffic signal modernisation for sites on borough roads
- Major Schemes “awarded through a competitive bidding process based on need, design and implementation” (Tfl, n/d.a).

4.4.2 Healthy Streets and the Livable Neighborhoods Programme (LNP)

The definition of a liveable neighborhood includes ones that are free of through-traffic, have main roads with safe space for cycling and pedestrians (Sustrans, 2017).

The LNP is a new fund part of the Healthy Streets Portfolio which is incorporated in the MTS. The first round of funding in 2017 saw 28 bids submitted by 21 councils resulting in 7 winning bids. Total potential funding is calculated as £42 million for the 2018/19 project implementation period (TfL, 2017b). As with the MAQF, bidding is restricted to the borough council who can submit at any time with the deadline closing near the end of each year.

Focus of the LNP is to “improve air quality and reduce congestion” through the transformation of communities, “making them greener healthier and more attractive places to live and do business.” (GLA, 2017b). Intended outcome and where bidding should focus efforts are shown below:

- A greater diversity, rate and number of people walking, cycling and using public transport
- Fewer collisions and improved perception of safety for those walking, cycling and using public transport
- Fewer motorised freight trips at the busiest times of the day
- Provision of attractive alternatives to car use for shorter journeys
- Improved street environments
- Reliable journey times for walking, cycling and public transport (TfL, 2017a)

The application requirements will follow much of the same line as the MAQF requirements (Appendix K). Please see Appendix P for additional guidance.
5.0 Recommendations

This section outlines recommendations and their applicable funding schemes to achieve the ultimate aim of the project of improving AQ in the borough of Brent.

5.1 Community awareness and engagement

Community awareness and engagement should be integrated into all decision making and action stages to mitigate air pollution. Studies show that it is a means to holistic, robust solutions, drafted by the community for the community (Parker, E.A. et al, 2005).

a) Community Based Participatory Research (CBPR)

Examples of CBPR include surveys, workshops and activities to involve the community in shaping solutions. Drivers affecting CBPR are the local authorities, the communities themselves and supporting organisations and large amounts of continued collaboration are required to reach a project goal (Winterbauer et al, 2016). An iterative cycle is needed to form the most effective and long-lasting solutions.

Recommendations are to partner CBPR with a robust evidence base, potentially from external organisations, to strengthen projects. This has been done by The Detroit Community-Academic Urban Research Center - a steering group that tackles issues around health, poverty and education with a focus on vulnerable groups. (Detroit URC, 2018).

Targeting a specific group within a community may increase likelihood of getting funding. This is particularly the case if the focus is on vulnerable groups but a focus on higher education and faith groups may increase outreach potential.

➔ MAQF has provided funds for these kinds of projects in the past.
➔ NCIL also would support a scheme if it benefits a community group.

An assessment of the problem CAfB wants to tackle is needed to determine the target group. Table 7 below gives some examples of target groups depending on the problem.

Table 7: Sample target groups based on the air pollution problem.

<table>
<thead>
<tr>
<th>Air pollution problem</th>
<th>Groups to target</th>
</tr>
</thead>
<tbody>
<tr>
<td>High traffic</td>
<td>Drivers - ward/borough residents, local businesses, parents driving to schools,</td>
</tr>
<tr>
<td></td>
<td>young people looking to start driving.</td>
</tr>
<tr>
<td>Pollution near schools</td>
<td>Schools, nurseries and parents.</td>
</tr>
<tr>
<td>Increasing cycle uptake</td>
<td>25-45 year olds, schools.</td>
</tr>
</tbody>
</table>
Another method would be to first define a group and then work with them to shape a project benefiting the community the most, in terms of air pollution exposure such as the CBPR approach (Figure 21).

![Diagram of project planning steps]

**Figure 21:** Sample method as to how to plan a project, based on CBPR approaches (Authors own).

b) Air Quality Action Days (AQAD)

AQADs are part of a strategy to increase engagement with the local community, awareness about AQ and to promote alternative modes of transport. They can work on various different scales such as a street, ward, borough or the whole city. As Brent council has committed in its AQAP to holding AQADs this section highlights some points of consideration.

The AQAD could establish a regular event such as ‘Car Free Sunday’, based on the Brussels case study that has been ongoing for 17 years. As well as raising awareness about other modes of transport, NO\(_2\) levels decreased by approximately 30% (Appendix Q). The Healthy Streets Approach toolkit can be utilised to help collect opinions and involve local residents in making plans to improve the overall experience of public areas in London (TfL, 2017c). In addition, interactive...
activities could better explain the AQ situation in Brent to residents along with measures the public could take to protect their health and reduce their own emissions. This includes awareness raising about cycling, scrappage schemes and car clubs (TfL, 2018b). The latter can help contribute to vehicular traffic reduction as studies show it has been able to demonstrate a 10% decrease in car ownership levels, with 26,400 cars being disposed or sold in London in 2016/17 (Carplus, 2017). More information on car clubs and scrappage schemes are in Appendix R and S respectively.

Although traffic survey data demonstrated that diesel vehicles are the majority in both case study areas, it is unfeasible to request people to change vehicles immediately. Similar to the London bus fleet, it is about encouraging awareness and phasing out of diesel, and encouragement of cleaner alternatives.

5.2 Placemaking (i.e. street layout and street furniture improvements)

Placemaking includes the restructuring of street alignments and road layout to improve traffic flow, cycling infrastructure and the public realm for pedestrians such as increased greenery and better access. It can contribute to traffic reduction and increase safety on roads (Urban Flow et al, 2016), while simultaneously improving the quality of a neighborhood (Wyckoff, 2018). Drivers are the local authorities and the local community.

Applicable funding schemes for placemaking include the NCIL and LIP.

a) Public realm improvements

Greenery makes an area more pleasant and potentially promotes walking and cycling (Urban Flow et al, 2016). It can also provide a barrier for pollution exposure but selection of the right plants is crucial. The harmful impact of urban air pollution is best combated by placing low hedges along roads in a built-up environment of cities instead of taller trees (Ferguson, 2017). Therefore, in areas such as Queens Park and Harlesden that are highly dense areas with tall buildings forming street canyons, low hedges are preferable. Furthermore, some evergreens with sticky or hairy leaves capture pollutants, which can then wash off in the rain, are particularly effective all year in reducing street-level ambient air pollutants (Abhijith et al, 2017).

b) Improved cycling lanes

As highlighted in section 4.4 the state of the official cycle routes are unsatisfactory and the various quiet routes in Brent lack signposts. This report recommends painting new road markings on all quiet routes; repainting faded markings; lowing pavements at cycle route junctions to allow greater accessibility; resurfacing of roads with materials that reduce cracking and insetting cycle lanes wherever possible as this is proven to increase uptake (Jaffe, 2014). Increasing the number of designated cycle routes falls in line with the MTS aim to have 80% of journeys being made by foot, bike or public transport by 2041 (TfL, 2018a). This strategy will also tackle concerns by residents that Brent Council’s new AQAP 2017-2022 has not proposed enough to promote cycling (LSE, 2017).
5.3 Management of bus schedules and transition to diesel free buses

Due to the excess of buses mentioned in section 4.2, we recommend collaboration with the council, TfL and the Mayor’s office to manage bus schedules and bus-driving rotas. More data collection on exactly how often the buses are arriving would be needed to support such a scheme.

Diesel buses in the areas are also an issue. TfL has existing plans to re-fit around 5,000 buses so that they meet the highest emissions standards (Euro 6) (TfL, 2018c). However, the Low Emission Bus Zones have precedence but Harlesden and Queens Park are not within these zones. Since Brent has been at constantly illegal levels of NOx (Brent Council, 2018e), working with TfL to apply for an early transfer to this higher standard level of buses is recommended.

5.4 Delivery optimisation

Redistribution of deliveries can lead to greater efficiencies and traffic emission reductions. The drivers are businesses and local authorities for both post office optimisation and for business deliveries. Residents are also a key driver for post office delivery optimisation. Applicable funding schemes include the CIL, MAQF and LNP.

The optimisation of deliveries for businesses is highlighted in several LEN schemes. For instance, the Shoreditch Zero Emissions Network (which preceded the LEN) offers free cargo bike and electric van trials for business deliveries (Zero Emissions Network, 2018), and grants to purchase these alternative transport systems. The Marylebone LEN scheme aims to reduce deliveries by sharing suppliers, consolidate deliveries and utilise suppliers who use ultra low emission vehicles (Marylebone Low Emission Neighbourhood, 2017). In both Harlesden High Street and Chamberlayne, there seems to be a multitude of small independent cafes, requiring frequent deliveries, which could be a potential target for a trial programme. Should the trial program succeed, a larger scale programme could be implemented.

On the residents’ end, post offices currently have a “Local Collect” option to pick up your own delivery (The Post Office, 2018). Although there are no statistics about the proportion of deliveries using local collect, increasing local collection rate has the potential to reduce journeys and/or the numbers of delivery vehicles and thus, emissions. If the public are unwilling to pick up their own deliveries, providing the option to choose a suitable period for home delivery could minimize the number of undelivered parcels. The scheme requires collaboration with the post office but it could potentially increase their business efficiency through decreasing journeys and undelivered packages thereby directly contributing to emissions reductions (Cross River Partnerships, 2018).

To prepare for the trial program, enthusiasm must be garnered from the local community to succeed. This could be done through engaging the community (as mentioned above) with holding meetings, advertisement and using surveys to gauge interests. To encourage businesses and/or residents to select off-peak deliveries, the following criterion must be taken into consideration:

- **Budget**: a proper budget should be proposed before meeting with the target group. The trial program should ideally have some form of subsidy by the borough to incentivise businesses to join. For instance, in their LEN funding application scheme, the Barbican
proposed that £40,000 be utilised for Ultra - Low Emission Vehicle Only loading bays and £90,000 for an area wide consolidated delivery plan (City of London, 2017).

- Accessibility and reliability of the program: Opinions of all the groups involved must be weighed, such as the post offices, residents, businesses and suppliers and the trial program would work the best using a schedule that meets the majority’s needs. It is vital to listen and reflect on the trial feedback. Adjustments have to be made on an iterative basis and there has to be monitoring throughout the trial program.

5.5 Air quality monitoring

Current diffusion tube data is not reliable due to the lack of adjustment factor. Also, as mentioned in Section 4.10, the data capture rate for AMS did not meet the 75% target for 3 out of 6 years and automatic monitoring data is not available for Harlesden High Street during 2013 - 2016. Additionally, there is only one year’s worth of data for CR. Therefore, we recommend enhancing automatic AQ monitoring to ensure greater reliability.

An additional diffusion tube study supervised by Brent Council is proposed where to improve data accuracy, an adjustment factor, or calibration is considered. To achieve this, a diffusion tube is to be placed next to an automatic monitoring station i.e. at AFA, to obtain a conversion factor between the passive and automatic monitoring concentration, to calibrate all other diffusion tubes in the study. Some tubes can also be placed at junctions to allow for comparison with tubes placed elsewhere as junctions typically have higher air pollutant concentration due to the starting and stopping of engines.

It would also be beneficial to monitor PM$_{2.5}$ concentrations as this is considered an even more harmful air pollutant to human health than PM$_{10}$ due to its ability to penetrate deeper into lung tissues (Xing et al., 2016). However currently only the latter is monitored at AFA and AMS. If this is not available to be carried out at the automatic monitoring stations, perhaps a small-scale short-term study can be conducted using more inexpensive and portable devices to gauge approximate concentrations.

The MAQF specifically states that it provides funding for a scheme to improve AQ monitoring.
5.6 Estimated Costs and Applicable Funding Schemes of Recommendations

Details of the estimated budget and applicable funding schemes for each recommendation are provided in Table 8.

Table 8: Estimated budget and applicable funding scheme(s) of each recommendation

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Estimated budget</th>
<th>Applicable funding scheme(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community engagement</td>
<td>Street stalls ≈ £50 - 200 Workshops ≈ £100 - 400</td>
<td>MAQF, LNP</td>
</tr>
<tr>
<td>Placemaking</td>
<td>£300,000 (Around £17 spent on each person in the ward)</td>
<td>NCIL, LIP</td>
</tr>
<tr>
<td>Improve air monitoring</td>
<td>£10 per diffusion tube Unknown for PM2.5 monitor</td>
<td>MAQF</td>
</tr>
<tr>
<td>Upgrade vehicle technology and bus route monitoring</td>
<td>N/A*</td>
<td>N/A*</td>
</tr>
<tr>
<td>Delivery optimization</td>
<td>£90,000</td>
<td>NCIL, MAQF, LNP</td>
</tr>
</tbody>
</table>

* Wide range of costs therefore unknown, with parts linked to other recommendations

5.7 Strategic Assessment Framework (SAF)

Using the SAF to evaluate the proposed recommendations in accordance with achieving overarching goals within the MTS, it is evident that the different schemes have varying strengths in the way that they tackle or address each challenge (See Figure 22).

Generally, the proposed recommendations are thought to have a stronger positive influence in the MTS goal 2 (enhance the quality of life); 3 (improve the safety and security) and (reduce transport’s contribution to climate change and improve its resilience). It is clear that the implementation of these schemes have co-benefits, such as improvements to health, road safety and the urban realm. The recommendations of placemaking, bus scheduling and delivery optimisation are examples of this.
Although AQ monitoring does not appear to directly affect upon any particular MTS goal, it is still considered necessary as it helps to build the evidence-base, justifying the need for the recommendations. This is particularly for bus scheduling, delivery optimisation and making residents more conscious of local AQ issues.

Community engagement, through AQ action days, would temporarily be able to enhance the urban realm due to short-term events. It raises awareness and educates participants’ families on health impacts associated with poor AQ and road safety by encouraging shifts towards alternative modes of transport such as walking, cycling and car-sharing. In the long-term, this could help to make residents more environmentally aware and encourage a reduction in individual CO₂ emissions.

However, without the combination of other recommendations such as placemaking to improve cycle route quality and the urban environment, the public would not be incentivised or persuaded to change their behaviours.

Although some MTS goals coincide strongly with the aim of this report to tackle poor AQ, it is also important to point out that some MTS goals are not directed towards this goal.

Ultimately, there is no one recommendation which should be selected over the other. Instead, all should be pursued as a group of schemes which complement each other to ensure wider holistic action with the aim to tackle air pollution and EU and WHO exceedances for AQ. Refer to Appendix T for more information on the raw scoring of the SAF.
5.8 SWOT Analysis

An overview of the strengths, weaknesses, opportunities and threats are given in Table 9. Each recommendation has its challenges but a consistent theme is that engagement with the public and local business is key to the long-lasting success of a scheme. Through this, opportunities such as increased outreach, future schemes, public health and cost reduction for business may be achieved. Also, in terms of threat mitigation, risk assessment and the ability of projects to adapt over time may ensure the durability of a scheme and continued reductions in emissions overall. Please refer to Appendices U to Y for the detailed SWOT analyses.

Table 9: Brief SWOT analysis of the various recommendations.

<table>
<thead>
<tr>
<th></th>
<th>Community awareness and engagement</th>
<th>Placemaking</th>
<th>Management of bus schedules and transition to diesel free buses</th>
<th>Delivery optimization</th>
<th>Air quality monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td>Informed, robust solutions</td>
<td>Increased safety for road users</td>
<td>Improved traffic flow</td>
<td>Emissions and congestion reduction</td>
<td>Low cost</td>
</tr>
<tr>
<td></td>
<td>Long lasting behavioral change</td>
<td>Encourages walking/cycling</td>
<td>Emissions reductions</td>
<td>Promotes sustainable business</td>
<td>Builds a greater evidence base</td>
</tr>
<tr>
<td><strong>Weaknesses</strong></td>
<td>Influence hard to judge/measure</td>
<td>High capital costs</td>
<td>Hard to obtain optimum route efficiency</td>
<td>Management difficulties</td>
<td>Time taken to complete dataset</td>
</tr>
<tr>
<td></td>
<td>Continuous engagement and resources</td>
<td>Long-term planning</td>
<td>Need to inform citizens of change</td>
<td>Costly trials due to the need for incentives</td>
<td>Reliability of dataset</td>
</tr>
<tr>
<td><strong>Opportunities</strong></td>
<td>Increase outreach</td>
<td>Improved health of public</td>
<td>Improved public health</td>
<td>Cost reduction for local business</td>
<td>Monitoring new pollutants (PM 2.5)</td>
</tr>
<tr>
<td></td>
<td>Ongoing feedback to inform future action</td>
<td>Engagement of residents</td>
<td>Increased stakeholder collaboration</td>
<td></td>
<td>Improved management</td>
</tr>
<tr>
<td><strong>Threats</strong></td>
<td>Bias from limited diversity of participants</td>
<td>Weathering of infrastructure</td>
<td>Reducing drivers’ jobs</td>
<td>High costs from poor management</td>
<td>Poor maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased congestion</td>
<td>Negative public response from longer waiting time</td>
<td>Negative public/local business perception</td>
<td>Poor analysis</td>
</tr>
</tbody>
</table>

6.0 Overall limitations

6.1 Case Study Areas

A factor related to using Queen’s Park as a case study area is that the ward is characterised by households with a higher average income in comparison to the rest of the borough which can introduce equity issues. This is especially because communities of a lower socio-economic status can experience exposure of air pollutants at higher levels making them more susceptible, especially when exacerbated by a general poorer health status (O’Neill et al., 2003).
Although a second case study was selected, in terms of geographical scale, both studied areas are in the south of the Borough. In general, the surrounding areas have been facing greater levels of regeneration which can also mean that various levels of works to improve the urban realm are ongoing. Because it was not feasible to have study areas in the north of the borough during the very short period when the field work was being carried out the authors were not able to assess the types of road traffic, road quality and urban environment. Therefore, it is uncertain to what extent similar recommendations could apply to the areas. Further studies would be required to assess the suitability.

6.2 Likelihood of getting funding

An increase in funding for AQ mitigation in London (Vaughan, 2016) is matched with uncertainty about who receives the funds and whether the current momentum will continue. There is around £9 million pounds left of the £20 million MAQF so Brent would benefit from as many bids as possible. Only a borough can apply for some of the recommended schemes, therefore CAfB would have to cooperate with the council to see that a scheme is carried through. There is also an uncertainty about whether the council can achieve the amounts of match funding needed for some of the schemes.

6.3 Communication constraints

There were several attempts to contact the local council officers and councillors in Brent and Queen’s Park ward to gain a greater understanding of their upcoming environmental action plans, but the response was constrained having regard to the time available to the authors within the project timetable. We appreciate that the relevant team is very small and was experiencing staff turnover at the time. Although some informative information was provided there may be some gaps that affect the data and recommendations presented.

6.4 Data collection uncertainties

The traffic flow and origin and destination surveys were all carried out during rush hour, at peak congestion times. Although the survey data was compared with an extrapolation of TfL’s peak hourly data, additional surveys and non-rush hour surveys would be valuable to better understand traffic flow and corroborate the evidence. However, this was limited by the availability of the Imperial College students due to their course commitments.

Due to time constraints, the Harlesden survey was conducted on consecutive days during the same week. For the whole week, there were temporary traffic lights operating due to a burst Thames Water water pipe at the main crossroads. This could potentially have influenced traffic flow readings due to increased waiting time at the lights, or people avoiding the route due to the obstruction.

Some road traffic surveys were also conducted on dates coinciding with the half term break of schools between 12 and 16 February 2018 (Brent Council, 2018g) which could mean that traffic counts may not accurately represent the typical flow.
6.5 Reducing Through Traffic

Both the traffic surveys in this report demonstrate a through-traffic problem also acknowledged by Brent residents (LSE, 2017). This creates limitations concerning the action Brent can undergo by itself as it requires holistic solutions and strong collaboration with neighboring areas. Although Brent is signed up to the West Trans Partnership aimed at reducing car use in west London boroughs, the annual report was not released in 2016/17 and so its impact is currently debatable (Westtrns, 2018).

7.0 Conclusion

In conclusion, Air Quality in the London borough of Brent is a long-standing issue with no one solution. This report has shown that in the case study areas, breaching of both WHO and the more stringent EU limits for NO2 is matched with traffic volumes at least twice as high as the average evening peak hour traffic count in UK. Through traffic has been identified as one of the leading culprits of poor Air Quality as well as a lack of good quality infrastructure to promote walking and cycling as alternative forms of transport. Recommendations put forward in the report demonstrate that there are many avenues to tackle when combating air pollution in Brent. Any action needs to be holistic, adaptive and requires extensive and long-term collaboration with local communities, organisations and governmental bodies. Suggested recommendations may not only directly affect local Air Quality as they also encompass themes laid out in the MTS goals to enhance quality of life, improve public safety and security, as well as reducing transport’s contribution to climate change. The clear drive by the London Mayor and Brent council to improve Air Quality, facilitates an organisation such as CAfB to obtain the resources needed to contribute to noticeable AQ improvements in the borough and assist with the fight against London’s polluted air.
References


Greater London Authority. (n.d.a) *Low Emissions Neighbourhoods Guidance Note.* Available from:


Appendices

Appendix A: Emails from CAfB Steering Group member Victoria Secretan to Violet Ross

Appendix B: Air Quality Management Areas highlighted in Brent (Brent Council, n/d).

Appendix C: Four Air Quality Action Areas in Brent (Ricardo, 2016)
### Appendix D: Details of Brent’s Air Quality Action Areas

<table>
<thead>
<tr>
<th>Air Quality Action Area</th>
<th>Councils reason for selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kilburn Regeneration Area</td>
<td>Spatially important to the borough (Brent Council, 2001). TfL working to increase uptake of cleaner (hybrid) buses and the council are working with the local community to increase AQ monitoring (Brent Council, 2017a).</td>
</tr>
<tr>
<td>2. Church End</td>
<td>Spatially important to the borough, “capable of accommodating large scale growth and essential infrastructure for new homes, business investment and job opportunities” (Brent Council, 2001). It is close to an AQFA and to Harlesden where there is a monitoring station (Brent Council, 2017a).</td>
</tr>
<tr>
<td>3. Neasden town centre</td>
<td>Located next to the North Circular and very close to Dudden Hill, it is also an Air Quality Focus Area (AQFA) selected by Greater London Authority (GLA, 2016a). Brent Council state that there are public realm improvement opportunities and “may offer the opportunity for future joint work and funding” (Brent Council, 2017a).</td>
</tr>
<tr>
<td>4. Wembley and Tokyngton</td>
<td>Encompasses three stations, a regeneration area around the stadium and Wembley triangle. It is also in close proximity to other developments (Brent Council, 2017a).</td>
</tr>
</tbody>
</table>

### Appendix E: Information on vehicles surveyed on Chamberlayne Road and Harlesden High Street

#### Chamberlayne Road Survey

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Count</th>
<th>Fuel type</th>
<th>Count</th>
<th>Time questioned</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van</td>
<td>25</td>
<td>Diesel</td>
<td>44</td>
<td>Between 7-9am</td>
<td>69</td>
</tr>
<tr>
<td>Car</td>
<td>43</td>
<td>Petrol</td>
<td>16</td>
<td>Between 4-7pm</td>
<td>1</td>
</tr>
<tr>
<td>Back Cab</td>
<td>1</td>
<td>Electric/Hybrid</td>
<td>4</td>
<td>Total count</td>
<td>70</td>
</tr>
<tr>
<td>Motorbike</td>
<td>1</td>
<td>Insufficient data</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total count</td>
<td>70</td>
<td>Total count</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Harlesden High Street Survey

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Count</th>
<th>Fuel type</th>
<th>Count</th>
<th>Time questioned</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van</td>
<td>8</td>
<td>Diesel</td>
<td>25</td>
<td>Between 7-10am</td>
<td>39</td>
</tr>
<tr>
<td>Car</td>
<td>52</td>
<td>Petrol</td>
<td>24</td>
<td>Between 4-7pm</td>
<td>21</td>
</tr>
<tr>
<td>Total count</td>
<td>60</td>
<td>Total count</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Annual mean NO2 concentrations in case study areas, using diffusion tubes (Adapted from London Borough of Brent, 2017).

<table>
<thead>
<tr>
<th>Year</th>
<th>Harlesden High Street</th>
<th>Chamberlayne Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>66.9</td>
<td>62.5</td>
</tr>
<tr>
<td>2011</td>
<td>70.6</td>
<td>66.5</td>
</tr>
<tr>
<td>2012</td>
<td>76.2</td>
<td>75.2</td>
</tr>
<tr>
<td>2013</td>
<td>70.4</td>
<td>70.1</td>
</tr>
<tr>
<td>2014</td>
<td>76.2</td>
<td>67.7</td>
</tr>
<tr>
<td>2015</td>
<td>73.5</td>
<td>56.8</td>
</tr>
<tr>
<td>2016</td>
<td>91.8</td>
<td>69.4</td>
</tr>
</tbody>
</table>

Appendix G: Results gathered from King’s College London automatic monitoring stations (Adapted from London Air Quality Network, 2018d)

Bolded numbers indicate an exceedance of the criteria. Italicized means that the data capture rates did not meet the validity threshold of more than 75% (i.e. that capture rate was not valid for more than ¾ of the year)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>John Keble Primary School</td>
<td>Annual NO2 mean (mg/m³)</td>
<td>44</td>
<td>45</td>
<td>N.D.</td>
<td>37</td>
<td>41</td>
<td>45</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>No. of times NO2 has exceeded the hourly mean limit of 200 mg/m³</td>
<td>0</td>
<td>0</td>
<td>N.D.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Annual PM10 Mean (mg/m³)</td>
<td>20</td>
<td>20</td>
<td>17</td>
<td>21</td>
<td>25</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>No. of times PM10 has exceeded the hourly mean limit of 50 mg/m³</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Annual NO2 mean (mg/m³)</td>
<td>57</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
</tbody>
</table>
Ark Franklin Academy

<table>
<thead>
<tr>
<th></th>
<th>No. of times NO2 has exceeded the hourly mean limit of 200 mg/m³</th>
<th>0</th>
<th>N.D.</th>
<th>N.D.</th>
<th>N.D.</th>
<th>N.D.</th>
<th>N.D.</th>
<th>N.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual PM10 Mean (mg/m³)</td>
<td>17</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
<tr>
<td>No. of times PM10 has exceeded the hourly mean limit of 50 mg/m³</td>
<td>0</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

Appendix H: Potential measures for Greater London Authority Air Quality Audits in schools (GLA, 2017b)

- Moving school entrances and play areas to reduce exposure to busy roads
- 'No engine idling' schemes which these schools have already begun
- Minimising emissions from boilers, kitchens and other sources
- Changes to local roads, including improved layouts, restricting the most polluting vehicles and pedestrianizing school entrances
- Green infrastructure such as ‘barrier bushes’ to help to filter toxic fumes
- Improvements to encourage walking and cycling to school along less polluted routes
- Engagement with the schools and its pupils is also highlighted as a means to engage the local community and raise awareness about these issues

Appendix I: Emails to Violet Ross with regards to AQ Improvement Measures in Harlesden High Street

Feb 26 to Violet Ross

Dear Violet,
Further to our previous correspondence I am pleased to say that I have now received an official response from the Council to my enquiries on your behalf.

You can read this answer below.
I hope this information is helpful to you and want to wish you all the best with your future studies.
Best wishes,
Matt

Cllr Matt Kelcher
Labour Councillor for Kensal Green Ward
Chair, Resources and Public Realm Scrutiny Committee
07721 233051 | cllr.matt.kelcher@brent.gov.uk | @mattkelcher | facebook.com/KensalGreenLabour

From: Environmental Monitoring [brent@mail.icasework.com]
Sent: 23 February 2018 14:47
To: Kelcher, Councillor Matt
Subject: Your query (ref: 9104398)

Ref: 9104398

Dear Councillor Kelcher
Case 9104398
RE: Ms. Violet Ross and a request for air quality information.

In response to your query received on 13 February 2018, I provided the following to Ms Ross with information requested as outlined in brief below:

- Are there any other plans in the pipeline to improve air quality in Harlesden in 2018?
  The council has identified some Air Quality Focus Areas in Brent which we will consider for targeted action to reduce / limit exposure to poor air quality where we can. Harlesden is one of these areas and we have started work to identify possible locations for Low Emission Neighbourhoods and other targeted action in these areas. The council is currently planning an educational programme for delivery to Brent residents. As examples, we aim to:
  - assist them to take their own action to reduce their impact on local air quality;
  - help them to understand that small actions can deliver larger local air quality benefits;
  - encourage them to consider cleaner, greener modes of transport such as walking and cycling.

We have been approached by a couple of schools in Harlesden requesting assistance to address air pollution and intend to build on work we have already started to look at localised idling and raising awareness about air pollution generally.

The council is also participating in a GLA-led programme to audit schools and identify a range of measures they may be able to implement to limit exposure to poor air quality. One of the 2 Brent Schools participating in this early work is the John Keble School. Although the we expect the GLA to finalise the report late Spring the council intends to start work reviewing and implementing the recommendations for this school where we can. We will then review our checklist for eventual rollout to other schools in Brent.

Whether Brent council is making any application for AQ funding in 2018? E.g. Mayors AQ Fund, LENs, Liveable Neighbourhoods Programme, Greener City Fund.

Work is currently underway to explore options for joint work with our South London and West London Partners in preparation for joint bids for the Mayors Air Quality Fund.

The council keeps abreast of new and emerging funding streams to assist us with our air quality objectives and, as well as the programmes you suggest, the council also considers
  - EU funding streams where air quality action may be considered as part of a larger initiative - such as LIFE, the Eco-Innovation Funding Programme and NGOs operating grants
  - Funding from UK streams such as directly from DEFRA and,
  - Indirectly from TfL via the Local Implementation Plan Fund and planning gain (or Section 106).

We also aspire to assist local groups to start their own small-scale projects via the Community Infrastructure Levy if we can.

The council has also started work to identify potential Low Emission Neighbourhoods using the Air quality Focus Areas we have previously identified as a starting point. Following the creation of this list we will then undertake a feasibility exercise to determine project barriers and costs, the potential for joint work with partners (internal and external to the council) or inclusion in other projects to facilitate delivery. We would then consult local residents to get their ideas about our thoughts and ideas for Low Emission Neighbourhoods.

In addition, we are also exploring other options for match funding or identifying funding

Non air quality data such as traffic flow, car ownership.

The following links to the latest Parking and Transport Strategies should provide all the information you require.

BRENT LONG TERM TRANSPORT STRATEGY 2015-2035
Link to the Current Strategies for Transport, Walking and Cycling

You can access information for 53 monitoring locations in Brent, reported to the DIT ()
https://www.dft.gov.uk/traffic-counts/cp.php?la=Brent#7613

The council also advised that we will assist with any additional information she required and contact details for officers dealing with this provided for future queries.

Yours sincerely

Jennifer Barrett
Regulatory Services Manager
jennifer.barrett@brent.gov.uk
Appendix J: Details of funding for upcoming electric vehicles schemes in Brent (Brent Council, 2018a)

<table>
<thead>
<tr>
<th>EV scheme</th>
<th>Year to be implemented</th>
<th>Source of funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 free-standing, fast-charging points at 24 locations in Brent</td>
<td>2018</td>
<td>Fully funded by BluePointLondon Ltd.</td>
</tr>
<tr>
<td>Rapid EV charging stations in five proposed areas that allow for 80% charge in 30 minutes</td>
<td>2018</td>
<td>Fully funded by Go Ultra Low City fund.</td>
</tr>
<tr>
<td>100-120 charging points installed within lamp columns - chosen according to residential demand.</td>
<td>2019</td>
<td>75% funded by Go Ultra Low City fund with the rest of capital costs being provided by Brent Council through the S106 developer contributions and TfL Local Implementation Plan Funding.</td>
</tr>
</tbody>
</table>

Appendix K: Application requirements for the Low Emissions Neighbourhood (LEN)

There are no defined size and/or boundary restrictions for a LEN, however, it should be an area with high levels of NO2 and greenhouse gas emissions, accompanied with high levels of public exposure. If the LEN area is identified within an Air Quality Focus Area by the GLA (which Harlesden is), it would be prioritised. It must be kept in mind that these areas are selected for their emissions and exposure levels and Harlesden High Street has more complete data on this than Chamberlayne Road.

In addition, the selected area for the LEN should also have to meet at least one of four other conditions which are:

(i) that the area should be located in an Opportunity Area as declared in the Mayor’s London Plan 2015 (Greater London Authority, 2018c);
(ii) there are plans for extensive regeneration or existing schemes to improve public spaces and/or to lessen traffic in the local area, where a LEN would then help to create added benefits, acting as a complementary scheme;
(iii) a possibility for the LEN location to experience decreased levels of traffic, a drive to enhance the urban environment and road safety, or to encourage greater involvement and collaboration with the local community;
(iv) an area which is a point of high levels of origin and destination movements (Greater London Authority, n.d.).
Appendix L: Data Requirements for the Low Emissions Neighbourhood (LEN)

Data can not only demonstrate the need for a scheme but can also provide the means to measure any impacts of the scheme after implementation. Below is a criteria for data collection that would provide a strong application for any number of funding opportunities. Most of these requirements have been provided in section 4 of this report.

| **Air pollutants** | • NO$_2$, PM$_{10}$ and PM$_{2.5}$ concentrations and information on sources  
|                    | • Readings from monitoring stations or calibrated diffusion tubes preferred for greater reliability.  
|                    | • Hourly and monthly air quality concentration provides more detail.  
|                    | • Comparisons with different areas may highlight the need for a LEN. |
| **Levels of human exposure** | • Demography and information on local health of residents.  
|                           | • Proportion and type of human activity. E.g. residential, commercial, industrial, educational, commute and leisure.  
|                           | • A higher residential population, a higher number of dependents or areas with a higher number of vulnerable groups would be a good candidate for a LEN. |
| **Transport modes** | • Modes of transport, traffic count data and public transport statistics.  
|                   | • Origin - destination vehicle date.  
|                   | • Car ownership.  
|                   | • Number of people using car clubs.  
|                   | • Business delivery times and loading areas. |
| **Pedestrian experience** | • Tools to determine the quality of existing pedestrian roads and public areas include the Healthy Streets indicator assessment (Transport for London, 2018a) and the Pedestrian Environment Review System (PERs) survey (TRL Limited, 2017).  
|                          | • Road safety and accessibility would also be applicable information. |
| **LEN proposals** | • Outline of proposed recommendations.  
|                   | • Impact evaluation of these recommendations with measurable indicators. E.g. cyclists or car traffic count.  
|                   | • Budget to be set for each recommendation. |

To indicate whether the measures being implemented and applied are effective it is important that all of the data collected should persist and continue at regular intervals after LEN applications and during and after the scheme implementation. This is also a way to demonstrate that the LEN schemes are effective, which would help to justify further funding from the MAQF for the creation of more LENs and provide more robust evidence that a specific measure works to then later be applied to other neighbourhoods.

There are also various tools which can be used to assess and monetise benefits resulting from the LEN schemes implementation such as the Valuing Urban Realm Toolkit and the Health
Economic Assessment Tool. Also, the improved environment and expected rejuvenation of the local economy, may show through the prices of surrounding residential property (Greater London Authority, n.d.).

Appendix M: Schemes associated with the Low Emissions Neighbourhood (LEN)
Below is a list of commonly implemented schemes, using the LENs funding achieved. The table compares the ongoing interventions the 5 LENs mentioned:

<table>
<thead>
<tr>
<th>Other points of interest</th>
<th>Barbican</th>
<th>Shoreditch Area</th>
<th>Marylebone</th>
<th>Greenwich Town Centre</th>
<th>Ilford Junction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Vehicle Charge Points</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle Parking</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parklets (Public space that may serve as bicycle parking when need arises), Gardens or Pocket Parks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycling programmes, grants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrianizing roads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No idling zones, Low Emissions Route for Walking, Resident Emission Vehicles Charging, Cooperation with businesses to reduce delivery emissions, Bus engagement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultra Low Emission Street Zones (banning of cars that do not meet the requirement at certain times)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric taxi ranks, Green roofs and walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Emission Delivery Services for businessmen, app that tracks cycling and walking with incentives for rewards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Emission Bus Zones, Segregation of vehicular and non-vehicular modes of traffic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix O: Neighbourhood CIL application requirements
Relevant factors may be employment rate; level of deprivation; demographics (to target the more vulnerable groups); crime rate; levels of congestion levels of air pollution. The project applications in 2017/18 included the following information:

- Outline of the project
- Statistical or consultational evidence of the local need for your project
- Delivery, outputs and implications of the project
- Whether the project addresses gaps in infrastructure
- Manpower, resources and skills involved
- Project timeline and funding (Brent Council, 2017k).

Appendix P: Indicative guidance for the Liveable Neighbourhoods Programme application
- Count data of all different vehicles
- Proportion of the population walking/cycling
- Car ownership
- Bus patronages
- Accident rates
- Estimates of reliability of public transport

<table>
<thead>
<tr>
<th>About the scheme</th>
<th>Measures on the day</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Part of the Mobility Week programme</td>
<td>• All private cars banned unless carrying special permits</td>
</tr>
<tr>
<td>• Running for 17 years and occurring most recently on 17 September 2017</td>
<td>• Maximum speed for other forms of transport was limited to 30km/h</td>
</tr>
<tr>
<td>Aim 1 - to increase citizen awareness about other methods of travelling such as walking, cycling, buses and skating</td>
<td>• Local non-profit organisations got involved such as Greenpeace and Cycle who organised a second-hand bicycle sale and offered free servicing</td>
</tr>
</tbody>
</table>

Appendix R: Details of car clubs

About (Carpus, 2017)

- Typically a fleet of lower carbon emissions where all cars comply with at least the Euro 5 emission standards.
- In London 66% of vehicles in car clubs comply with Euro 6 standards, and 3% are zero emission vehicles.

Statistics from the most recent Annual Car Clubs Survey (Carplus, 2017)

- Each car is able to increase car occupancy from an average of 1.6 to 2.5
- Each car can replace 10.5 privately owned vehicles on roads
- Car clubs have been shown to demonstrate a 10% decrease in car ownership levels.

Existing car clubs in Brent (Transport for London, 2018b)

- Zipcar and Enterprise Car Club are the key operators in Brent.
- Cars available for sharing are predominantly located in the south of the borough around Willesden, Kensal Green, Kilburn and Queens Park. Although there are also some cars located around Wembley with access.

Limitations

- As the distance from central London increases, car club accessibility becomes more limited. Hence, this could be a factor preventing greater rates of uptake in the area.
- Car club journeys are not typically used for commutes (Gifford, 2016).
- Vehicles coming from outside would be very difficult to target

Methods to encourage uptake

- Increase in awareness and engagement with local residents.
- Collaboration with neighbouring boroughs to target through traffic.
- Sufficient facilities such as parking and charging stations, where applicable, in the areas that the scheme promotion occurs (Car Club Coalition, 2016).
- Car club operators working with the local council to help identify areas for expansion.
- Incentive schemes set up to promote usage such as extra mileage credit or car club memberships at a reduced price in exchange for the giving up of parking permits.
Appendix S: Details of scrappage schemes (Haining, 2018)

About

- Older, ‘dirty’ vehicles can be traded into a manufacturer for a less polluting model with a discount offered.
- Coincides with the government’s ban on the sale of diesel and petrol cars from 2040.
- No scheme available from the government or local council and a recent debate in the House of Commons suggests that there will not be one introduced in 2018.
- Many car companies offer cash reductions in certain models if the scrapped model meets certain requirements.

Statistics from RAC Foundation (House of Commons, 2018)

- If 400,000 older cars were replaced with a new zero emission electric vehicle then the cut in annual NOx emissions from the diesel fleet would be about 4,900 tonnes or 3.2% of the total emissions from diesel cars. This drops to 2,000 tonnes per annum (1.3% of the total) if the scrapped cars were replaced with the latest Euro 6 diesel models and driven the same distance as those scrapped.

Available scrappage schemes for Brent residents (Lloyds, 2018)

- Audi £2000 to £8000 off for orders by 31 March 2018 with a trade-in EU1 to EU4 diesel registered before January 2010
- Dacia £500 on Sandero and £1000 on Duster (excluding Access models) when trading in pre-2010 EU4 vehicle by 31 March 2018
- Hyundai £1500 to £5000 to trade in EU1 to EU4 vehicles registered before January 2018
- Mitsubishi Scrappage scheme extended until 27 March 2018: now £5000 off Outlander diesel, £4k off PHEV, £2k off a Mirage mini, £3k off ASX
- Nissan £1000 to £2000 for Micra, Juke, Qashqai, X-Trail (plus used Leaf purchased through finance) ordered by 2 April 2018 with pre-2010 trade-in
- Peugeot £1750 to £6000 for orders by 31 March 2018 with a pre-2011 trade-in
- Seat £1500 to £3500 for orders by 31 March 2018 with a pre-2010 EU1 to EU4 diesel trade-in
- Skoda £1500 to £4000 for orders by 31 March 2018 with a pre-2010 EU1 to EU4 trade-in
- Suzuki £2000 for new car orders with any pre-2010 EU1 to EU4 trade-in. No end date announced
- Toyota £1000 to £4000 for orders placed by 31 January 2018 with any pre-2010 trade-in
- Volkswagen £1800 to £6000 for orders placed by 2 April 2018 with a pre-2010 EU1 to EU4 diesel trade-in

Limitations

- Vehicles coming from outside would be very difficult to target

Methods to encourage uptake

- Increase in awareness and engagement with local residents.
- Collaboration with neighbouring boroughs to target through traffic.
## Appendix T: Information on the raw scoring of the SAF

<table>
<thead>
<tr>
<th>Strategic Assessment Framework</th>
<th>MTS Challenge</th>
<th>MTS Outcome</th>
<th>AQ Monitoring</th>
<th>Community Engagement</th>
<th>Placemaking</th>
<th>Bus Scheduling</th>
<th>Delivery Optimisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MTS Goal 1: Support economic development and population growth</strong></td>
<td>Supporting sustainable population and employment growth</td>
<td>Balancing capacity and demand for travel through increasing public transport capacity and/or reducing the need to travel</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Improving transport connectivity</td>
<td></td>
<td>Improving people's access to jobs</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Improving access to commercial markets for freight movements and business travel</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Delivering an efficient and effective transport system for goods and people</td>
<td>Smoothing traffic flow (managing delay, improving journey time reliability and resilience)</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improving public transport reliability</td>
<td>1</td>
<td>1</td>
<td>1.25</td>
<td>4</td>
<td>3.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reducing operating costs</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bringing and maintaining all assets to a state of good repair</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td><strong>MTS Goal 2: Enhance the quality of life for all Londoners</strong></td>
<td>Improving journey experience</td>
<td>Improving public transport customer satisfaction</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improving road user satisfaction (drivers, pedestrians, cyclists)</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reducing public transport crowding</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Enhancing the built and natural environment</td>
<td>Enhancing streetscape, improving the perception of urban realm and developing better streets initiatives</td>
<td>3</td>
<td>3.50</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protecting and enhancing the natural environment</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Improving air quality</td>
<td>Reducing air pollutant emissions from ground based transport, contributing to EU air quality targets</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Improving noise impacts</td>
<td>Improving perceptions and reducing impact of noise</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Improving health impacts</td>
<td>Facilitating an increase in walking and cycling</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>MTS Goal 3: Improve the safety and security of all Londoners</strong></td>
<td>Reducing crime, fear of crime and anti-social behaviour</td>
<td>Reducing crime rates (and improved perceptions of personal safety and security)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Improving road safety</td>
<td>Reducing the numbers of road traffic casualties</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Improving public transport safety</td>
<td>Reducing casualties on public transport networks</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>MTS Goal 4: Improve transport opportunities for all Londoners</strong></td>
<td>Improve accessibility</td>
<td>Improving the physical accessibility of the transport system</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2.50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improving access to services</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Supporting regeneration and tackling deprivation</td>
<td>Supporting wider regeneration</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>MTS Goal 5: Reduce transport's contribution to climate change and improve its resilience</strong></td>
<td>Reducing CO2 emissions</td>
<td>Reducing CO2 emissions from ground based transport, contributing to a London-wide 60% reduction by 2025</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Adapting for climate change</td>
<td>Maintaining the reliability of transport networks</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes:
1. Scores range from 1 to 5, where 5 would mean that there is a large positive influence on the outcome, and 1 signifies a lack of influence on the outcome.
2. Where there are multiple MTS outcomes for a MTS challenge, scores are averaged.
Appendix U: Community awareness and engagement SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Introduces a project/issue to community</td>
<td>• Influence difficult to judge/measure</td>
</tr>
<tr>
<td>• More informed decision-making</td>
<td>• May only reach a small proportion of the community</td>
</tr>
<tr>
<td>• Pushes knowledge out to the individual and potentially their family and friends</td>
<td>• Requires collaboration with council</td>
</tr>
<tr>
<td>• Holistic, robust solutions drafted by the community for the community (Parker, E.A. et al, 2005)</td>
<td>• Requires continuous engagement and resources over long periods in the review and reaction process</td>
</tr>
<tr>
<td>• Increases quality, and use of research data (Winterbauer et al, 2016).</td>
<td></td>
</tr>
<tr>
<td>• Provides more informed future action (Ahmed &amp; Palermo, 2010)</td>
<td></td>
</tr>
<tr>
<td>• CPBR can increase the likelihood of overcoming distrust of research by communities that have traditionally been only the ‘subjects’ (Winterbauer et al, 2016).</td>
<td></td>
</tr>
<tr>
<td>• Can create consensus for action on complex issues that require broad-based community input</td>
<td></td>
</tr>
<tr>
<td>• Involving residents and businesses fulfils the LEN criteria of encouraging involvement and collaboration with the local community</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data collection (Bonnes, 2007)</td>
<td>• Only people with the time or concern may get involved creating a skewed view of the issue or bias</td>
</tr>
<tr>
<td>• Ongoing “feedback of data” to inform future action (Israel et al, 1998)</td>
<td>• May generate unintended public perception</td>
</tr>
<tr>
<td>• Increased outreach potential for the issue or for CAIB to expand</td>
<td></td>
</tr>
</tbody>
</table>

Appendix V: Placemaking SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aesthetic improvements to the public realm (Wyckoff, 2018)</td>
<td>• Takes up road space</td>
</tr>
<tr>
<td>• Safer streets for all road users</td>
<td>• High capital cost</td>
</tr>
<tr>
<td>• Improve traffic flow (smoother congestion)</td>
<td>• Long-term planning</td>
</tr>
<tr>
<td>• Encourages uptake of cyclists</td>
<td>• Requires constant maintenance</td>
</tr>
<tr>
<td>• Emissions reductions from ‘green barriers’ and if it encourages more people to walk and cycle</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Residents engaged/involved in shaping the environment they live in</td>
<td>• Weathering/ageing of infrastructure</td>
</tr>
<tr>
<td>• Raising awareness of residents involved in planning of air quality</td>
<td>• Could increase congestion by taking up road space</td>
</tr>
<tr>
<td>• Improved health among residents if emissions are reduced</td>
<td></td>
</tr>
</tbody>
</table>
- Involving residents and businesses fulfils the LEN criteria of encouraging involvement and collaboration with the local community
- Vehicles moving to an alternative route since road space is taken up.
- Could increase road casualties
- Habit car use
- Cyclist can cause a reduction of road capacity by 25% (Begg, 2017)

Appendix W: Management of bus schedules and transition to diesel free buses SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| • Improve traffic flow (smoother congestion)  
• Safer for cyclists  
• Emissions reductions | • Hard to obtain optimum bus route efficiency  
• Need to inform citizens about the change  
• Expensive to upgrade large numbers of buses at once - a diesel bus costs around £350k while an electric bus costs around £570k (Uhler, 2017) |

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
</table>
| • Improved health among residents  
• Increased collaboration between stakeholders  
• Increased community outreach through spreading awareness to citizens of changes to bus routes  
• Involving residents and businesses fulfils the LEN criteria of encouraging involvement and collaboration with the local community | • Reducing bus drivers’ jobs  
• Longer waiting times creating negative public response  
• Coordination challenges to maximise bus route efficiencies as it is time consuming and requires intensive planning  
• Costly to upgrade large numbers of buses at once |

Appendix X: Delivery Optimization SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| • Minimises emissions  
• Congestion reduction  
• Increase in efficiency due to bulk buying  
• Promotes sustainable business  
• Fulfils the LEN criteria of encouraging involvement and collaboration with the local community | • Many parties have to be involved creating potential management difficulties  
• Requires subsidies as incentives  
• A trial programme could be costly if subsidies for incentivise are provided for participants  
• Negative public perception if badly managed or expensive |

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More business opportunities</td>
<td>• Negative public/local business perception</td>
</tr>
</tbody>
</table>
- Cost reductions for local business due to bulk buying which often leads to lower wholesale prices
- High maintenance costs
- Poor management

Appendix Y: Air Quality Monitoring SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Low cost - in particular, diffusion tubes</td>
<td>• Time taken to complete dataset</td>
</tr>
<tr>
<td>• Build a greater evidence-base</td>
<td>• Reliability of data sets</td>
</tr>
<tr>
<td>• Long term monitoring → established, reliable database</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Other pollutants can also be monitored</td>
<td>• Poor maintenance</td>
</tr>
<tr>
<td>• Improved management of air quality</td>
<td>• Poor analysis</td>
</tr>
<tr>
<td>• Increased public awareness and learning through citizen science (Bonney et al, 2016) which can foster better community spirit to increase advocacy for the environment</td>
<td></td>
</tr>
<tr>
<td>• Involving residents and businesses fulfils the LEN criteria of encouraging involvement and collaboration with the local community</td>
<td></td>
</tr>
</tbody>
</table>