Brent Inclusive Growth Strategy (IGS): Environment

2019-2040

Contents

Executive Summary

Looking forward to 2040, the state of the environment in Brent will be heavily influenced by both a growing population and the effects of climate change, which will increase resource demand and exacerbate resource scarcity. Without intervention, the mismatch between resource supply and demand has the potential to leave Brent residents without adequate environmental services and resources, such as water and energy.

Baseline

To adequately understand the current and future environmental conditions in Brent, the Environment Theme of the Inclusive Growth Strategy first identifies the current baseline position of Brent's environment considering: Climate Change, Energy Use, Transport & Network Management, Biodiversity & Green/Blue Infrastructure Management, Waste, and Enviro-Crime & Environmental Protection. Key findings from this analysis include:

- Half of energy consumed in Brent is for domestic use, representing the main source of CO^2 emissions at 44%.
- Most of Brent's energy is consumed from burning fossil fuels. Natural gas accounted for 48% of energy use in 2016; while electricity represented 31% and petroleum products represented 20%.
- In 2017-18 Brent Council exceeded its 4 year 15% target reductions in CO^2 over 2014-18, achieving 15.6% savings.
- Air quality in London and Brent has improved in recent years. However, updated pollution concentration data still shows exceedances of the annual EU limit values.
- Greatest roadside annual mean NO^2 concentrations occur along the North Circular Road
- Motorised vehicles are the main mode of transport in Brent: latest 2017 data shows 45% were made by private motorised vehicles, 20% by bus, 32% walking and only 1% cycling
- From 2009 to 2016 the number of vehicles registered in Brent increased by 4.5%. Although, from 2013 to 2016 Brent has the lowest car ownership rate in Outer London with an average of 0.7 cars, and the number of vehicles registered in Brent decreased by 1.1% between 2016 and 2018.
- Brent has a lower percentage of green space when compared to the London average, at 21.9% in Brent versus 38.2% across Greater London.
- Over 50% of Brent households live further away from the nearest green space than the 400m maximum recommended distance in the London Plan.
- 36% of household waste in Brent was sent for recycling/compost in 2017-18.
- Brent is amongst the top 4 London boroughs with the highest rates of employment in the circular economy.
- 195,000 tonnes of waste is managed in Brent per annum, representing 3.4% of London's waste.
- Last year in Brent, there were more than 315 enforcement actions to tackle ASB, the most common including: casual labour market activities, street drinking, drug dealing, prostitution and begging.

Trends

In the context of growth projections, changing demographics and income levels, regeneration of the borough, Brent's diversity and changing lifestyles, anticipated trends must be considered for the Inclusive Growth Strategy (IGS) to understand how the environment will be impacted in the future and how the borough may reduce such impacts. Key trends that will affect environmental aspects of inclusive urban growth in Brent include:

1. Climate change, rising temperatures and environmental impacts
2. Increased resource consumption
3. Increased demand for sustainable transport and car use
4. Increased demand for environmental recreation
5. Low Carbon Circular Economy
6. Data use to improve climate change through Smart Cities technology
7. Reduced enviro-crime and ASB working with communities

Although these trends pose significant challenges to Brent, it is possible to reframe these challenges as opportunities through the provision of innovative green infrastructure and sustainable urban design in the future. By embracing the challenge of climate change and addressing environmental needs in Brent, the borough can simultaneously gain health, connectivity and economic benefits, making Brent a better place to live and improving well-being for all residents.

Responses

This report concludes with proposals that could be taken forward to address the challenges and seize the opportunities to integrate environmental sustainability into urban growth. Proposals highlight the need to research and capture data on environmental conditions moving forward, to ensure the borough can adequately respond to the challenges of climate change, growing populations, and resource scarcity and provision into the future. Headline responses surround the need to deliver sustainable transport, tackle climate change reduce carbon emissions and pollution, oversee a transformation in the energy mix, develop the circular economy, and support blue and green infrastructure. Responses include:

Construction represents a growing source and proportion of air pollution. It is therefore critical to reduce the pollution generated both on and off construction sites. New clean technology has the potential to replace ageing fleets of diesel diggers, excavators and inefficient generators and lighting rigs. Offsite factory manufacture can drastically reduce waste materials, noise, dust and litter on site – and reduce defects and shorten build times. The Council can better recognise innovation in building technology and cleaner construction when procuring development partners to deliver regeneration and development across the borough.

The circular economy model shows positive impacts in London, including Brent, building economic, natural and social capital, and having the scope to reduce CO^2 emissions and environmental impacts. Potential innovations include increasing emphasis on reducing carbon emissions through the use and reuse of resources before they become waste, including the manufacture of goods to higher quality standards, and the establishment of clean-tech hubs in borough strategic industrial locations including Park Royal and Wembley.

To deliver a zero carbon city by 2050. Brent must not only maximise energy efficiency in the built environment and encourage behavioural change in energy use by consumers, but oversee a transformation in the energy mix. The Council has the opportunity to take a leadership role by increasing the use of renewable energy sources on its own assets, and in securing more localised and sustainable energy networks in major new regeneration and development schemes.

Introduction

Looking forward to 2040, the state of the environment in Brent will be heavily influenced by both a growing population and the effects of climate change, which will at increase resource demand and exacerbate resource scarcity. Without intervention, the mismatch between resource supply and demand has the potential to leave Brent residents without adequate environmental services and resources, such as water and energy.

For the environment, Inclusive Growth in Brent means finding sustainable solutions to provide adequate resources and environmental services to Brent's residents, while minimising resource consumption and utilising environmental resources as efficiently as possible, to ensure that the needs of Brent's population will be met in 2040 and beyond. Particular consideration must be given to climate change, energy use, transport & network management, biodiversity & green/blue infrastructure management, waste and enviro-crime & environmental protection.

These sub-themes are addressed separately in this document, although it is essential to understand that each of them have significant overlap. The suggested solutions for future development must also take cross-theme integration into account, and the other chapters in the Inclusive Growth Strategy are inter-related. Economy, Infrastructure, Education, Housing, Health and Culture must all be considered in conjunction with environmental issues in Brent, in order to adequately improve environmental resources in the borough.

To formulate proposed solutions, this report analyses the Environment Theme of the Inclusive Growth Strategy in three sections:

- The first section describes the current baseline position of Brent's environment.
- The second section identifies and analyses anticipated changes in the form of environmental trends and projections in Brent and wider London.
- The third section, based on the trends identified, suggests policy responses and actions that could be taken to address the challenges and seize the opportunities to protect, enhance and enjoy the environment in the future.

Baseline

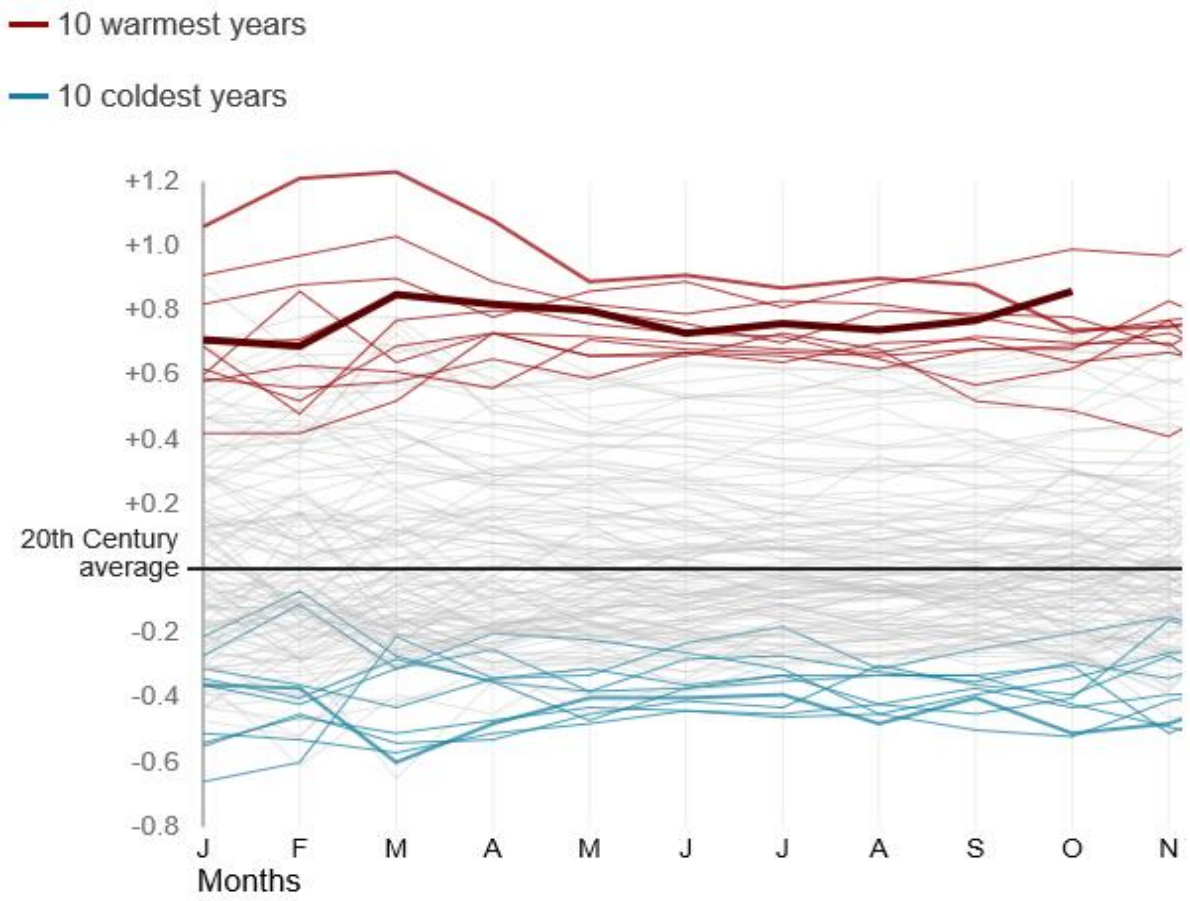
As the population and economy continue to grow, London and Brent face several environmental challenges that threaten the future of its citizen's health and wellbeing, and economic performance. The city is forecast to have more frequent and intense episodes of extreme weather, detriments in its air quality; risk of water shortages, over-reliance on fossil fuels, gradual loss of green space, increased demand for energy and the infrastructure required to distribute it.

To understand the scale of the environmental challenges to be addressed as we move forward to 2040, this section analyses the present environment situation for Brent and London.

Climate Change

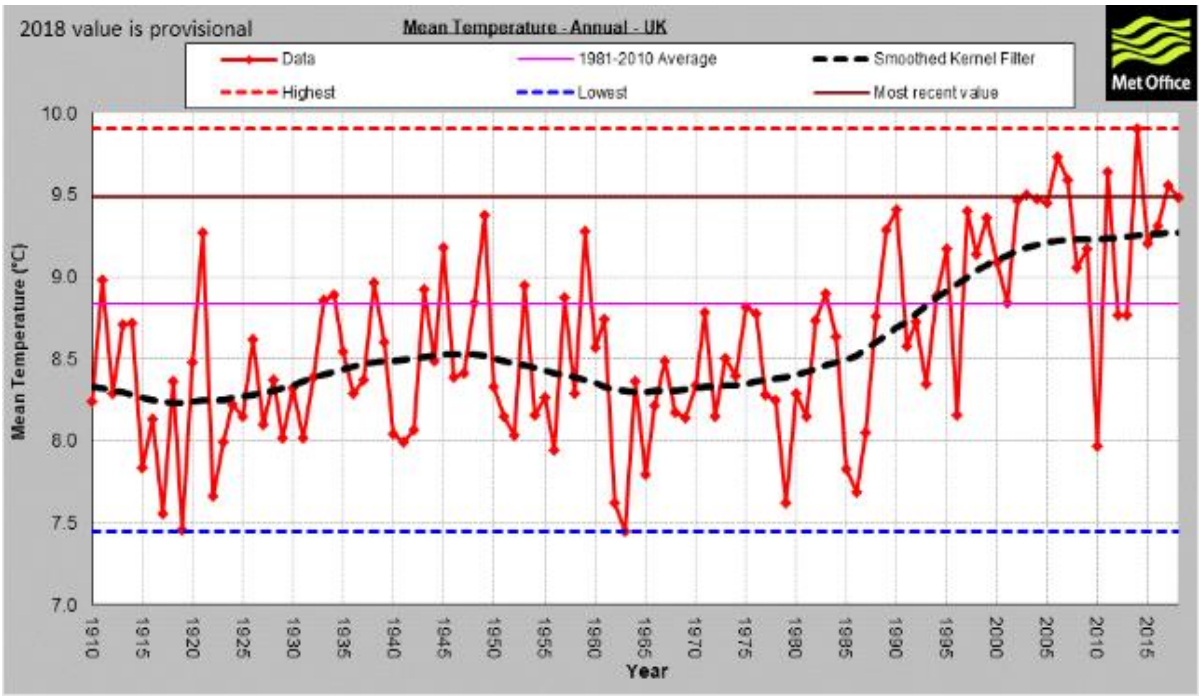
In London climate conditions are already changing and are expected to continue with warmer, wetter winters, and hotter, drier summers. The consequences of climate change have far reaching implications that affect aspects of everyday life, through flooding, heat risk and drought. The 20 warmest years on record have been in the past 22 years, with 2015-2018 making up the top four.

Figure 190:How years compare with the 20th Century average global



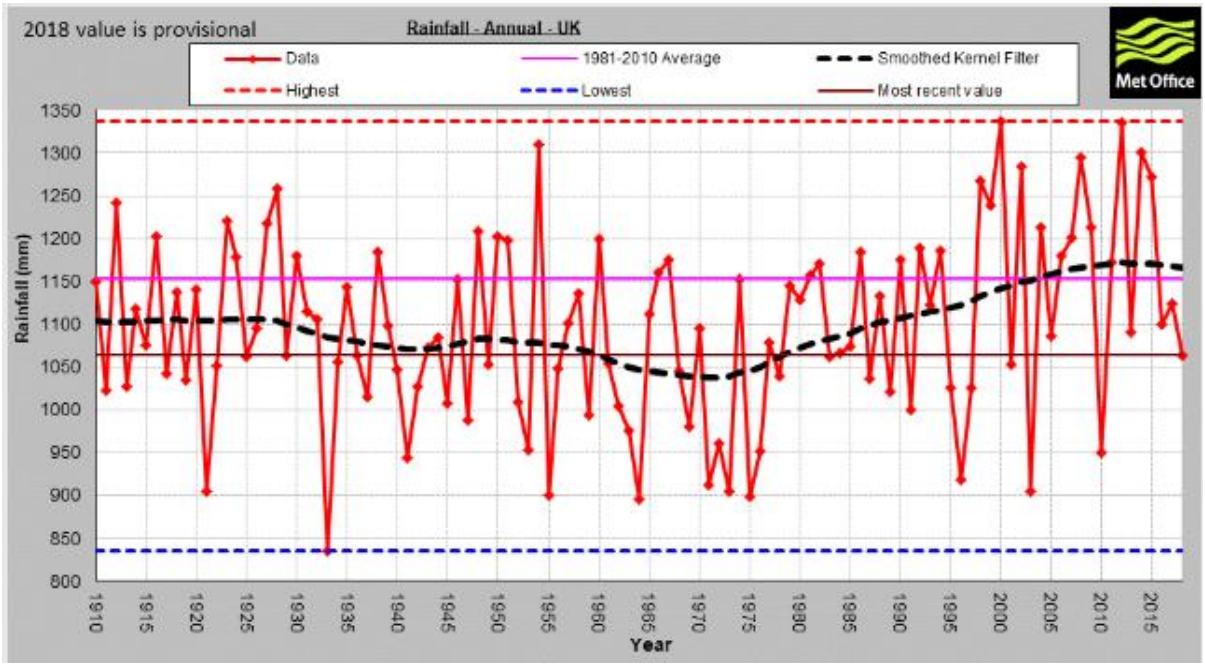
Source: Met Office

Figure 191: Annual Mean Temperature 1910-2015 England



Source: Met Office

Figure 192: Annual Rainfall UK 1910-2015 England



Source: Met Office

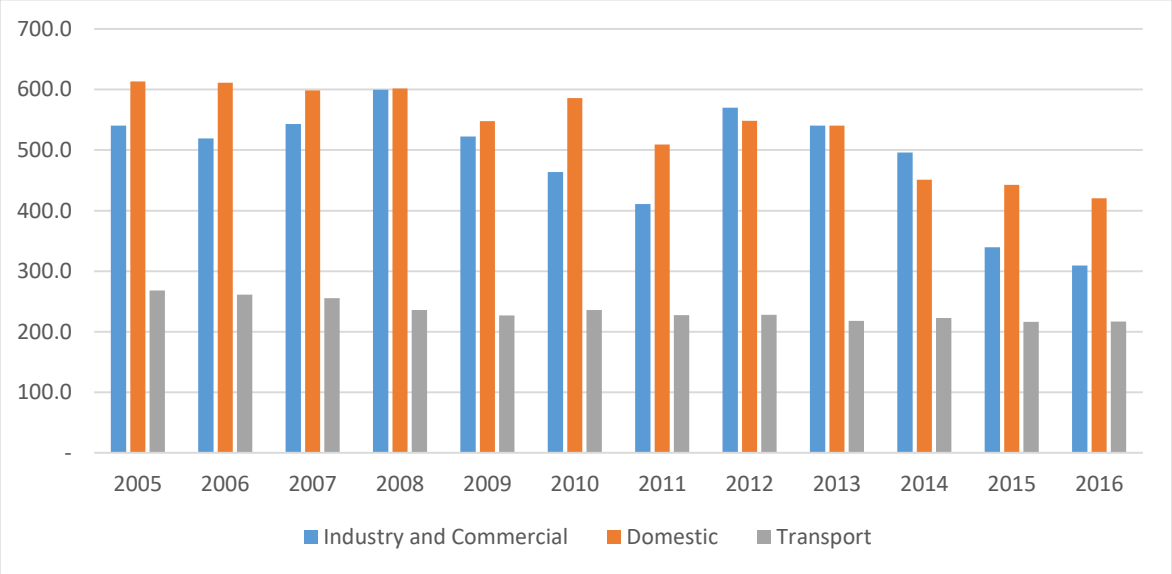
Greenhouse gas emissions (GHG), which have historically caused climate change, are being reduced in UK and London. However, current over-reliance on fossil fuels for energy production and transport use and resultant carbon dioxide (CO_2) emissions is now the main contributor to climate change. London is responsible for 8.7% of national emissions and Brent for 0.8%.[393]

[393] BEIS (2018) UK local authority and regional and carbon dioxide emissions national statistics.

In London, Mayoral and central government policy targets an 80% reduction of CO_2 emissions by 2050, relative to 1990 levels. In line with the Paris Environmental Agreement, central government has also indicated it intends to set a UK target for reducing domestic emissions to net zero. In London and Brent, homes and workplaces are currently the biggest-emitting sectors, with transport responsible for less than a quarter of emissions. The Mayor's Climate Change Mitigation and Energy Strategy (CCMES) states that all sectors must reduce emissions, with homes and workplaces to reduce the most, and transport to reduce the least.[394]

In 2016, Brent CO_2 emissions had declined 31% over the past 10 years (Figure 193) and accounted for 3% of London CO_2. In 2016 the domestic sector represents the largest source of emissions, accounting for 44.4% of carbon emissions in Brent. Industrial and commercial emissions accounted for 32.6%, while transport accounted for 22.9% of emissions.[395]

Figure 193: Historic CO2 emissions for sector in Brent



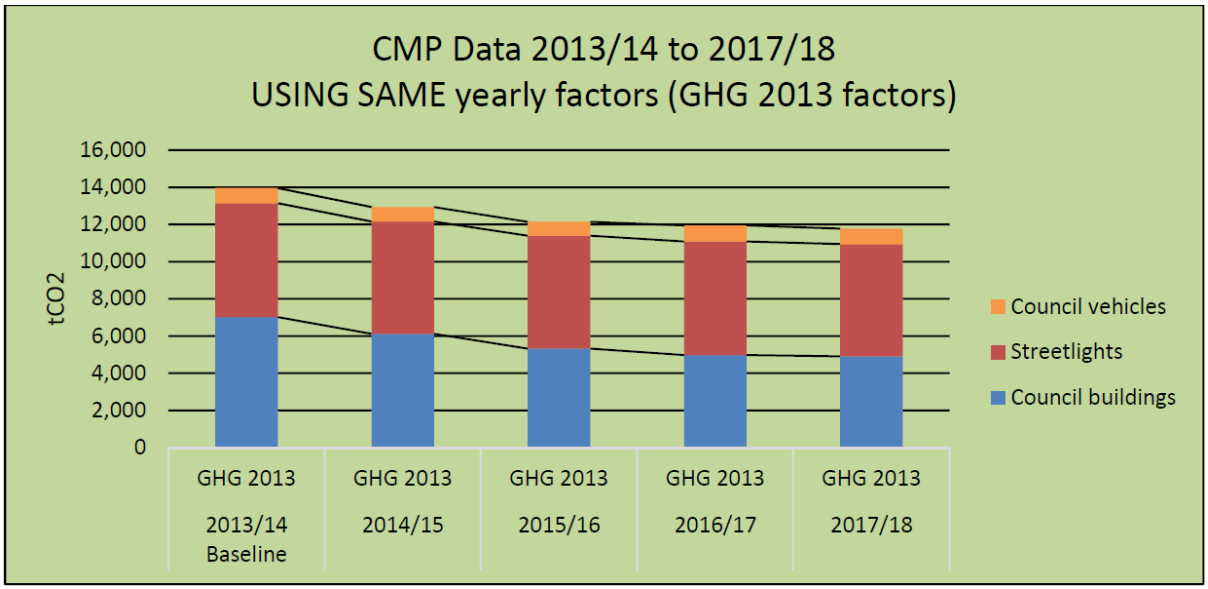
BEIS (2018) UK local authority and regional and carbon dioxide emissions national statistics.

Brent Council is concerned about the importance of reducing CO_2 emissions to meet national and international environmental targets. Therefore, in line with national and local policies, since 2007 Brent has implemented a Carbon Management Programme (CMP) which aims to reduce emissions from Council assets. This programme has included introducing street lampposts with LED technology, reducing electricity energy consumption. Council housing stock is also targeted for this programme, but the cost of management and design are the main barriers delaying implementation. Brent's CMP targeted a 15% reduction in CO_2 over the 4 years 2013/14 to 2017/18. The Council has slightly exceeded this target (Figure 194) and has achieved 15.6% savings over the period**.**

[394] The Mayor's Climate Change Mitigation and Energy Annual Report, 2013-14

[395] BEIS (2018) UK local authority and regional and carbon dioxide emissions national statistics.

Figure 194: Brent Carbon Management Programme

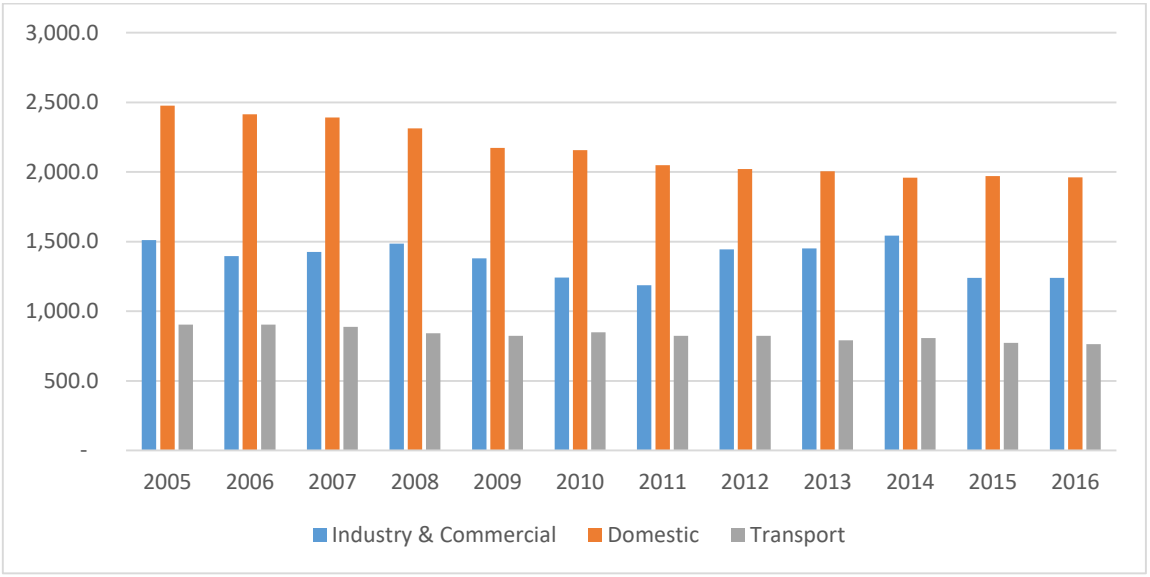


Source: Brent (2018) Carbon Management Programme CO2 Emission Report 2017/18.

Energy use

In Brent, energy consumption has reduced over the past 10 years (Figure 195), however reliance on fossil fuels still drives CO_2 emissions. In 2016, approximately 44.5% of all energy was consumed in people's homes, 32.6% in industry and commerce and 22.9% in transport. Brent was the 7th largest consumer of domestic energy in London.

Figure 195: Historic Energy Consumption in Brent



BEIS (2019) UK local authority and regional and carbon dioxide emissions national statistics.

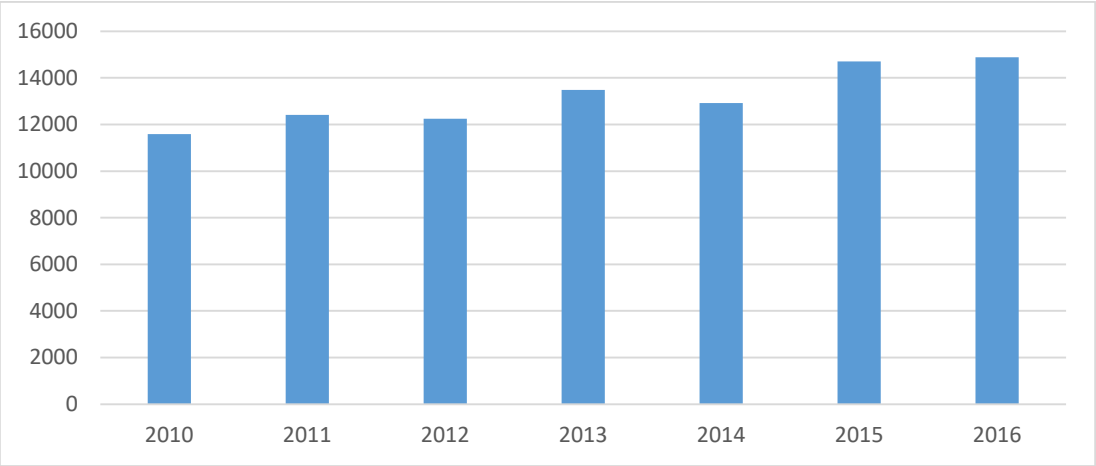
Most of Brent's energy is consumed from burning fossil fuels. Natural gas accounted for 47.8% of energy use in 2016; while electricity represented 31.3% and petroleum products

represented 20.3%.[396] Natural gas is mainly used to heat spaces and water for domestic consumers. Electricity is mainly used for commercial and industrial users, and petroleum used in road transport.

Brent Council is also committed to tackling fuel poverty in the borough, and developing a Fuel Poverty Strategy to address this issue. Households are considered by the Government to be in fuel poverty if they would have to spend more than 10% of their household income on fuel to keep their home in 'satisfactory' condition. According to the Department of Energy and Climate Change, there are three main factors which lead to fuel poverty: poor energy efficiency in the home, high energy prices, low household income. The elderly, children and those with a disability or long-term illness are particularly at risk of poor health outcomes as a result of living in a cold home. Evidence shows the significant impacts that cold housing can have on the population in terms of cardio-vascular and respiratory morbidity.[397]

In Brent the proportion of total households living in fuel poverty reached 12.9% in 2016, increasing 22% between 2010 and 2016 (Figure 196). It is important to consider measures that could reduce this rate moving forward.[398]

Figure 196: Number of fuel poor households in Brent



Source: BEIS (2018). Sub-regional fuel poverty data 2018.

Therefore, in line with the London Environment Strategy, Brent is committed to reduce carbon emissions, increase the efficiency of its energy sources, and encourage the implementation of green technology. Additional to the CMP, since 2007 the Council has received more than £700,000 of funding from NPO Salix Finance to provide energy efficiency through 61 projects saving 1,325 tonnes of annual CO_2. Since 2004 Brent has also been a beneficiary of the REFIT programme funded by the GLA and the European Regional Development Fund. This funding was utilised for the installation of Energy Conservation Measures (ECMs) in three schools and four corporate buildings at Brent, with an investment of more than £300,000, although this only represents 33% of the total loan approved 13 years ago.[399]

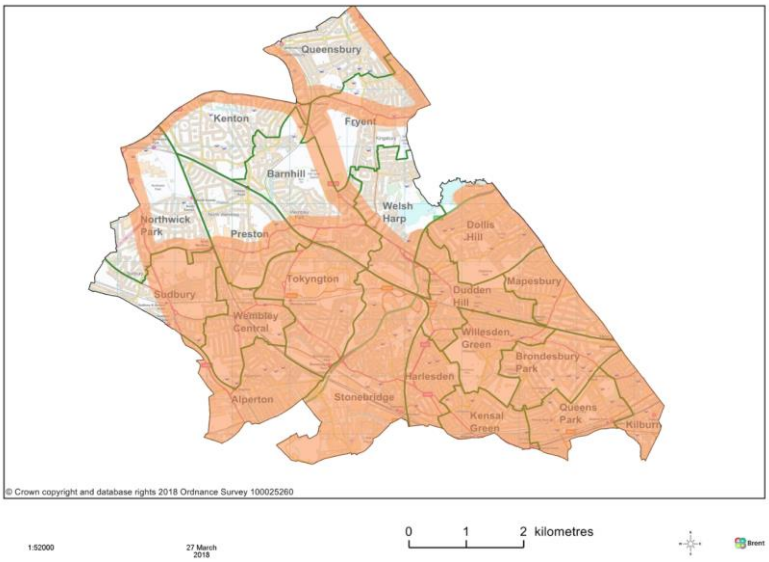
Air Quality

Air quality directly impacts people's health and the economy, therefore in London and Brent cleaner air has been a priority to increase community wellbeing and address climate change. For the last 15 years Brent Council has implemented several measures, which include the

[396] BEIS (2018) Total final energy consumption at regional and local authority level.
[397] Brent (2016) Joint Strategic Needs Assessment (JSNA) 2015/2016.
[398] BEIS (2017) Sub-regional fuel poverty data 2018.
[399] Brent (2014) Report from the Strategic Director of Regeneration and Growth. Brent REFIT Programme.

establishment of specific areas to monitor through the Local Air Quality Management (LLAQM) programme (Figure 197) which covers the vast majority of London.

Figure 197: London Borough of Brent Air Quality Management Areas (AQMA)



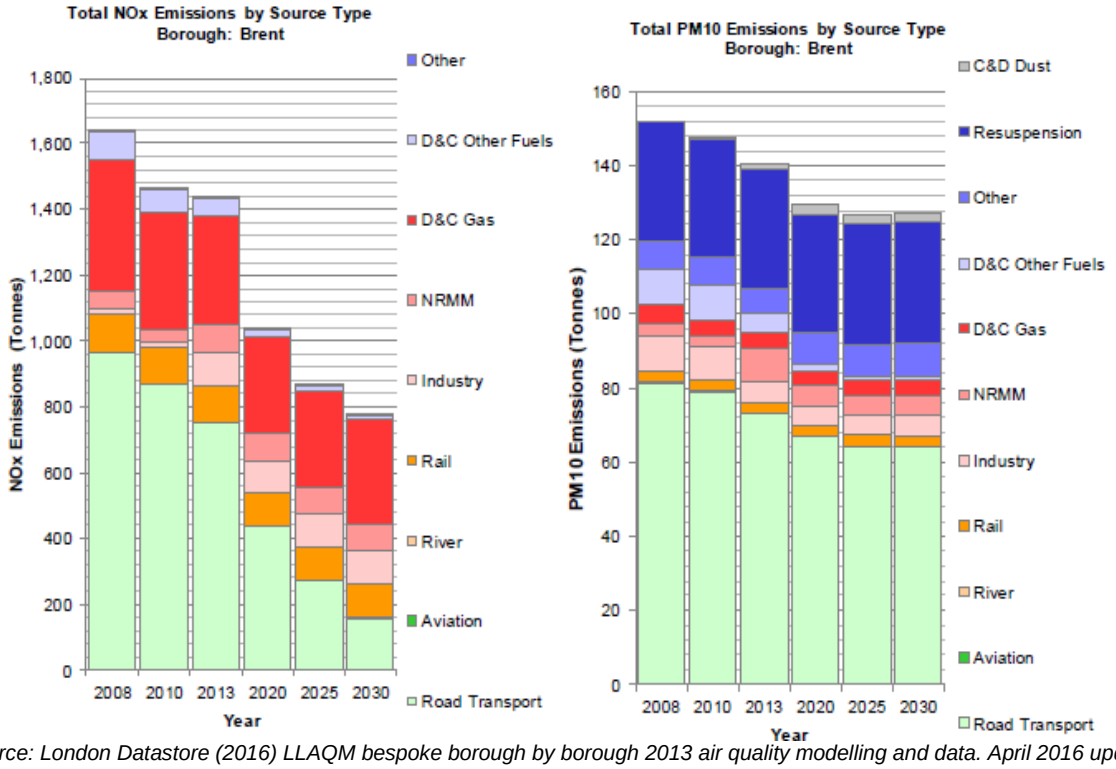
Source: Ordnance Survey.

Air quality in London and Brent has improved in recent years, as a result of policies to reduce emissions, primarily from road transport, and is projected to improve moving forward to 2030. Policies implemented in Brent include improving cycling infrastructure with the development of the first lightly segregated route on Carlton Vale; parking permit charges modified where the most polluting vehicles pay more; and, upgrades to local air quality monitoring points [400]. Future policies are included in Brent's Air Quality Action Plan 2017-2022[401].

The largest contributors to poor air quality in Brent are road transport, construction and local energy generation. Although road transport emissions have reduced in recent years, updated pollution concentration data in Brent still shows exceedances of the annual national and EU limit values for Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) (Figure 198)[402]. NO_2 and PM_{10} are linked to 9,500 early deaths in London each year.[403]

[400] Brent (2017) Report form the Strategic Director of Regeneration and Environment. Air Quality Action Plan (2017-2022).
[401] Brent (2016) Air Quality Action Plan (2017-2022).
[402] London Datastore (2016) LLAQM bespoke borough by borough 2013 air quality modelling and data. April 2016 update.
[403] Kings College London (2015) Understanding the Health Impacts of Air Pollution in London

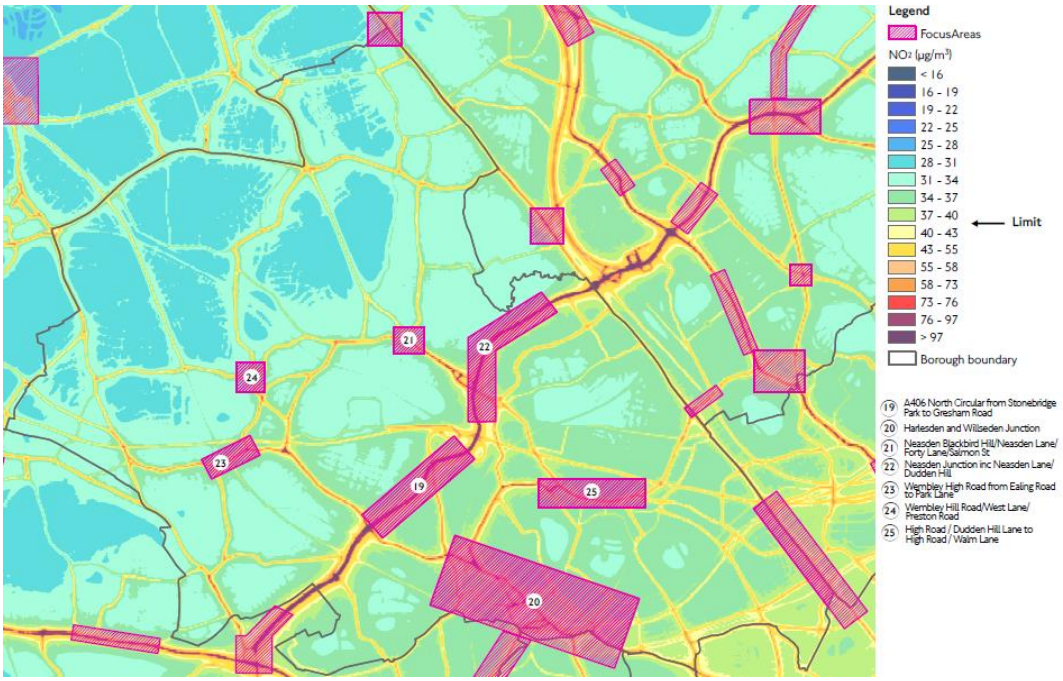
Figure 198: Brent Air Quality Management



Source: London Datastore (2016) LLAQM bespoke borough by borough 2013 air quality modelling and data. April 2016 update.

Concentrations of NO_2 and PM_{10} occur in several hotspots in the borough that correspond to known traffic congestion areas. Model results from the Air Quality Assessment and Air Quality Management Areas (AQMA) reviewed in 2016 indicate that the greatest roadside annual mean NO_2 concentrations occur on the North Circular Road A406 (Figure 199).[404]

Figure 199: NO2 annual mean concentrations 2016 (base year 2013)

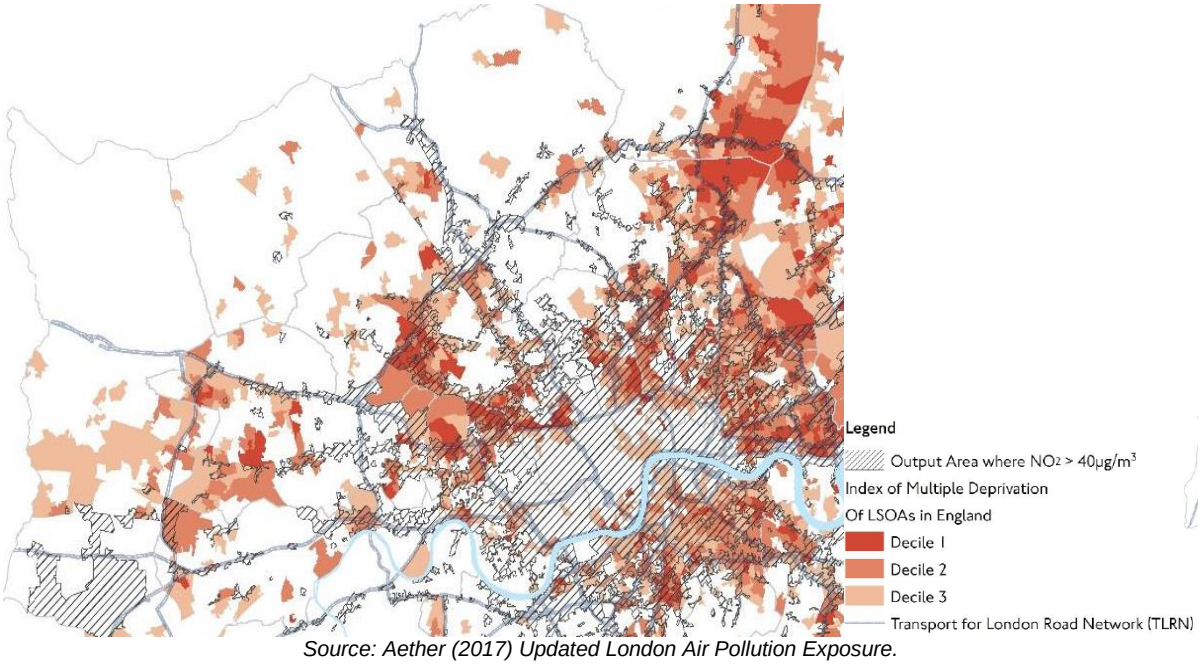


Source: Data Store (2016) London London Atmospheric Emissions Inventory 2013 Air Quality Focus Areas - 2016 update.

[404] London Datastore (2016) London Atmospheric Emissions Inventory (LAEI) 2013 Air Quality Focus Areas - December 2016.

Analysis of air pollution in London indicates that 11% of the schools and educational institutions inBrent are in locations where average concentrations exceed the NO_2 EU limit value (40 µg/m3 annual average) and 68% of the most deprived population were exposed to the worst air quality areas in the borough (Figure 200)[405].

Figure 200: Locations of 30% most deprived LSOAS vs. locations of exceedances to NO2 limit value, 2013



Source: Aether (2017) Updated London Air Pollution Exposure.

Diesel vehicles are currently the highest contributor to road transport pollution in London, emitting local particulates such as PM_{10} and $PM_{2.5}$ which are known to be significant contributors to ill health. Reducing private car dependence and switching to more sustainable modes of transport are the main methods targeted to reduce diesel emissions and particulate matter. It is also important to reduce emissions from freight by encouraging a switch to lower emissions vehicles, and to adopt practices that reduced freight movements.

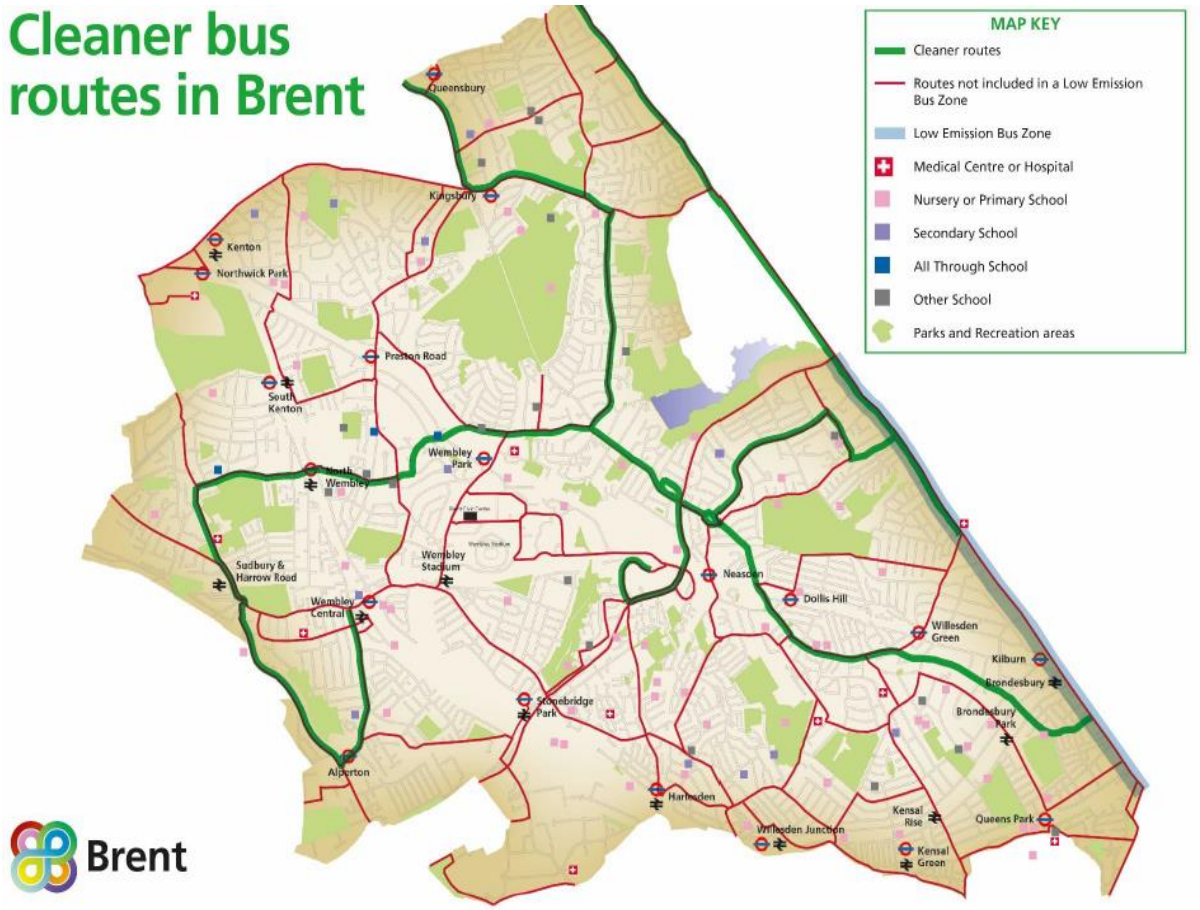
Transport for London (TfL) has introduced initiatives to reduce air pollution caused by road transport. The Emissions Surcharge or Toxicity Charge, commonly known as the T-charge programme, discouraged the use of older polluting vehicles, through charging those not meeting minimum European emissions standards circulating in central London. The T-charge was the forerunner to the Ultra-Low Emissions Zone (ULEZ), a 24-hour charging zone programme that came into force on the 8th of April 2019 in Central London. Current plans propose that from the 25th of October 2021 the ULEZ boundary will be extended to create a single larger zone bounded by the North and South Circular Roads. This extensions would include the whole of south of the borough.

Reducing private car dependency and switching to more sustainable modes of transport is the main objective to achieve a modal shift towards a more environmentally-friendly transport mix. However, it is also important that current public transport modes become more environmental friendly. TfL has therefore started a programme of technology transformation to extend cleaner bus routes, mainly in areas considered to be hotspots of harmful emissions, some of which are in Brent. This programme is due to complete by 2020 and will include 17% of Brent's bus

[405] London Datastore (2016) Analysing Air Pollution Exposure in London.

routes using cleaner buses in Low Emission Bus Zones (LEBZs), including the Edgware Road route in Brent's boundary; the route from Cricklewood Broadway via Shoot-Up Hill to Kilburn High Road. 5% of the Brent's bus routes will be served by the Ultra-Low Emission Zone (ULEZ) and by hybrid vehicles. Consequently, nearly a quarter of Brent's routes will be low emission buses (Figure 201) [406]

Figure 201: Cleaner Bus Routes in Brent



Source: Brent 2017 Cleaner and greener bus routes.

Transport & Network Management

Transport in Brent is responsible for a significant proportion of both carbon emissions and air pollution, and encouraging the use of clean vehicles and green modes of transport is a government priority. Brent residents make 2.3 trips per person per day, with only 30% of trips made on public transport.

Public transport in Brent includes:

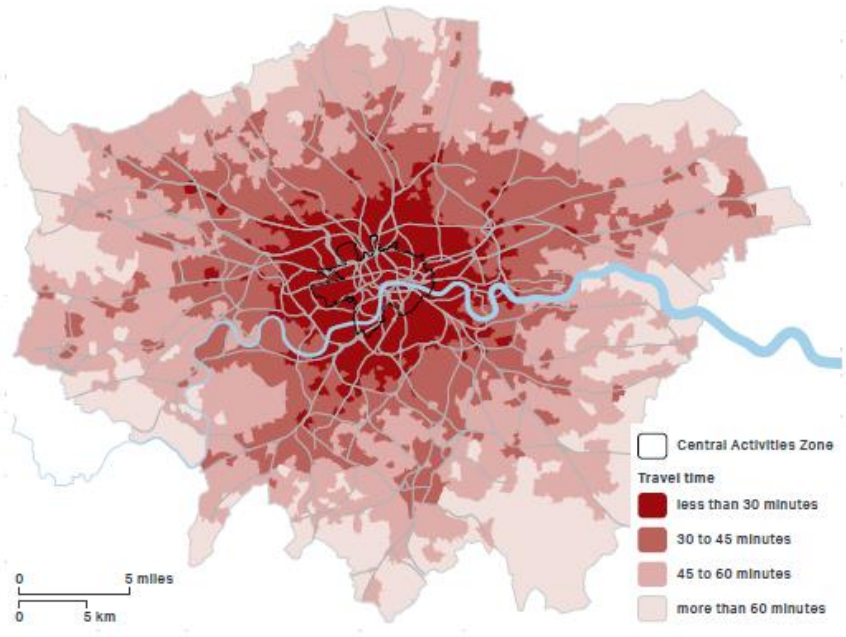
- 58 bus routes, 7 of which are night buses.
- 25 Underground stations, with currently only 3 stations with step free access at Wembley Park, Kingsbury, and Kilburn (and step free access now planned for Park Royal). Brent has direct access to Jubilee, Piccadilly, Metropolitan and Bakerloo Underground lines. Jubilee line with night service during weekends.
- 3 Overground stations with access to Euston-Watford Junction and Richmond, Clapham Junction Overground routes.

[406] TfL (2017) Improving buses.

- 4 National Rail stations offering direct links to Marylebone and out-lying destinations such as Birmingham/High Wycombe

In Brent, public transport allows relatively high accessibility by public transport within 45 generalised minutes (Figure 202).

Figure 202: Public transport travel time to the Central Activities Zone, 2015

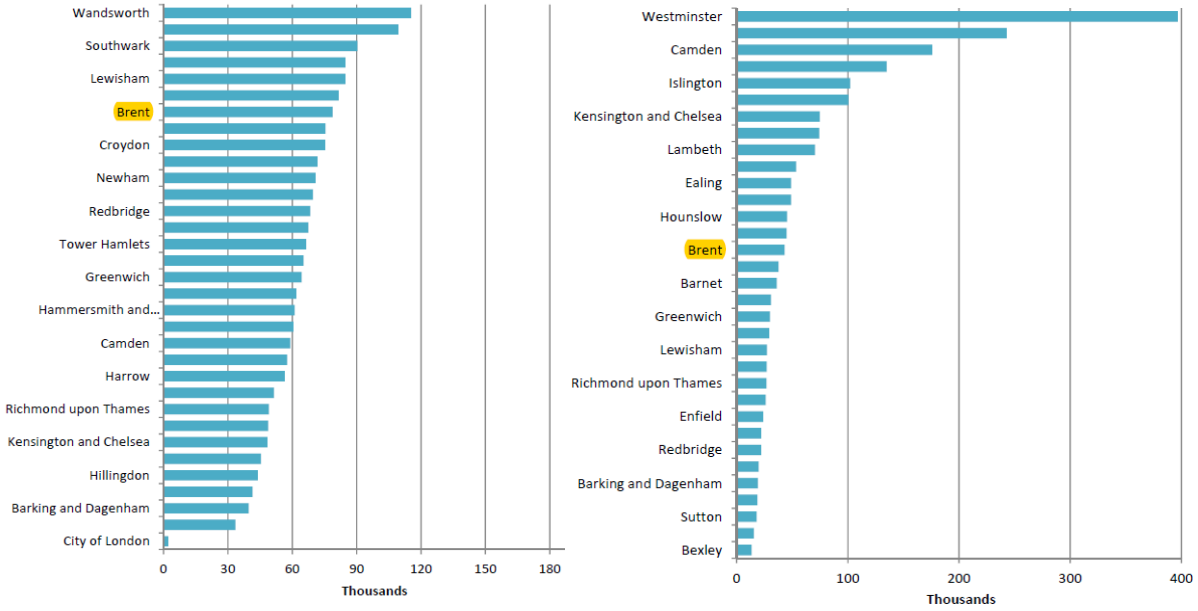


Source: GLA (2018) Mayor's Transport Strategy

Brent is well connected to Central London, however it is poorly connected to other Outer London Boroughs and to London Heathrow Airport, despite relatively close geographic proximity. Brent is therefore seen to have strong radial public transport links to Central London, but much weaker local orbital ones to the other West London boroughs.

The distance of trips by underground originating in Brent are on average 11.75 km, representing a large outflow of commuter trips to Central London. Census data shows commuting outflow in Brent heavily outweighs commuting inflows, ranking 7th out of the 33 London boroughs for commuting outflows (Figure 203).

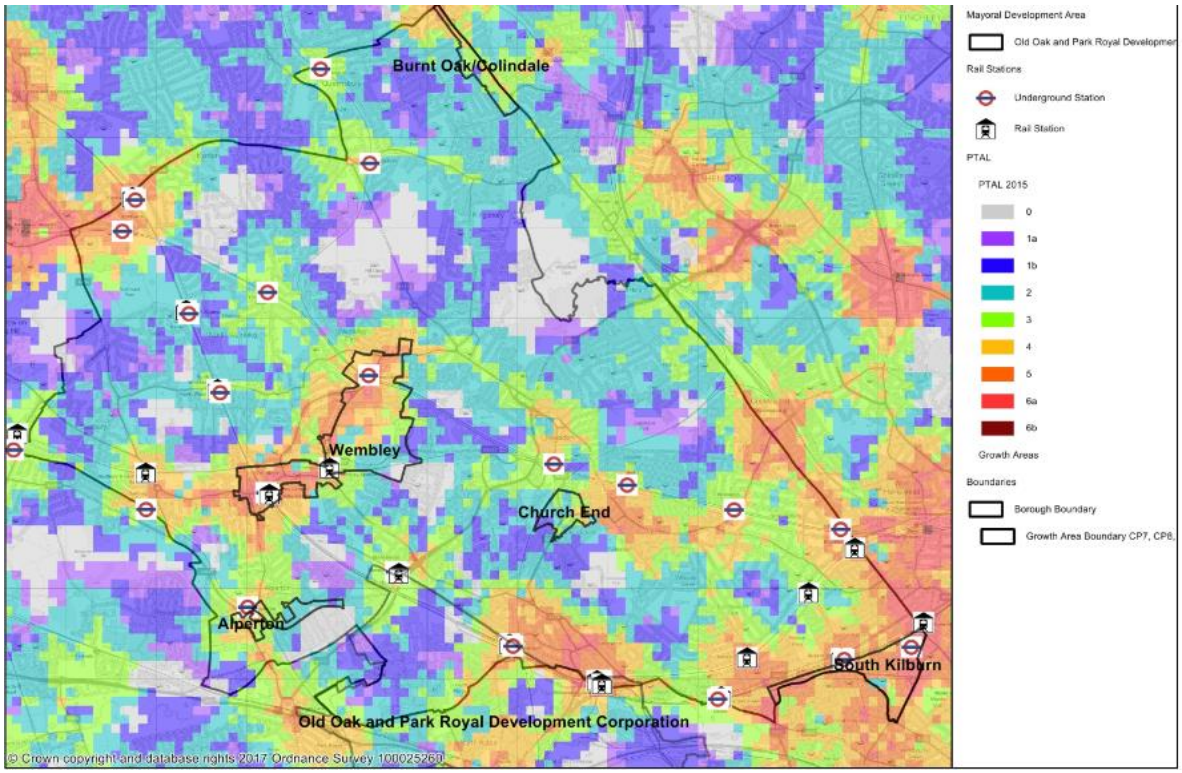
Figure 203: Commuting outflows (left) and inflows (right) within London



Source: GLA Intelligence (2014) Commuting in London Report 2014, 2011 Census table WU01EW

Transport access in London and in Brent is measured by Public Transport Accessibility Levels (PTAL) which indicate a significant difference in accessibility within the borough, with the central and southern wards of Brent in red and orange representing the best connected neighbourhoods. While northern wards in blue have lower PTAL (Figure 204).

Figure 204: Brent PTAL 2015

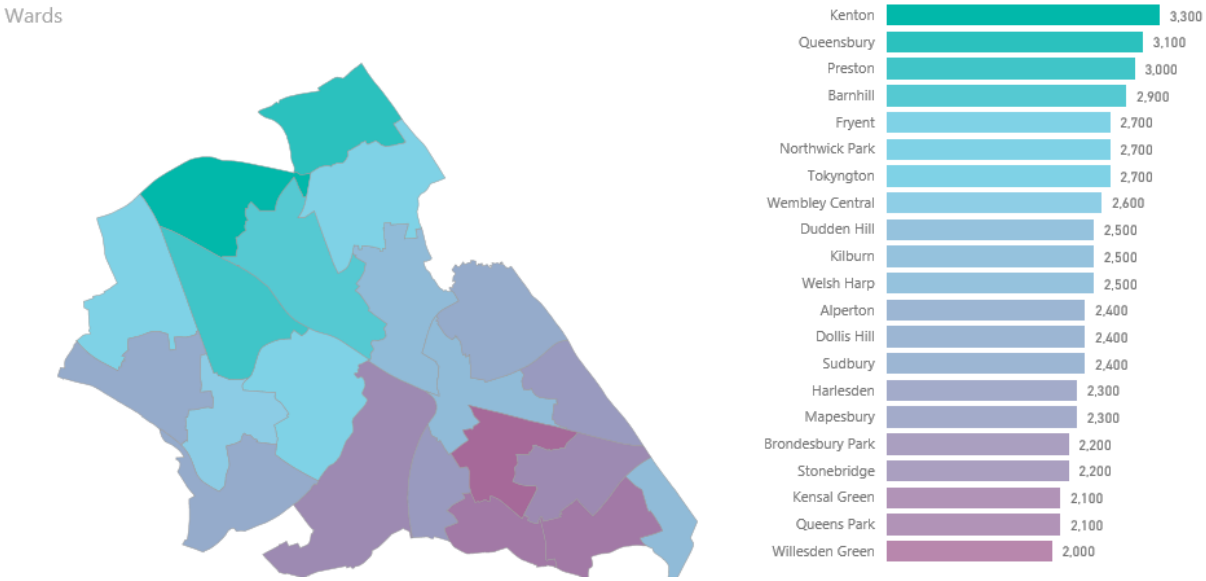


Source: *Ordinance Survey.*

PTAL and safety is particularly important for the elderly population, who with increasing age are more likely to use the car (mainly as a passenger) as first choice for travel. In London the main barriers to increased public transport use amongst older people are concern about crime and antisocial behaviour; as well as, health problems that limit their ability to travel.[407] In the UK, the most frequent reason for not using public transport is that it is not convenient and does not go where those 60 and over want to go.[408]

Around 16% of Brent's population are over 60 and therefore have access to free travel on public transport, either through the Freedom Pass (available from the state retirement age) or the London-only 60+ Oyster Photocard (available from age 60)[409]. The older population in the borough is mainly concentrated in the north of the borough, 28% of older people live in Kenton, Queensbury, Preston, Barnhill and Fryent (Figure 205). 2 of the 3 step-free stations in Brent are located in the north of the borough; and PTAL levels are lower compared with southern wards (figure 280).

Figure 205:Brent's population over 60

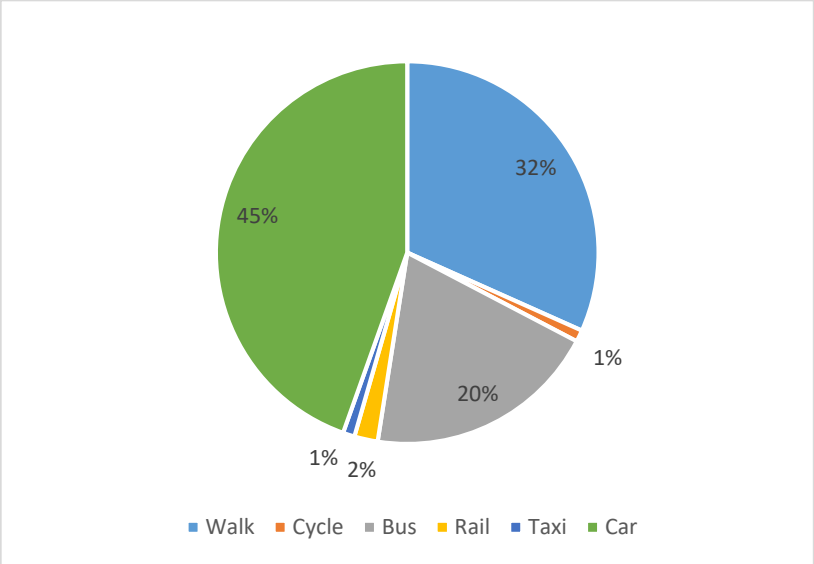


Source: Ordinance Survey with GLA estimates for 2017, rounded to nearest 100.

Lack of transport accessibility in Outer Brent therefore contributes in part to high car usage in the borough. Use of buses and underground in Brent are equal highest amongst Outer London boroughs, however a majority (40% of trips) originating in Brent are still by way of car, with 18% by bus, 8% by underground, and 2% by rail. For active transport, walking represents 29% of trips in Brent, but cycling represents only 1% (Figure 206).

[407] TfL (2012) Understanding the travel needs of London's diverse communities.
[408] ILC (2017) The Future of Transport in an Ageing Society.
[409] Population GLA estimates for 2017, rounded to nearest 100.

Figure 206: Modal Split 2017

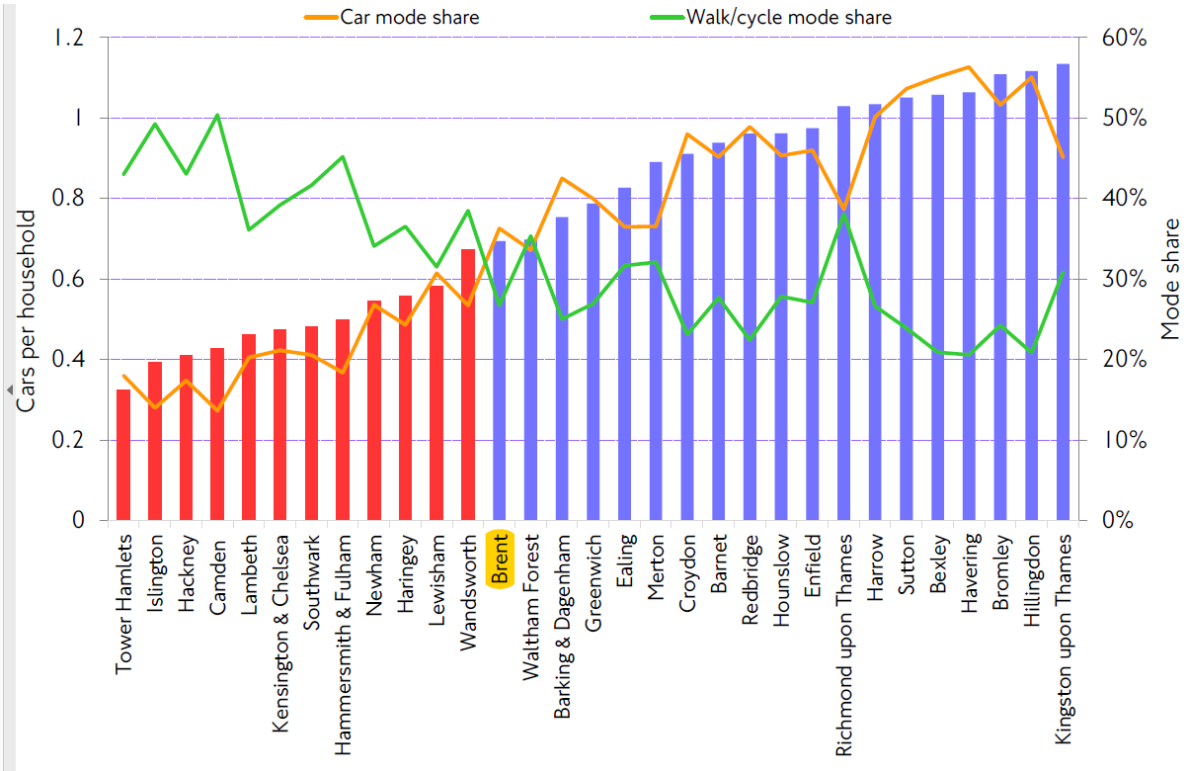


Source: Brent Local Implementation plan 2018

Cars

From 2013 to 2016, Brent had the lowest car ownership rate in Outer London with an average of 0.7 cars per household. However, Brent had a lower walk and cycle mode share (29%) compared with other boroughs with a similar car ownership rate[410] (Figure 207).

Figure 207: Car ownership rates by borough of residence. Average number of cars per household, car mode share and active travel mode share compared.

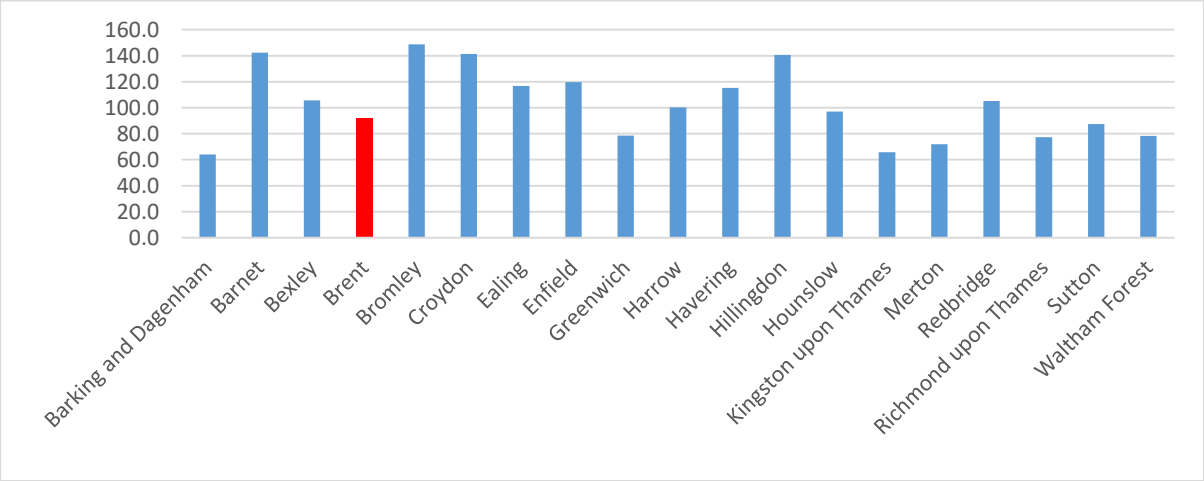


Source: TfL (2017) Travel in London Report 9.

[410] TfL (2017) Travel in London Report 9.

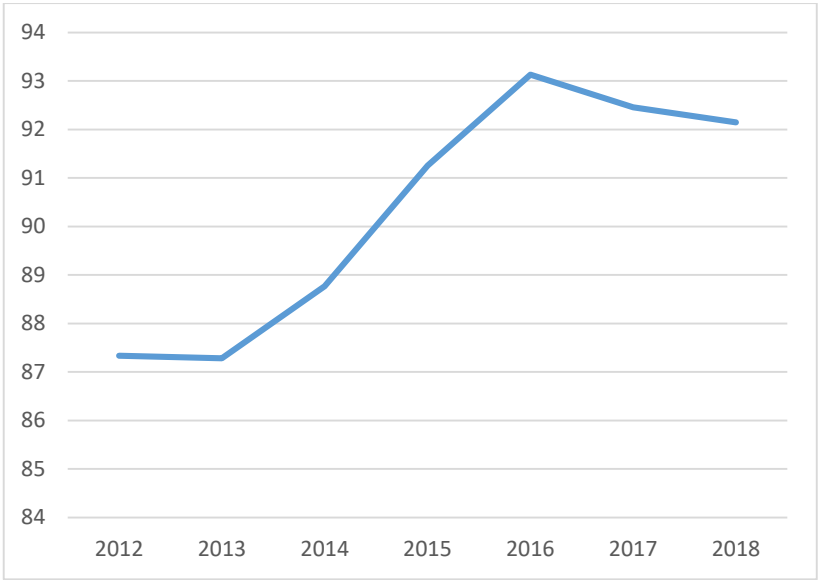
Although, in Brent there are less cars per household than in other Outer London boroughs, latest data shows that Barking and Dagenham is the borough with lowest cars registered (Figure 208). From 2009 to 2016 the number of cars registered in Brent increased by 4.5%, however has subsequently between 2016 to 2018 decreased by 1.1%. (Figure 209).

Figure 208: Cars registered 2018 Outer London (000s)



Source: Department for Transport Statistics Vehicle Licensing Statistics 2019.

Figure 209: Number of Licensed Cars Registered in Brent (000s)

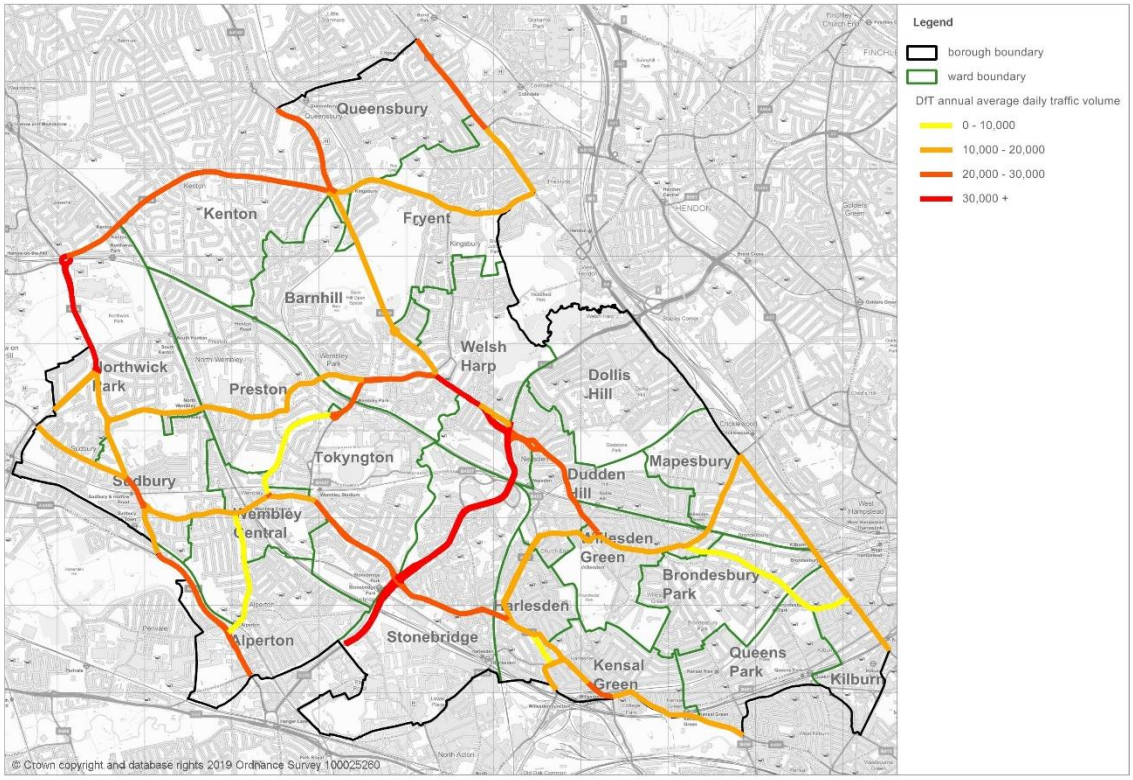


Source: Department for Transport Statistics Vehicle Licensing Statistics 2019.

Traffic Congestion

High rates of car use cause traffic congestion in Brent, which is especially concentrated in central wards, and along the North Circular Road. The map below shows daily traffic flow where red indicates the most congested roads (Figure 210). High levels of congestion reduce the quality of life of Brent residents and have a negative effect on economic growth. They also suppress the uptake of active travel modes by degrading the environment for cyclists and pedestrians.

Figure 210: Annual Average Daily Traffic Volume All motor vehicles



(Units=vehicles per day)
Source: GIS Map

Parking

Demand for parking in the London Borough of Brent is high. Over time the Council has introduced a number of measures to control the demand for kerb space. Parking in the south-eastern part of the borough, which is closest to central London, is regulated through Controlled Parking Zones (CPZs) where residents have the option of purchasing resident permits. Other parts of the borough also have parking controls, typically in and around busy high street locations, or near railway stations where there may be a demand for parking from commuters.

Another key feature is the presence of Wembley Stadium. On major event days the local area receives an extremely high number of visitors, placing significant pressure on local parking. For this reason, the area surrounding the Stadium also has parking controls to protect parking for local residents and businesses.[411]

In 2018 the Council operated 11 public car parks providing 714 off-street parking stock (including motorcycle spaces), allocated as follows[412]:

- 650 standard car parking spaces:
- 18 disabled spaces
- 26 business spaces
- 10 P2W spaces
- 4 parent & child spaces
- 53 electric vehicle spaces

[411] Brent (2015) Parking Strategy 2015.
[412] Brent (2018) *Parking Annual Report 2017-2018*

There are also over 700 spaces in privately-run car parks available to the public on a “turn up and pay” basis. There are large numbers of parking spaces associated with shopping centres, supermarkets etc., although these are often intended for customers only.

There are 33,000 on-street parking spaces managed through 40 Controlled Parking Zones (CPZs) across Brent.

Car Clubs

Car Clubs provide an alternative to private and commercial car ownership and/or use, with cost-effective benefits for the user, and reduce parking pressures to the borough, freeing up residents parking spaces. Car Clubs can reduce overall car dependence by making access to cars more flexible, reducing pressure on road space and encouraging sustainable transport. Car Clubs can help to support low-car, car-lite or car-free developments. Members have access to vehicles on a pay-as-you-drive basis. Cars tend to be located in clusters, allowing access to another car within a short walk if the car in the first location is not available.[413]

Car Clubs are now well-established in Brent, with 87 fixed Car Club bay spaces through two companies Zip Car and City Car Club. The fleet of these Car Clubs includes both diesel and electric vehicles, although the number of vehicles with green technology are lower.

In 2018 Brent Council resolved to implement a flexible car club. Currently Brent Council promotes car club use through the planning system requiring S106 monies to fund car club spaces near new developments as a means of increasing densities through reducing parking requirements.[414] Car clubs can be beneficial in the borough for their ability to improve its public realm, reduce congestion, increase the number of electric vehicles and supporting regeneration.

Electric Cars

Electric vehicles (EVs), Plug-in hybrid electric vehicles (PHEVs) and hydrogen fuel cell electric vehicles (FCEVs) are road transport solutions to reduce the environmental impact on air quality caused by conventional vehicles. EVs produce zero direct NO_2 and CO_2 emissions. PHEVs produce evaporative emissions from the fuel system and tailpipe emissions only when operating on gasoline. FCEVs produce CO_2 only when converting natural gas into hydrogen, and could otherwise use electricity from renewable sources.

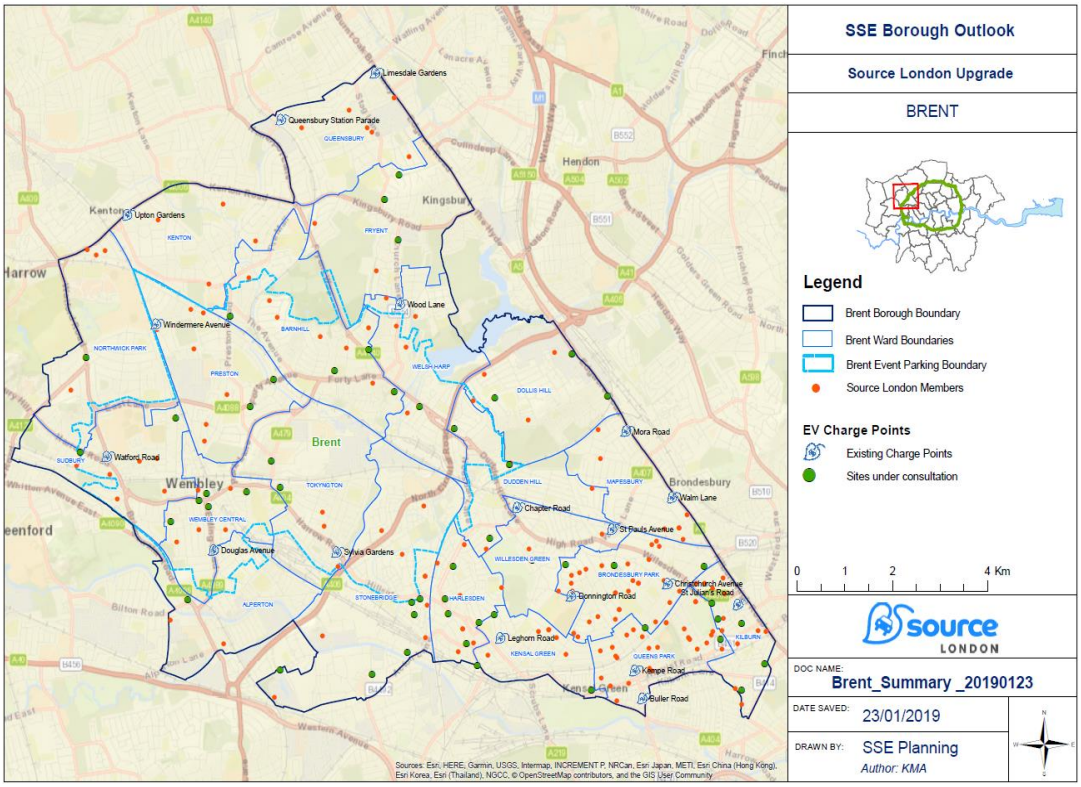
National, regional and local government all encourage the use of EVs due to the environment benefits that they bring in urban areas. However, in London to date, take-up of EVs by the general public has remained low, and there have been problems with the maintenance and reliability of some of the charging points installed across the City.[415]

Brent Council, in line with Mayor’s environment policy, recognises the importance and promotes the use of EVs in the borough, as one of the measures to tackle poor air quality across the city. There are 26 electric charging points in Brent with an expectation to install 100 more in 2019.

There are currently 40 CPZ’s in the borough providing around 33,000 on-street parking places to some 56,000 households. CPZs cover around 35% of the borough with the Wembley Stadium Protective Parking Scheme (WSPPS) covering a further 35%. Approximately 30% of the borough does not have area wide parking controls.

[413] TfL (2015) A Car Club Strategy for London: Growing car clubs to support London’s transport future.
[414] Brent (2018) Cabinet Paper Flexible Car Clubs
[415] Brent (2015) Parking Strategy 2015.

Figure 211: Brent's charging points



Source: Zap-Map (2019)

Cycling

Cycling as a mode of transport reduces pollution, congestion and emissions, improving air quality and delivering additional health benefits from increased physical activity. The Mayor's strategies and Brent Council therefore seek to encourage everyone who lives and works to cycle through provision of cycle training schemes, and cycle infrastructure including cycle pathways and cycle parking.

In developing the Brent Cycling Strategy 2016-2021 extensive engagement with residents indicated that the most significant barrier to cycling is considered to be road safety, followed by the cycling environment, and the need to develop a network of quiet, on-road, routes avoiding major links, to encourage cycling and reduce concerns over road safety.[416]

As part of the Cycling Strategy and the Air Quality Action Plan Brent Council has implemented different mechanisms to reduce barriers to cycling including the lightly segregated cycle route in Carton Vale; a Quietway from Gladstone Park to Regents Park; free cycle training sessions planned in 50 schools and 20 nurseries; as well as, cycling and walking strategies to assist residents to actively choose to make journeys by cycle[417].

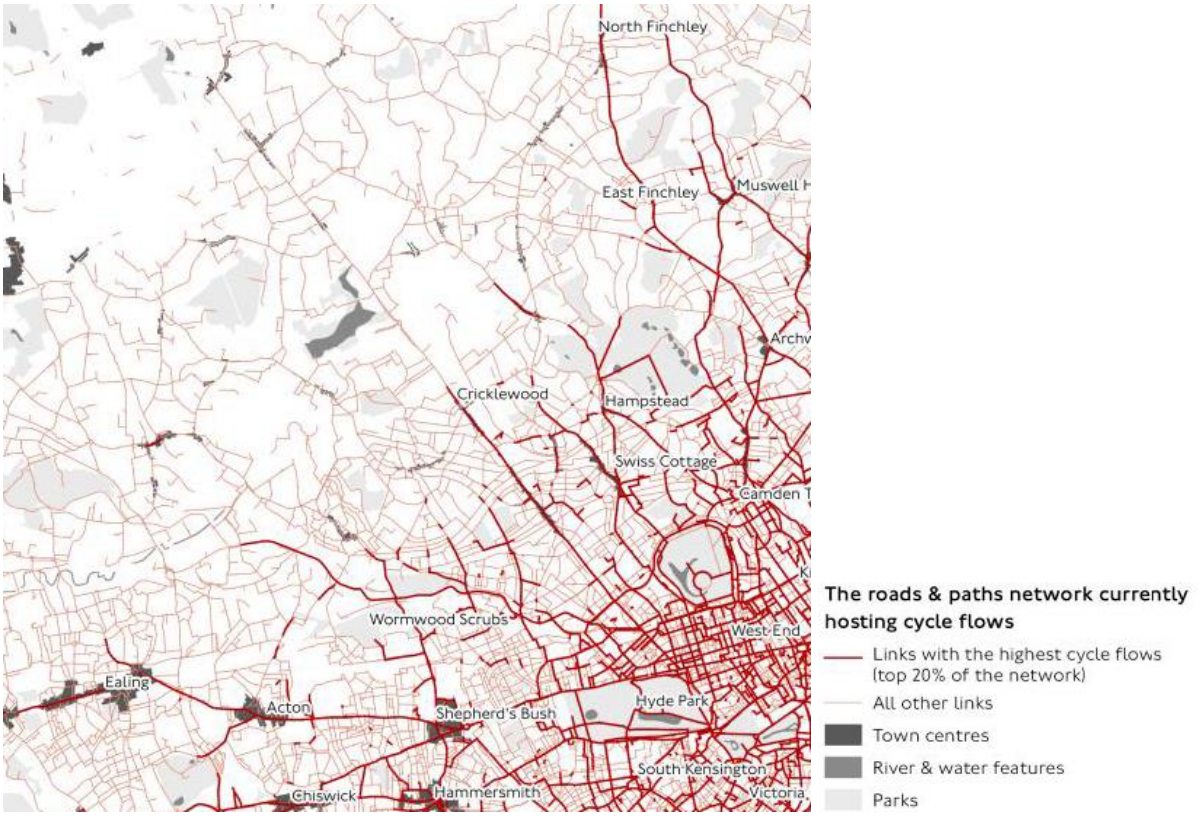
Cycle training in London has proved particularly successful in encouraging people to cycle more, with a positive impact on confidence and safety.[418] In 2013, the Mayor's Vision for Cycling in London was launched, including financial support to encourage more people to cycle through the Borough Cycling Programme (BCP). In 2016 TfL approved £128,700 for

[416] Brent (2016) Cycle Strategy 2016-2021.
[417] Brent (2017) Air Quality Action Plan 2017-2022.
[418] TfL (2015) Adult Cycle Training Monitoring.

BCP in Brent to finance training, parking and staffing to support the initiative.[419] That year, Brent's cycle training programme reached 285 adults and 956 children.[420]

In Brent, 2% of all trips were made by bicycle, and around 32% of households own at least one bicycle. Uptake of cycling in the north of the borough lags behind that in the south. In the south of the borough, cycling constitutes 2-5% modal share of journeys, whereas in the north only 0-1%.[421] The map below shows that most cycle flows in Brent are along the A5 and in the south of the Borough (Figure 212). Difference on rate trips could be due in part to population demographics within Brent – 77% of adults between 20 and 49 with a higher preference to cycle live in central and southern wards, while the older population live mainly in the north of the borough. East London benefits from higher cycle flows, and also has greater cycle infrastructure investments, with 6 existing cycle superhighways, Quietways and mini routes.[422]

Figure 212: Roads and paths hosting the highest current cycle flows.



Source: TfL (2017) Strategic Cycling Analysis: Identifying future cycling demand in London.

Walking

Most journeys start and end with walking. Encouraging walking is key to encouraging more sustainable and active modes of travel, whether for part or all of a journey. Pavements and footpaths are essential for all (including wheelchair users) to allow access to local places and to create the street environments where daily life is played out. With Brent's growing population, an increase in walking is essential to ensure other transport networks continue to function efficiently, as well as delivering public health improvements for Brent residents.[423]

[419] TfL (2017) Borough Cycling Programme Funding for 2016/2017.
[420] Brent (2017) Cabinet report 24 April 2017. Report for the Strategic Director Regeneration & Environment.
[421] Brent (2015) Long Term Transport Strategy 2015-2035
[422] TfL (2017) Strategic Cycling Analysis: Identifying future cycling demand in London.
[423] Brent (2017) Walking Strategy 2017-2022

Biodiversity & Green/Blue Infrastructure Management

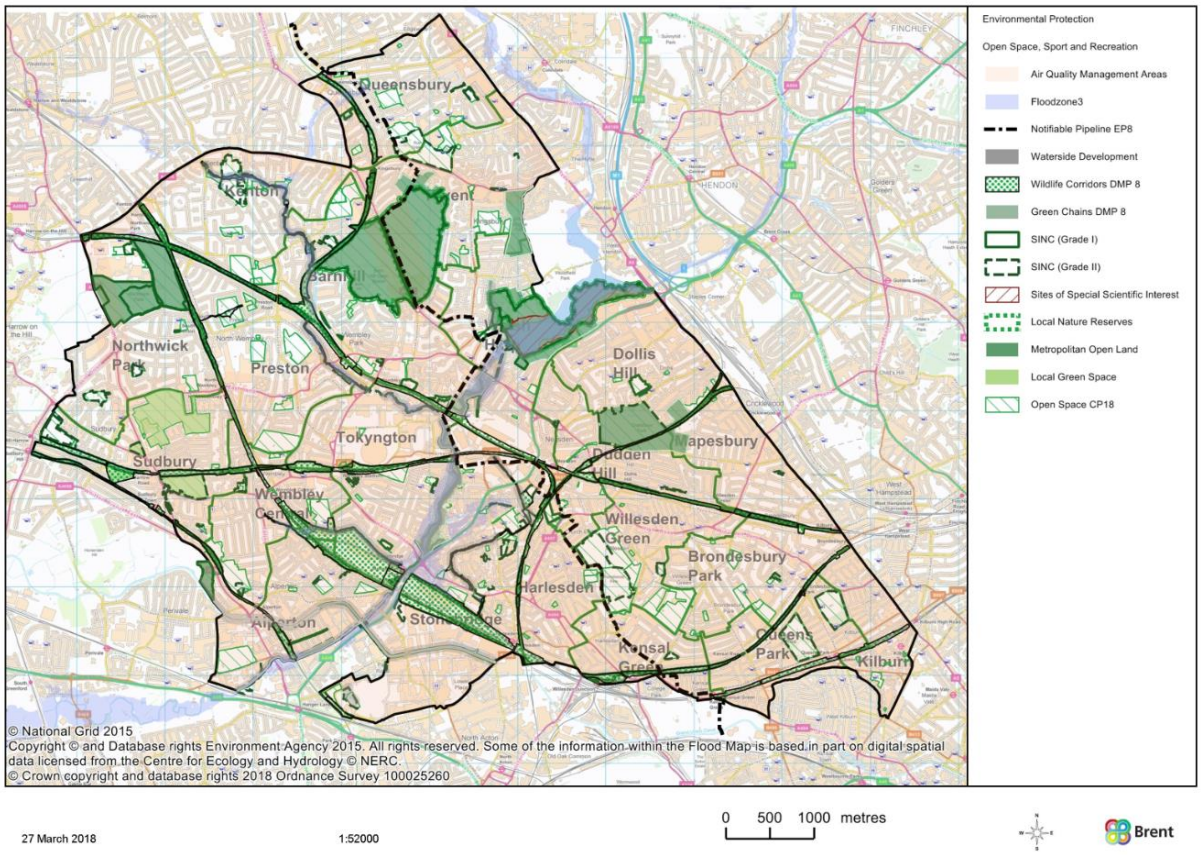
The environment is fundamental to the health and quality of life of Londoners, but also has an important role in the function of the London economy. In London public parks are estimated to have a gross asset value of over £91 billion due to their value for recreation, health and environment, benefiting individuals, public services and business. 61% of this economic value is attributed to increased residential property prices, 19% physical and mental health benefits, 19% recreational value, and 1% temperature regulation and carbon storage. For public services, the economic contribution of green areas are most particularly from the health benefits received.[424] Other green areas similarly have relevant environmental value that can too often be overlooked, with a range of benefits including: mitigating flooding, improving air and water quality, cooling the urban environment, absorbing carbon dioxide, providing shade from UV radiation to reduce skin cancer risks, supporting biodiversity, encouraging walking and cycling, and enhancing biodiversity and ecological resilience.

Open Spaces within Brent include green spaces such as parks, tree-lined streets, allotments, natural habitats, recreation grounds, playing fields, burial grounds, woodlands, farmland, amenity space and children's play areas (Figure 213). Fryent Country Park (103 ha) and the Brent Reservoir (102 ha, of which approximately 50 ha are in Brent), are the two largest wildlife sites in the Borough. The Grand Union Canal (12 ha in Brent) also provides a valuable habitat for fish, waterbirds, aquatic plants and invertebrates.[425]

Brent has 4,300 ha of green spaces and 600 ha of parks areas, a lower percentage of green area compared to the London average, at 14% in Brent versus 20% in Greater London[426]. Brent Council is however committed to increase and protect green areas, through the Tree Management Policy that looks manage and maintain tree stock on public highways, housing estates, parks and cemeteries; enhance the role of trees in mitigating climate change; plant new trees and protect threatened trees in conservation areas.[427]

[424] GLA (2017) Natural capital accounts for public green space in London.
[425] Brent (2007) Open Space and Biodiversity LDF 2007.
[426] GLA (2017) Natural capital accounts for public green space in London.
[427] Brent (2017) Tree Management Policy.

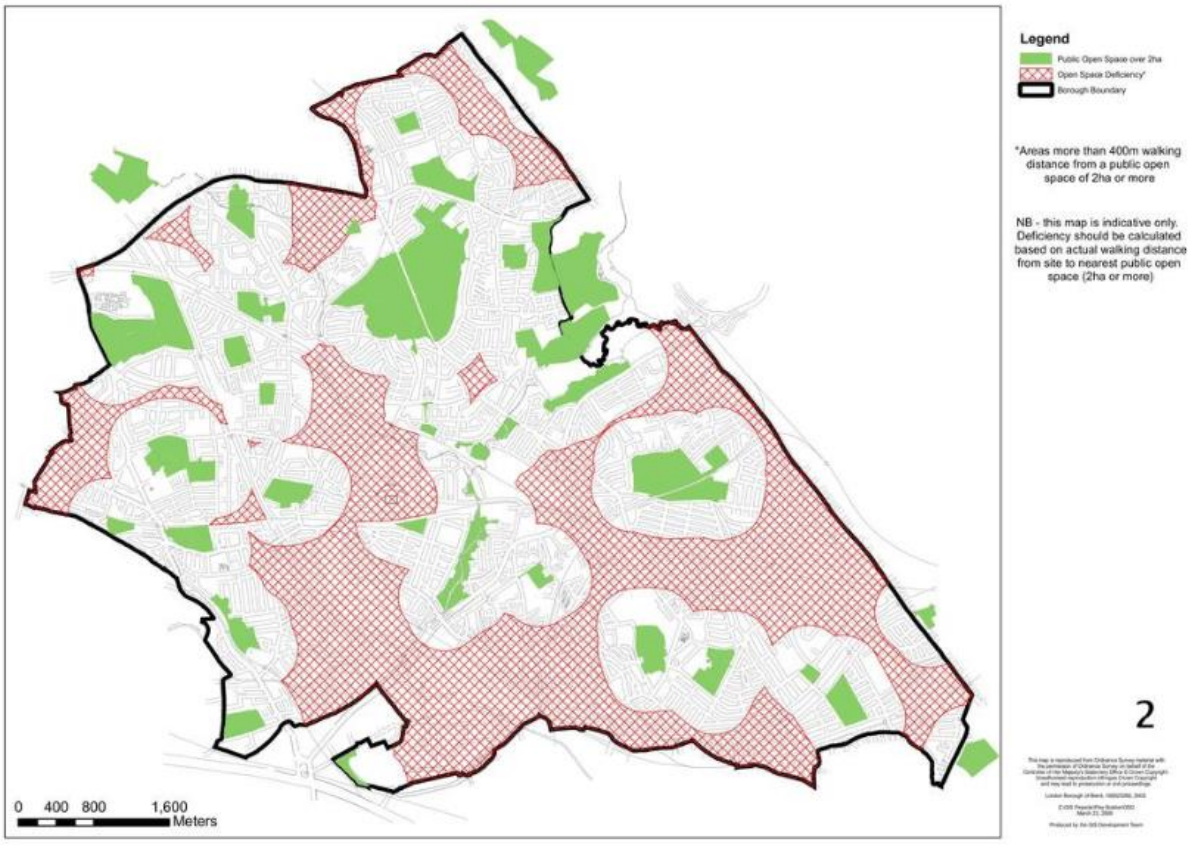
Figure 213: Open Space



Source: Ordinance Survey.

Given Brent's smaller proportion of public Green space, the borough is characterised by areas of open space deficiency (Figure 214). More than half of Brent households live further away from the nearest green space of more than 2 hectares than the maximum recommended distance of 400m in the London Plan.

Figure 214: Local Open Space Deficiency Areas



Source: Ordnance Survey.

Brent Council has worked with communities to maintain current green spaces and increase the number of trees, including the £0.12m funding received in 2016 from Mayor's "Community Green Space" and "Community Tree Planting" grants, including planting 590 trees with 4 different community groups. [428]

Though Brent is characterised by a lower percentage of public green space, the borough has a higher percentage area of domestic gardens than in Greater London, at 30.34% versus 23.85%.[429] Private gardens occupy approximately a fifth of the Borough by land area. There are 1,108 allotment plots in the Borough managed by Brent Council Parks Service and a number of private allotments. These areas provide opportunities for relaxation and exercise; for growing food and providing seasonally changing vegetation; in reducing urban flooding and helping to store carbon dioxide; and provide wildlife and biodiversity on the doorstep.

Biodiversity

A wide range of habitats are associated with trees. In Brent these include broadleaved woodland, lowland mixed deciduous woodland, wet woodland, street trees, veteran trees, orchards, hedges and hedgerows, and scrub. Trees and other vegetation are net absorbers of carbon during their lifetime which has the effect of reducing atmospheric carbon; and of potentially providing a carbon-neutral source of energy to substitute the combustion of fossil fuels. Trees can also reduce winter heat loss around buildings; and provide summer shading for both buildings and people. Brent Council manages trees in streets and parks; and through the planning system has a role in encouraging an appropriate stock of trees in the Borough.

[428] GLA (2017) Tree planting grants 2016-17.
[429] London Datastore (2014) Land use by Borough and Ward.

Blue Infrastructure Management

Adequate management of the blue infrastructure in the borough will relieve environmental threats that increase risks of flooding and droughts, as well as meet the drainage and water provision demands of a growing population.

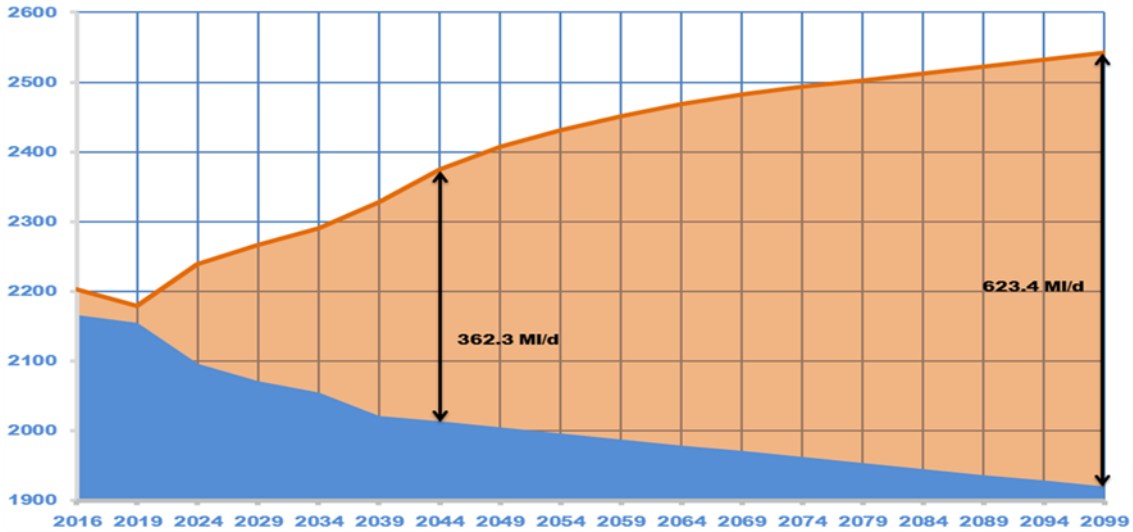
Thames Water Corporation is the main authority in charge of the public water supply and waste water treatment in London and Brent. Blue infrastructure serving Brent includes sewage treatment plants, sewer systems and catchments which are controlled by Thames Water. The existing water supply in Brent is composed of 77% surface water and 23% groundwater. To evaluate if the current blue infrastructure meets population and environment requirements, water consumption patterns, drainage capacity and flood risk areas should be analysed.

Water Consumption

The South East of England is classified by the Environment Agency (EA) as being in "serious" water stress. This means that in an average year more water is abstracted from the environment to meet our demands than is sustainable in the long term. Many water companies in the South East have been set 'sustainability reduction targets' by the EA to reduce the amount of water they take from the environment. This serious water stress, together with climate change and population growth, have led Thames Water to estimate that by 2050, without further action, London's demand for water will exceed the available sustainable supply by 522M litres per day (l/d) by 2050.[430]

London's water supply is in deficit, with the deficit growing from 7.6M (l/d) in 2016-17 to 40.1Ml/d in 2017-18. Over 2017-18, London's annual water consumption per capita was 120.8 l/d for households in measured (metered) areas, and 159.4 l/d for households in (unmetered) unmeasured areas.[431] Thames Water indicates that London's overall water supply capacity is below consumptions patterns. Growth in demand from an increasing population, and falling available supply due to climate changes, changes in bulk supply and increased third party abstraction from the River Thames, means the gap is predicted to widen if no action is taken, with insufficient water to meet London's needs.

Figure 215: Thames Water, Water Deficit Prediction (Ml/d) 2016-2100 under dry year average.

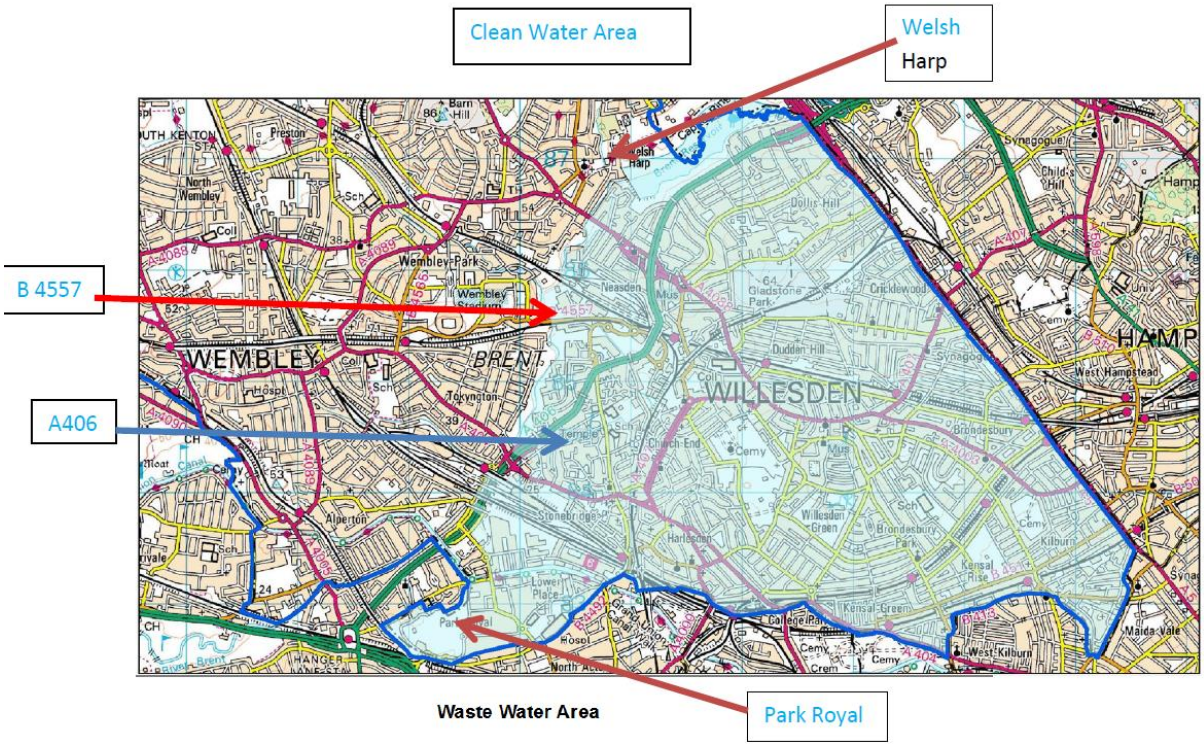


Source: Thames Water Revised Draft Water Resources Management Plan 2019

[430] GLA (2016) Economic Evidence Base for London 2016.
[431] Thames Water (2017 & 2018) Environment Agency Annual Review 2016-17 and 2017-18

At a local level, Thames Waters are able to provide some limited detail on water demand and consumption in the District Meter Area which covers half of Brent south and east of the River Brent and Welsh Harp Reservoir.[432]

Figure 216: District Meter Area in LB Brent



Source: Thames Water (2018) Environmental Information Request Response 12/091

Taking latest data for 2016-17 and 2017-18 provided by Thames Water below, household water consumption per capita is noted to be higher than the Thames Water 125 l/d standard[433] or the London Plan105 l/d standard set for new domestic properties[434]. Assuming an LB Brent average household size of 2.8 persons as per Census 2011, latest data indicates daily annual water consumption per capita fell from 152 l/d to 139l/d for households in the LB Brent District Meter Area between 2016-17 and 2017-18. Over the same period 2016-17 and 2017-18 the number of domestic properties metered in the area rose from 28% to 47% and this increase in metering is considered the main driver for the fall in water consumption. Clear variance is observed between daily water consumption per capita at both the London and Brent levels, with water consumption 30% higher at 156 l/d in unmeasured (unmetered), compared to 120 l/d in measured (metered), domestic properties in Brent over 2017-18.[435]

[432] Thames Water (2018 & 2019) Environmental Information Request Responses 12/091 and 19/20/014
[433] CLG / DEFRA (2007) Water Efficiency in New Buildings
[434] Mayor of London (2016) London Plan : Chapter Five : London's Response to Climate Change
[435] Thames Water (2018 & 2019) Environmental Information Request Responses 12/091 and 19/20/014

Figure 217: Household and Commercial Water Consumption 2016-17 & 2017-18

		Property Count[1]	Average Daily consumption m3	Average per property consumption l/d
Households	Measured	16457	5554.56	337.51
	Unmeasured[2]	41451	19165.55	462.36
Commercial	Measured	2708	5426.57	2003.90
	Unmeasured[3]	579	183.3	316.58

		Property count	*Average Daily Consumption (ADC)*	*Average consumption per property*
Household	Measured	27318	9207.34	337.043
	Unmeasured	30934	13530.88	437.4113
Commercial	Measured	2776	5302.4	1910.086
	Unmeasured	716	188.51	263.2821

Source: Thames Water (2018 & 2019) Environmental Information Request Responses 12/091 and 19/20/014

Flood Risk

Flood risk poses a significant threat to a large proportion of Brent, with 4% of properties lying directly within a floodplain. The percentage of properties in Brent with a significant chance of flooding is 2.7%, and the percentage of properties in Brent with moderate and low chances of flooding are 0.4% and 1.4% respectively.[436] The probability of flooding is considered likely to grow as climate change increases the frequency of extreme weather. Brent is very fortunate not to have experienced major flooding incidents in the last two decades, only in 2007 and 2010 did flooding extend to the highway, open spaces and gardens.[437]

According to the Environment Agency's national Flood Map for Surface Water (FMfSW) dataset, approximately 35,500 residential properties and 4,400 non-residential properties in Brent could be at risk of surface water flooding of greater than 0.1m depth during a rainfall event with a 1 in 200 probability of occurrence in any given year (0.5% Annual Exceedance Probability, AEP). 12,600 residential properties and 4,400 non-residential properties are estimated to be at risk of flooding to a depth of greater than 0.3m during the same modelled rainfall event.[438]

Waste

In 2015, London produced around 18 million tonnes of waste, 17% from household, 28% commercial and industrial waste, and 54% of construction, demolition and excavation. London has lower rates of recycling compared to England as a whole. Around one-third of households recycle, which is approximately 10% lower than the national average. [439]

[436] Thames Water (2017) Annual Review 2016-17
[437] Brent (2015) Flood risk Management Strategy.
[438] Environment Agency, Flood Map for Surface Water (FMfSW) (2017).
[439] GLA (2016) Economic Evidence Base for London 2016.

Latest published data (2019), indicates that in 2016 London produced 18.7 million tonnes of waste and Brent produced 0.94 million tonnes of waste, categorised as below:

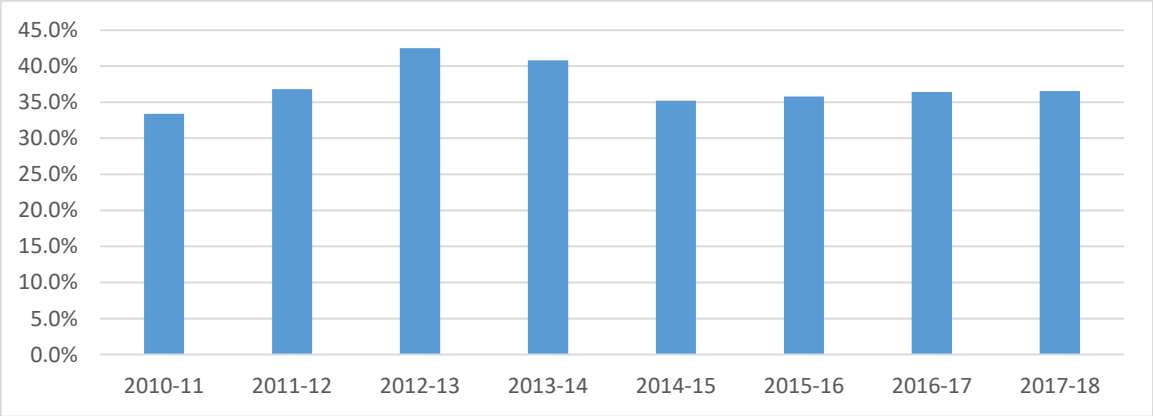
Figure 218: London and Brent Waste 2016 (millions of tonnes)

London		
Household/Industrial/Commercial	7.9	42%
Construction & Demolition	10.4	56%
Hazardous	0.4	2%
	18.7	
Brent		
Household/Industrial/Commercial	0.4772	50.6%
Construction & Demolition	0.4658	49.4%
Hazardous	0.0008	0.1%
	0.9438	

Source: Environment Agency (2019) Waste Data Interrogator 2016

Household recycling in Brent has generally improved since 1998, and in 2017/18, 36.5% of household waste in Brent was sent for recycling/compost (Figure 218).

Figure 219: Percentage of household waste sent for reuse, recycling or composting



Source: DEFRA (2018) Local Authority Collected Waste Statistics - Local Authority data

In 2015, Brent adopted the West London Waste Plan, partnering with the London Boroughs of Ealing, Harrow, Hillingdon, Hounslow, Richmond upon Thames and the Old Oak and Park Royal Development Corporation (OPDC) to manage waste.[440] The West London boroughs agreed to co-operate to produce a single waste plan for their combined area that now forms part of each of their Local Plans and the OPDC development plan. A significant amount of waste is transferred outside of London for treatment or disposal (Figure 219 & 220).

[440] WLWP (2015) West London Waste Plan 2015.

Figure 220: Quantity of waste produced in West London (tonnes per annum)

	2011	2016
MSW arisings	796,000	826,000
C&I waste arisings	1,287,000	1,258,000
Total (MSW and C&I waste) arisings	2,085,000	2,084,000

Figure 221: West London Waste Capacity Requirements (tonnes per annum)

	2011	2016
Apportionment	1,399,000	1,595,000
Total existing waste management capacity	1,636,000	1,636,000

Source: WLWP (2015) West London Waste Plan 2015.

Circular Economy

A circular economy differs from traditional 'take-make-use-dispose' approaches and offers a solution to the problem of waste management, particularly for waste generated by construction and demolition, which accounts for more than half of waste production in London. Movement towards a circular economy in London with greater reuse, recycling and re-manufacture can help address negative externalities associated with increased waste and provide opportunity for new economic activity in the capital.[441]

This model is particularly important as a growing population will increase household waste, and in regeneration areas, where projects generate a demand for new materials and demolition of existing buildings creates large volumes of waste. Brent manages around 3.4% of waste managed in London, 195,000 tonnes per annum. [442]

Enviro-Crime & Environmental Protection

Environmental crime is generally used to describe any illegal activity that harms the environment and that has serious human health and social impacts. Some definitions link it to other types of serious crime related with Anti-Social Behaviour (ASB).

In Brent, graffiti, fly-posting, fly-tipping, litter, dog fouling and waste burning are all activities related with enviro-crime. Tackling Environmental ASB in the borough is important due to its negative impact on the environment and because the quality of the local environment contributes to people's satisfaction with the conditions within which they live.

Brent Council works in partnership with the Metropolitan Police, Safer Neighbourhood Teams, charities and the community to deal with ASB. Current measures implemented include: the street cleaning programme, online platform to report street problems through the Council website, Cleaner Brent App, and financial penalties.

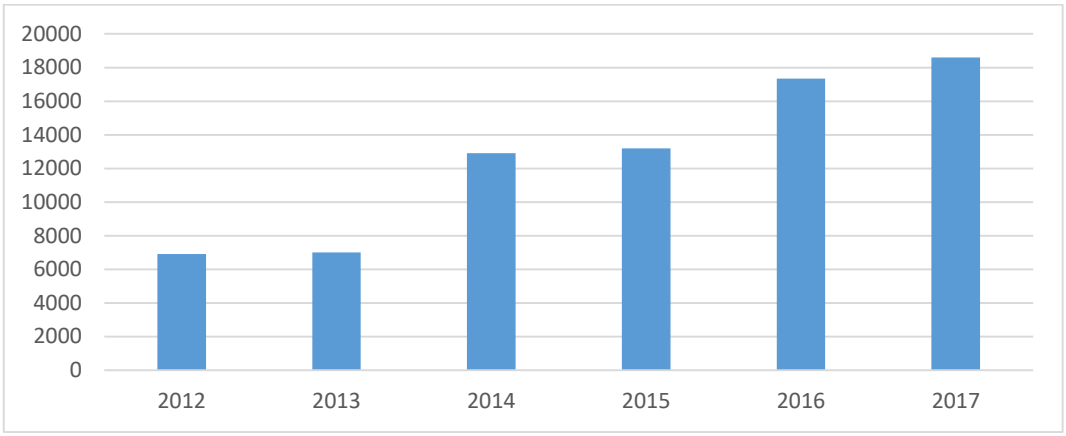
Improper disposal of waste can contaminate land, water and air, and is often linked to organised crime, the convenience of fly-tipping in areas with poor tip access, and lack of public awareness about negative environmental impacts[443] In Brent, the number of reported fly tipping incidents has increased each year, with a rise of 169% from 2012 to 2017 (figure 298).[444]

Brent Council explains that this growth is partly due to the introduction of the Cleaner Brent App in 2015, which encourages members of public to report incidents. Incidents can range from a few black bags placed around a tree, to a large deposit of DIY or building material, and

[441] GLA (2016)Economic Evidence Base for London 2016
[442] GLA (2016) Further Alterations London Plan. Table 5.3.
[443] POST (2017) Environmental crime.
[444] DEFRA (2017) ENV14. Fly tipping incidents and actions taken, reported by Local Authorities in England 2012 to 2017.

offences can carry a £75,000 (individual) and £95,000 (business) maximum fine or 5 years imprisonment. Any vehicles used in such offences can be seized by the Council.[445]

Figure 222: Fly Tipping incidents reported in Brent



Source: DEFRA Waste and recycling statistics (2018) Fly tipping incidents and actions taken, reported by Local Authorities in England 2012 to 2018.

Environmental ASB leads communities to view and consider their neighbourhoods negatively and can be argued to result in social disorganisation.

Brent tackles wider Anti-Social Behaviour (ASB) activity through a specific strategy included in the Safer Brent Partnership 2014-2017, that seeks to protect vulnerable locations, manage prolific offenders of ASB and safeguard vulnerable victims. The aim is to create a new model of community safety, reducing demand, identifying and addressing behaviours that make people feel uncomfortable or unsafe in our shared public spaces.[446]

Total Anti-Social Behaviour Cases opened 16/17 = 275
Total case actions 16/17 = 1943

Overlaying the Council, Police and Ambulance data and licensing reviews, 12 areas have been identified as drinking hotspots. The areas identified are; Neasden, Sudbury, Ealing Road, Kingsbury, Harlesden, Willesden, Wembley, Wembley Park, Cricklewood, Kensal Rise, Kilburn and Queens Park.

Since the ASB Crime and Policing Act was implemented in 2014 to date, the Council has registered 409 enforcement actions, 315 in the last year which includes:[447]

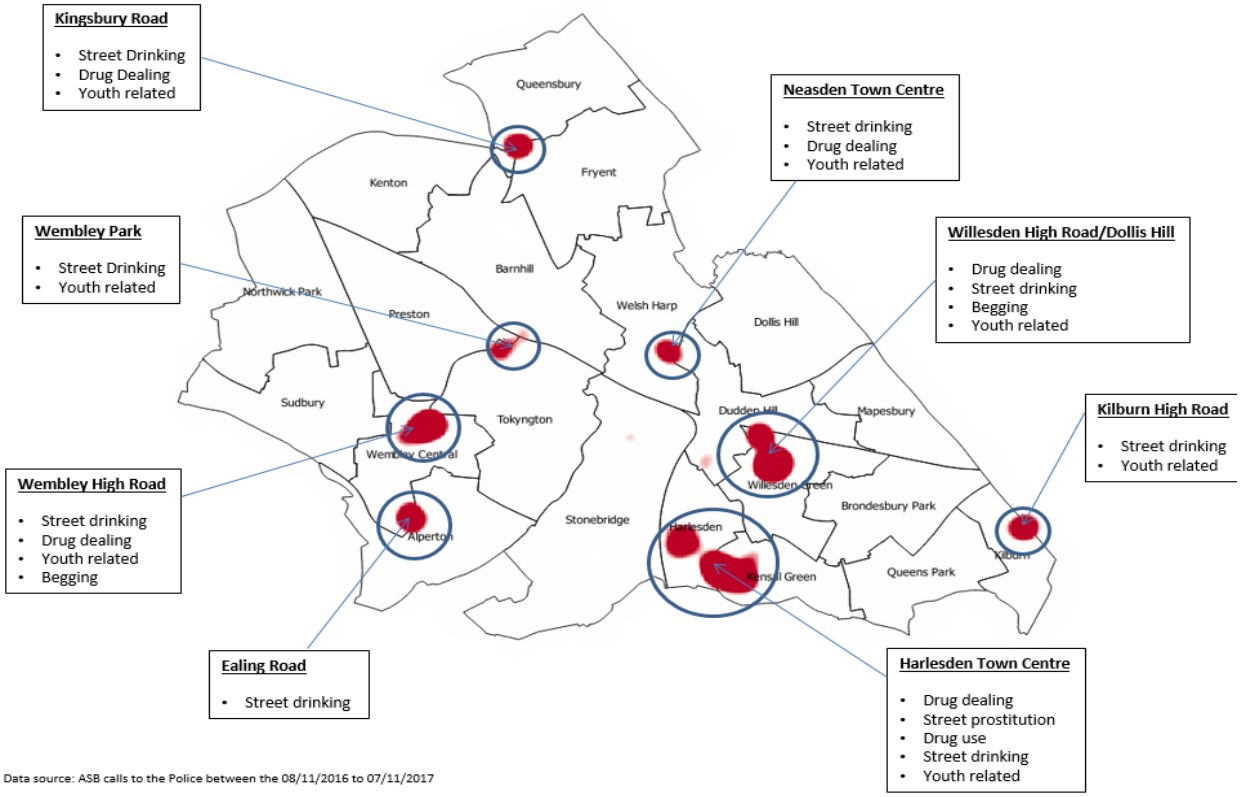
- 5 Criminal Behaviour Order (CBO) issued by the criminal court against people convicted for ASB offences.
- 8 Crack House Closure Orders related with drug use, production or supply.
- 40 Community Protection Notice (CPN) warnings issued by the Council to stop offenders from committing ASB related with kerb crawling, pitching tents on public land, drug related and nuisance behaviour.
- 14 CPN for ASB related with drugs, kerb crawling and operate coach without authorisation.
- 84 Fixed Penalty Notice (FPN) for breach of CPN.
- 141 Public Space Protection Order (PSPO) warnings related with street drinking 70% of them occurred in Ealing Road and Neasden.
- 23 PSPO FPN for street drinking, 78% of them occurred in Neasden.

[445] Brent (2017) Illegal rubbish dumping.
[446] Brent (2017) Safer Brent Partnership. Annual Report 2016-2017.
[447] ASB LB Brent, information updated to November 2017.

- 5 PSPO FPN for casual labour market activities in Honeypot Lane, Queensbury Ward.

In Brent, ASB is more commonly observed in town centre and high street locations. ASB activities are mapped by the Community Safety Analyst who prioritises enforcement and engagement in the 21 wards in Brent, coordinating efforts of the three Local Joint Action Groups (LJAG), the local police and Safer Neighbourhoods Team (SNT) (Figure 223).

Figure 223: ASB Hotspot Areas 2016-2017



Data source: ASB LB Brent, information updated to November 2017.

Brent's strategy to prevent and tackle ASB includes the following additional measures:

- More targeted use of Criminal Behaviour Orders to deal with high level ASB offenders.
- Public Spaces Protection Orders (PSPOs) to tackle street drinking over the borough and nuisance. PSPOs are particularly implemented to deal with labour market problems in areas with higher rates such as Cricklewood, Kingsbury and Queensbury.
- Partnerships with Charities such as St Mungo's, Change Grow and Live to deal with issues related with prostitution, drug and alcohol addiction.
- London police partnership to identify brothels, gangs, Child Sexual Exploitation (CSE) and violence against women and girls in Brent.
- Current use of Community Protection Warnings and Notices used to tackle low level ASB.
- Management groups to ensure better coordination of approach, with multi-agencies and internal departments, across ASB, Waste Enforcement, Private Housing, Noise Nuisance and Regulatory services.

Key Trends

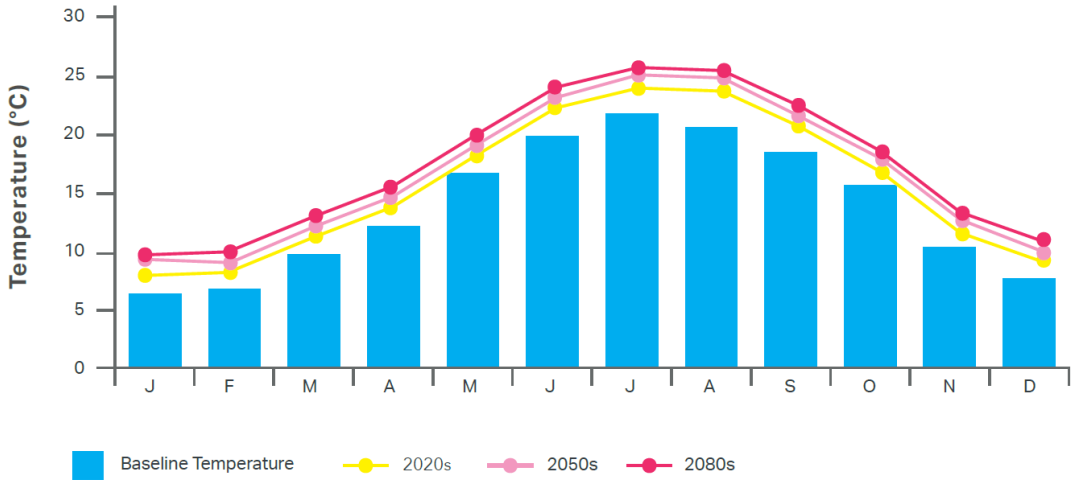
In the context of the growth projections, changes in demographics and income levels, regeneration of the borough, diversity of Brent and changing lifestyles, anticipated trends must be considered for the Inclusive Growth Strategy (IGS) to understand how the environment will be impacted in the future and how the borough may reduce such impacts.

Trend 1: Climate Change, Rising Temperatures & Environmental Impacts

The effects of climate change may leave Brent at risk of extreme weather, increased flooding, and associated health and safety risks for residents. London is already vulnerable to extreme weather, in the form of floods, droughts, heatwaves and very cold weather. Without action, further climate change, London's population growth, changes to the make-up of London's population and land cover, and other factors, will increase the risk of severe impacts.

London and UK has already experienced a temperature increase of approximately 1°C since the late 19th century, and it is likely that global emissions of GHG have contributed to this rise. By 2050 it is projected average monthly temperatures will increase 5-6°C in summer and winter, compared with current levels (Figure 224).[448] Extreme weather, such as heatwaves and very heavy rainfall is expected to become more frequent and intense. Very cold winters will still occur, though they will become less frequent. Sea levels are due to rise for centuries.[449]

Figure 224: Average monthly temperatures (°C) in London over the century



Source: GLA (2018) London Environment Strategy

Urban areas with a concentration of higher and denser buildings could have warmer temperatures due to the increasing amount of heat absorbed. GLA forecast that in urban areas with high-rise buildings and limited access to green space, the urban heat island (UHI) effect can be up 10°C warmer than in other areas in London. Therefore, high temperatures have a bigger impact in built up areas in Brent. High temperatures also affect people at work, particularly those who work outdoors (e.g. construction or parks staff), within confined spaces (e.g. in workshops or garages) or in vehicles (e.g. taxi, delivery, bus, train or tube drivers).

Heavy thunderstorms and intense winter downpours are forecast to become more common. Because most of Brent is built-up, almost all rainfall ends up in drains, which were not designed to cope with sudden, very heavy rainfall. The resulting flash foods could block roads, cause

[448] GLA (2018) London Environment Strategy.
[449] GLA (2011) London Climate Change Adaption Strategy.

damage and lead to prolonged disruption to the local economy. Sea levels will also gradually rise, increasing the risk of major flooding in London.

Brent Council is committed to improve the environmental quality of the borough and wellbeing of its citizens in line with national and local policies such as the Climate Change Strategy, the Carbon Management Strategy and the Energy Statement & Strategy.[450] These strategies look at how the borough can cope and respond to the challenges and opportunities that climate change brings. There are two main responses to the challenges that arise from climate change: to slow it down by cutting emissions of greenhouse gases (mitigation) and to cope with the changing climate by adapting to changes in the weather (adaptation).

London and Brent's greenhouse gas emissions are dominated by buildings and transport. As the population continues to grow, so too will the levels of decarbonisation required to improve air quality and tackle public health inequalities. Addressing climate change requires specific actions to be implemented, such as adoption of tighter $PM_{2.5}$ limits, reduction of the number of vehicle kilometres, a modal shift to walking, cycling and public transport, reduction of black carbon emissions by switching to zero emission vehicles, replacement of inefficient boilers, increase in the energy efficiency of buildings, and increased use of renewable energy.[451].

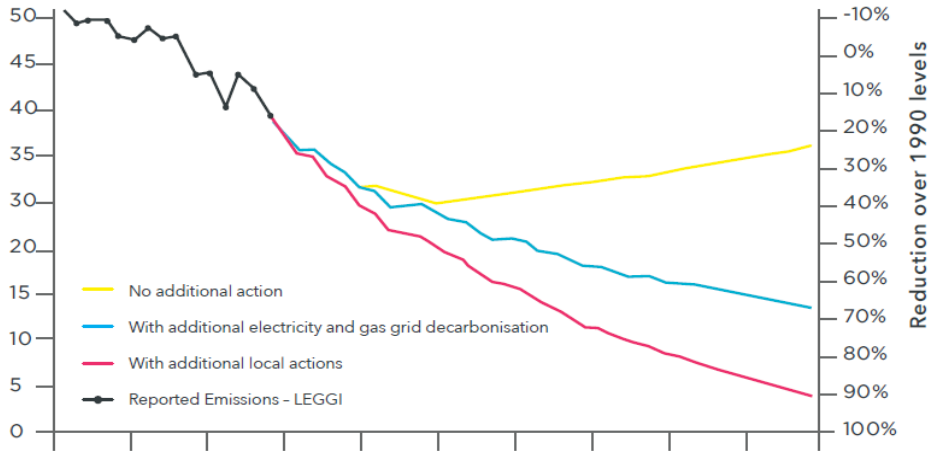
Reducing Carbon Emissions

Reducing GHG emissions to tackle climate change is a national and local priority. Carbon dioxide (CO^2), is the most common GHG emitted by human activity and is now the main contributor to global warming and climate change. The UK is the world's 8th largest emitter of this pollutant, Brent is responsible for 0.3% of national CO^2 emissions and 3% of London CO^2 emissions. The Council is committed to reduce its emissions and contribute to achieving national and local targets.

The UK's long-term target is to reduce at least 80% of GHG emissions by 2050 to maintain global average temperature at around 2°C above pre-industrial levels[452]. The Mayor's carbon emissions target is 60% by 2025, with the aim to achieve zero carbon city by 2050. Policy intervention and action to meet current national and local targets is essential. The Mayor forecasts that implementing existing policies, the UK and London could achieve a 25% GHG reduction on 1990 levels by 2050. An extra 45% GHG reduction is shown to be achievable through decarbonisation of energy grids and other actions at a UK level in line with policies and proposals needed to achieve UK carbon budgets. The final extra 30% GHG reduction would be met through new policy and additional action at city level (Figure 225).[453]

[450] Brent (2017) Report from the Strategic Director of Regeneration and Environment. 11 December 2017.
[451] GLA (2017) London Environment Strategy. Draft for public consultation.
[452] Committee on climate Change (2016) UK climate action following the Paris Agreement.
[453] GLA (2017) London Environment Strategy. Draft for public consultation. Appendix 2. Evidence base.

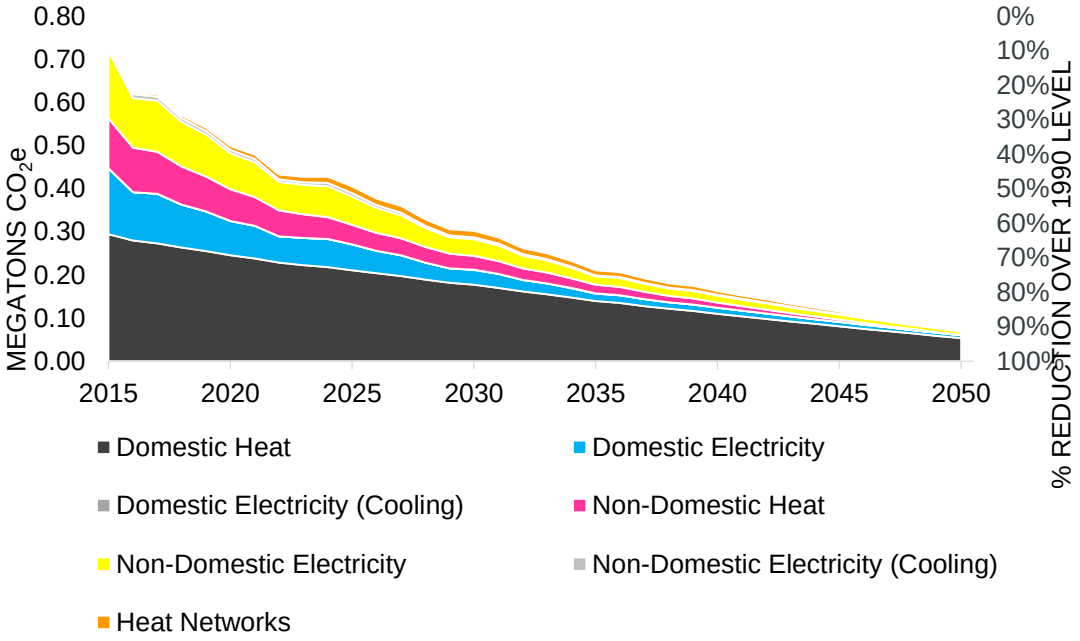
Figure 225: London's GHG emission trajectory to zero carbon



Source: GLA (2017), Modelling including BEIS and Committee on Climate Change datasets

Therefore, based on projected future energy demand, technological change and changes in energy supply mix, the GLA have developed an expected pathway to achieve zero carbon emissions in Brent by 2050 as is shown in figure 226.

Figure 226: Brent Carbon Emissions - Projections



Source: London Datastore (2017) London's Zero Carbon Pathways Tool.

Decarbonisation of homes and workplaces, and the development of clean and smart energy systems using local and renewable energy resources, should be prioritised to reduce carbon emissions. The planned revision of the AQMA in 2020 for Brent will also support requirements to achieve the carbon emissions projections. Brent currently has an Air Quality Action Plan 2017-2022 (AQAP) to reduce pollution from local industry, transport and construction that complements the AQMA monitoring, with four Air Quality Action Areas (AQAA). The AQAP sets specific strategies to reduce traffic volumes and levels of emissions, with focus in areas of air deficiency: Neasden town centre, Church End, Kilburn Regeneration Area and Wembley

& Tokyngton.[454] The strategies include: management of emissions from current and new development, community education, increasing green space, planting new trees, identifying low emission neighbourhoods, encouraging Car Clubs, car free initiatives.

Public transport is the third contributor of NO_X emissions in Brent. To fully achieve London's decarbonisation target, the Mayor plans a zero emission transport network by 2050. This plan includes electrifying all rain lines and new energy-efficient trains with on-train management systems and regenerative braking. New trains are to be piloted on the Elizabeth line, then rolled out on the Piccadilly, Waterloo & City, Bakerloo and Central lines from the mid-2020s.[455]

Further consideration to reduced vehicle emissions, particularly in Outer London, will include the implementation of local zero emission zones in town centres by 2050. For construction emissions, consideration is being given to create a Non-Road Mobile Machinery (NRMM) Low Emission Zone, with minimum emissions standards to control the NRMM used in the construction and infrastructure building sector[456]. In Brent, construction is one of the largest contributors to air pollution and this initiative could have positive impacts on air quality. Offsite manufacturing (OSM) techniques and new building technologies provide further opportunities to cut construction site traffic, emissions and build programmes.

Trend 2. Increased Resource Consumption

Brent's growing population will put increased strain upon available resources, including energy and water in the borough. To avoid a looming energy crisis and decarbonise our energy supply, it is imperative Brent make a change in future use of resources (energy, water and waste): balancing population growth and ensuring a good environmental quality.

Energy Demand

Approximately 94% of energy demand is sourced from outside of the city. As the largest proportion of energy use in Brent and London occurs from the domestic sector; the population increase will put significant strain on the domestic energy supply if measures are not taken to improve energy efficiency. It is important to consider that even by reducing energy demand and generating more renewable energy, due to limited space in the city, it will be difficult to achieve full energy self-sufficiency. To reduce energy supply pressures however, it is crucial to encourage developments whenever possible provide on-site renewable technologies, solar energy installations, energy efficiency measures, drainage technologies to reuse and recycle water, and sustainable waste facilities to recycle and recover waste.

In London, electricity accounts for almost half of the total CO_2 emissions. Therefore, in line with decarbonisation policies and targets, GLA project that renewable energy will increase in the following years, reducing carbon base energy and improving energy efficiency. The graphs below indicate GLA energy demand and supply projections for Brent to achieve the zero carbon target for the City, reducing the proportion of fossil fuels resources 60-70% by 2038, and 80% by 2050, and increasing the proportion of renewable energy used by 500%, to reduce 69% of total domestic carbon emissions by 2038 and 87% by 2050, while non-domestic carbon emissions would reduce 88% by 2038 and 97% by 2050 (Figure 227 & 228).

[454] Brent (2016) Air Quality Action Plan 2017-2022.
[455] GLA (2018) Mayor's Transport Strategy
[456] GLA (2018) London Environment Strategy

Figure 227: Projected Brent Energy Supply

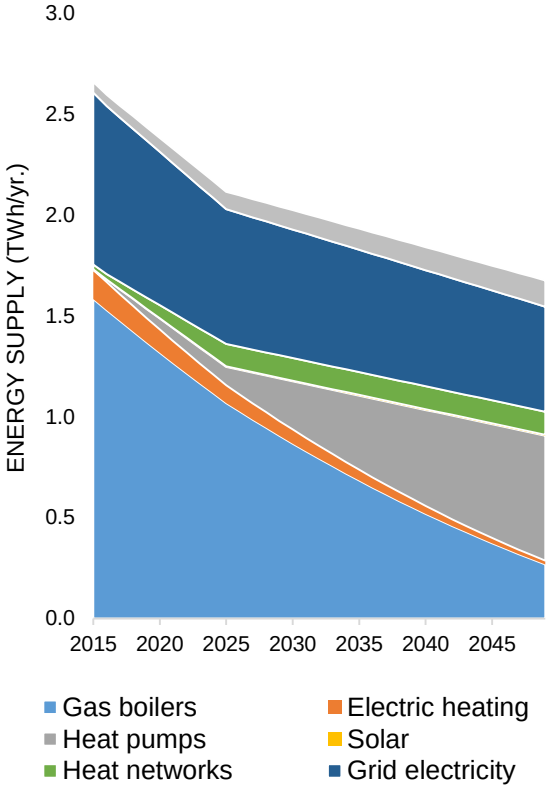
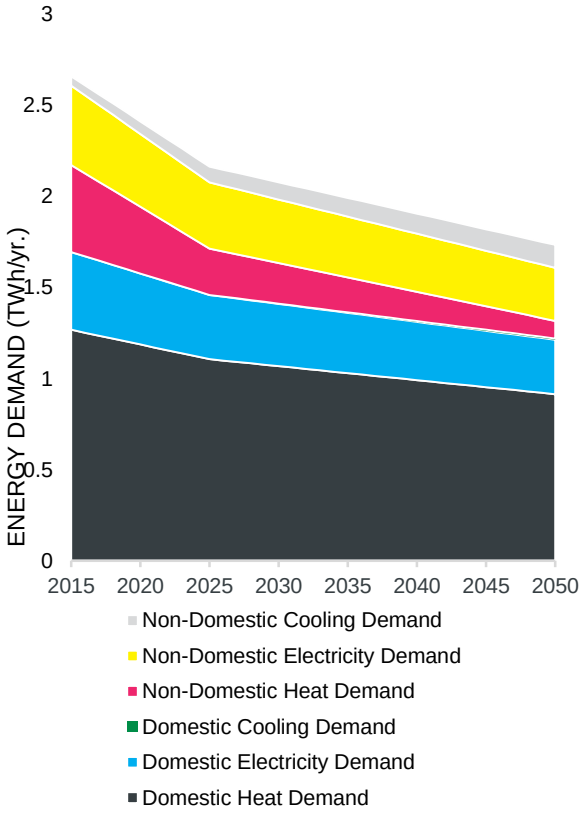


Figure 228: Projected Brent Energy Demand



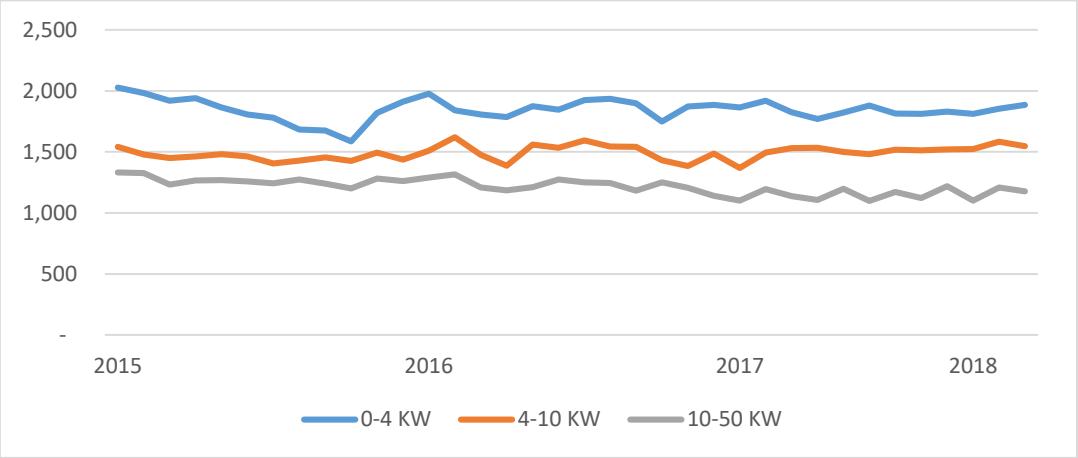
Source: GLA (2016) Zero Carbon Pathways Tool.

Gas use in London represents around half of total energy consumption. Over 70% of energy is used for heating space and water in homes and work places, 90% of which is from gas-fired boilers, which produce NOx emissions. The Mayor's Energy for Londoners programme will support the transition from old inefficient gas boilers to new ultra-low NOx gas boilers though a cashback scheme. This initiative to replace and improve existing less efficient heating systems could directly benefit Brent, however it is also important to analyse how to optimise energy use and efficiency on new developments, and encourage more renewable and sustainable energy heating systems, such as solar energy, to reduce demand for grid electricity, and combine electricity storage technologies, such as batteries, with solar energy generation.

One of the main barriers to investment in solar technology has been the relatively high cost of installation. Globally, Solar PV use is rising and prices have plummeted over the last three decades, with use up 90% as result of an increasing supply.[457] In the UK the cost for domestic solar PV installations has followed the same global trend, although with slightly lower growth recently, due to a decrease in demand and a reduction in UK government financial support for solar, and in particular the 64% reduction in feed in tariffs for solar arrays less than 4 kw announced in 2015 (Figure 229).[458] As a result of this, UK solar capacity grew less during the last two years compared with rates before 2015 (Figure 230).

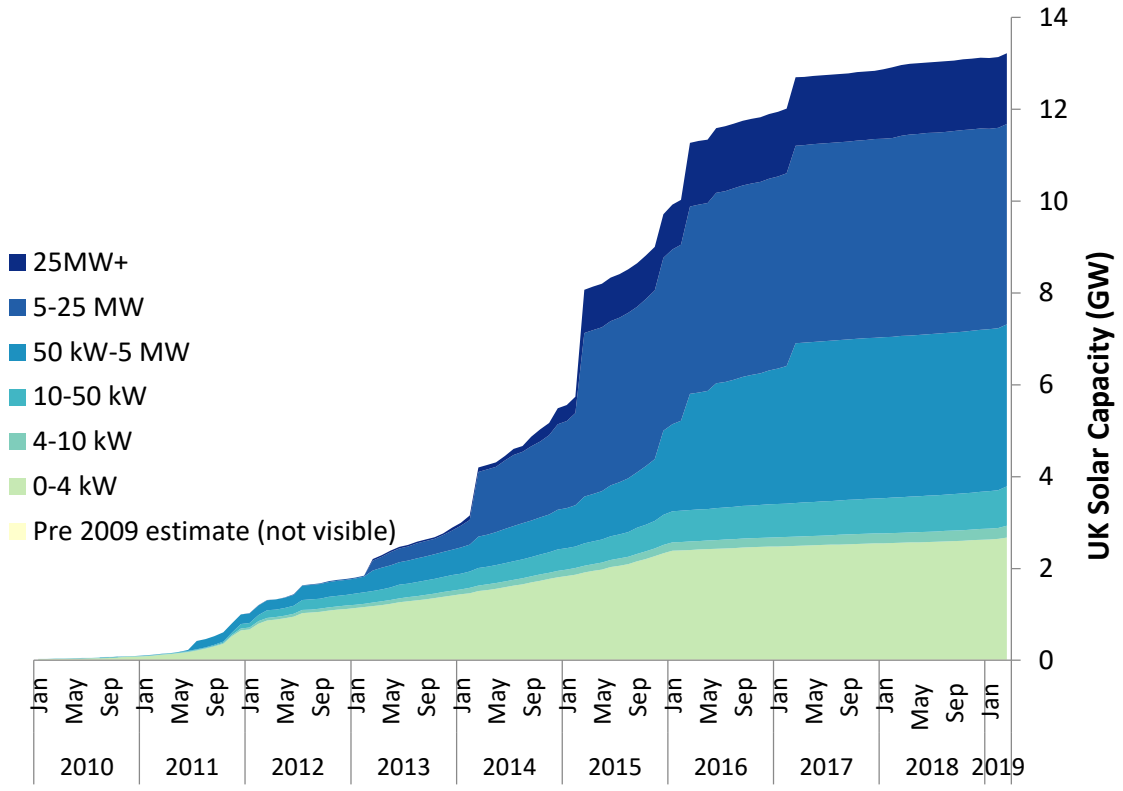
[457] The Economist (2012) Science and technology. Sunny uplands.
[458] BEIS (2017) Solar PV cost data.

Figure 229: Solar PV cost per kW installed by size band £ in UK (mean)



Source: BEIS (2018) Solar photovoltaics deployment

Figure 230: UK Solar Deployment by Capacity



Source: BEIS (2019) Solar PV cost data 2019

In current circumstances, lower investment in solar energy on existing UK domestic properties is expected, particularly where the property owner does not directly benefit, such as landlords of private rented homes. Other barriers to investment and installation of solar in London include denser developments and taller buildings leading to shading and lack of suitable space for solar installations, as well as competing development uses for precious roof space, such as amenity spaces and brown, green and blue roofs.

Existing solar generation capacity in London is one of the lowest at national level. The Mayor aims to double London's solar capacity from 95MW to 195MW by 2030, which is the minimum

requirements for solar energy to achieve the zero carbon city target by 2050. GLA estimates London requires solar energy installation with capacity to generate around 1GW by 2030 and 2GW by 2050. The Mayor is therefore encouraging Local Authorities to ensure that new developments include solar energy through the planning process, as well as promoting installation on existing properties, particularly public buildings and major developments.[459] Brent Council has installed solar PV technology on recently-constructed Council buildings such as John Billam Resource Centre, Willesden Green Library Centre and Roundwood Youth Centre, and some public schools.

Brent Council similarly recognised the importance of increasing energy efficiency, implementing projects such as:

- CMP, carbon management programme to reduce emissions from Council assets.
- REFIT programme funded by the GLA and the EU to help make London's non-domestic public buildings and assets more energy efficient by implementing retrofit projects through free of charge technical support and guarantees of energy service and cost savings.
- SALIX independent, publicly funded, not-for-profit company, providing 100% interest-free capital finance for energy efficiency in the public sector.

Future plans consider investment in solar panel technologies, primarily on Council assets. Moving forward, investment decisions in residential areas and on private buildings must balance the high cost of investment and execution against increasing demand for energy resources, particularly from domestic use. Specific programmes, such as the proposed District Energy Network in South Kilburn, could have direct effects on energy mix and demand rates in particular areas.

Water Demand

Demand for water is increasing as London's population grows, and climate change is likely to reduce the amount of water available when we need it most – in the summer. Overall, the London wide baseline demand forecast for annual water demand (before intervention) is expected to increase by 134 Ml/d in the period of 2019-2040. This represents a significant challenge, particularly in the face of reductions in water supply capability. Thames Water predict a cumulative deficit of 416 Ml/d by 2040 (Figure 231)[460]

Figure 231: Water supply-demand balance for London

WRZ	Item	Volume (Ml/d)					
		2019/20	2024/25	2029/30	2039/40	2074/75	2099/00
London (DYAA)	Demand	2020	2068	2093	2154	2326	2376
	Headroom	122	134	136	137	130	130
	Supply	2155	2096	2071	2022	1962	1920
	Balance	12	-106	-158	-269	-494	-587
	(WRMP14)	-133	-213	-292	-416		

Source: Thames Water Revised Draft Water Resources Management Plan 2019

London must reduce the level of water consumption per person to remain sustainable.
London's water supply is in deficit. Over 2017-18, London's annual water consumption per capita was 120.8 l/d for households in measured (metered) areas, and 159.4 l/d for

[459] GLA (2017) Draft Solar Action Plan.
[460] Thames Water (2016) WRMP19 Resource Options.

households in (unmetered) unmeasured areas, and similar consumption levels are observed in Brent.[461] Household water consumption per capita is therefore higher than the Thames Water 125 l/d standard[462] or the London Plan[463]

Growth in demand from an increasing population, and falling available supply due to climate change, changes in bulk supply and increased third party abstraction from the River Thames, meaning the gap is predicted to widen if no action is taken, with insufficient water to meet London's needs.

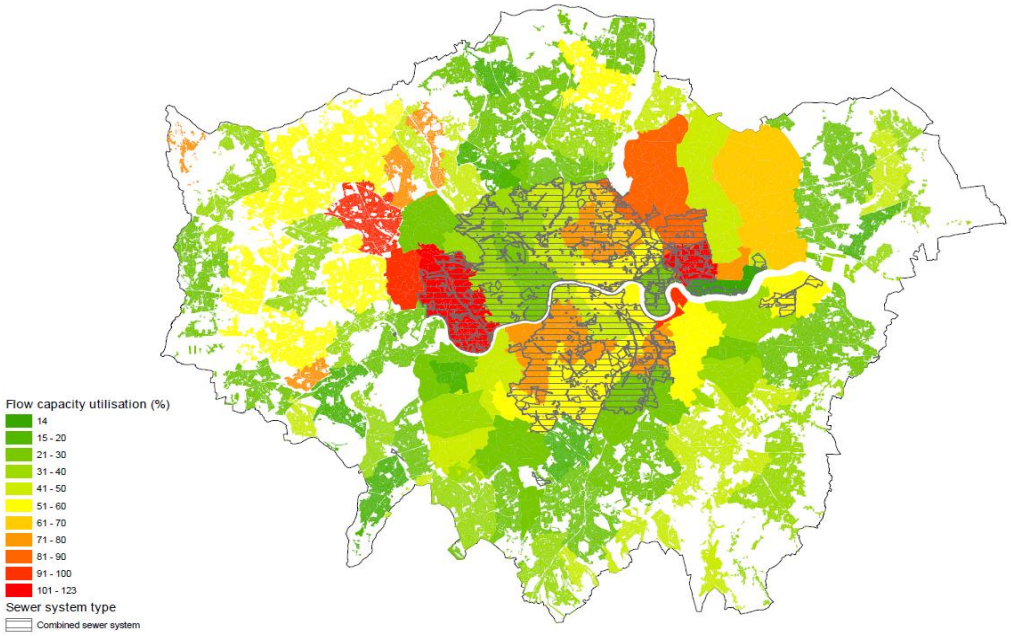
New strategic water resources are therefore required. Water demand and the need for new water infrastructure is exacerbated by climate change predictions of more sporadic and intense rainfall and a higher likelihood of droughts, as well as the need to protect the water environment by implementing the Thames River Basin Management Plan requirements. Thames Water, which provides over three-quarters of Londoners with water, projects a significant and growing capacity deficit moving forward.

To ensure London's future water security, the prudent use of water will be essential: all new development will need to be water efficient. Residential development should be designed so that mains water consumption would meet a target of 105 l/d per capita, excluding an allowance of 5 l/d per capita for external water use.[464]

Drainage and sewerage network

London's tributary rivers suffer poor maintenance, pollution from road run-off and water treatment and sewer infrastructure problems. Parts of the drainage and sewerage network in London have limited capacity, which is predicted could lead to increased risk of surface water and sewer flooding if no actions are taken. The map below highlights in red the areas where GLA predict sewage capacity will exceed requirements, including in Brent (Figure 232).

Figure 232: Capacity of the drainage Network-Thames Water



Source: GLA (2018) London Environment Strategy

[461] Thames Water (2017 & 2018) Environment Agency Annual Review 2016-17 and 2017-18
[462] CLG / DEFRA (2007) Water Efficiency in New Buildings
[463] Mayor of London (2016) London Plan : Chapter Five : London's Response to Climate Change
[464] GLA (2016) London Plan, Chapter 5: London's Response to Climate change.

Waste

The London Plan highlights the importance of managing and reducing waste, and supporting the circular economy. The New London Plan therefore sets recycling targets for construction, excavation and demolition waste at 95% by 2020, and municipal waste at 65% by 2030.[465]

The London Plan projects how much municipal waste and commercial and industrial waste is likely to be generated in the capital over 2021 to 2041. Each borough is allocated an amount of London's waste that it is required to positively plan for and manage. This includes ensuring that sufficient capacity is identified to meet the apportioned targets in the London Plan. By each borough meeting its apportionment, London can dramatically reduce its reliance on landfill and move towards being net self-sufficient overall. Waste arising for Brent and partner boroughs in the West London Waste Plan are indicate in Figure 233. The percentage share of London's total waste to be managed by Brent and the West London partnership is indicated as apportionment in Figure 234.

Figure 233: West London forecast arising of total waste (000's tonnes)

	2021	2041
Brent	260	274
Ealing	291	306
Harrow	188	205
Hillingdon	347	367
Hounslow	260	276
Richmond	180	191
London	8216	8726

Figure 234: West London Borough-level total apportionments (000's tonnes)

	% London waste to manage	2021	2041
Brent	5.0	412	438
Ealing	6.6	543	576
Harrow	1.9	151	170
Hillingdon	5.1	423	450
Hounslow	5.0	407	432
Richmond	1.8	148	157
London	100.0	8,216	8,726

Source: GLA (2017) The London Plan: The Spatial Development Strategy for Greater London. Draft for public consultation.

For the West London Boroughs to meet the New London Plan apportionment targets for household and commercial & industrial waste, the West London Waste Plan indicates additional capacity of 448,000 tonnes will be required by 2021, and 587,000 tonnes by 2041 (Figure 235). The land required to provide this additional capacity was calculated based on previous figures from West London Waste Plan.[466]

Figure 235: West London capacity requirements for target years based on the New London Plan

	2011	2016	2021	2041
Apportionment (000's tonnes)	1399	1595	2084	2223
Total existing waste management capacity (000's tonnes)	1636	1636	1636	1636
Additional capacity required to meet the apportionment (000's tonnes)			448	587
Land Required to address the capacity gap (Has)			6.9	9.1

Source: GLA (2017) The London Plan: The Spatial Development Strategy for Greater London. Draft for public consultation &, WLWP (2015) West London Waste Plan.

[465] GLA (2017) The London Plan: The Spatial Development Strategy for Greater London. Draft for public consultation.
[466] WLWP (2015) The West London Waste Plan 2015.

Trend 3: Low Carbon Circular Economy Model

The circular economy model has shown positive impacts to London, including Brent, although there is more to improve, particularly reducing environmental impacts. The circular model builds economic, natural and social capital. Innovation to the current circular model includes increasing emphasis on reducing carbon emissions through the use and reuse of resources before they become waste; including the manufacture of goods to higher quality standards.

As a result of the Paris Agreement on Climate Change and the 2030 Agenda for Sustainable Development, the UK together with over 150 countries has agreed to decarbonise their economies and make them more climate-resilient, opening increasing export opportunities for the goods and services needed in a low-carbon economy. In London this sector is expected to grow over 6% a year by 2020.[467] In the EU, it is estimated this model could reduce CO_2 emissions by 8.2% and save 219 billion cubic metres of water by 2020.[468] Worldwide global exports for low carbon good and services could be worth £1-1.8 trillion a year by 2030, equivalent to 7 to 12 times more than today.[469]

The potential of the circular economy model is to extend from the clean technology sector to other sectors including transport, industry, consumer products and services. Such growth could bring environmental and economic benefits in Brent, which has been observed to have a relatively strong existing circular economy compared to other London boroughs. Old Oak and Park Royal is identified as having potential to develop SMART and sustainable districts.

The New London Plan indicates that low carbon circular economy principles should be taken into account on new developments at every stage, starting with the design process, ensuring waste reduction, using materials that can be re-used and recycle, and building in layers to facilitate maintenance and repairs.[470]

Trend 4: Increased Demand for Sustainable Transport and Car Use

Road transport is one of the main sources of air pollution, and it is therefore important to reduce road transport and promote a mode shift to walking, cycling & public transport. London's Councils are responsible for 95% of roads, therefore they have a major role to play in finding innovative actions to tackle this issue. Brent expects high levels of growth over the next 20 years, with the population due to increase by 66,000 people, and 21,500 new homes built. Growth makes it imperative trips to and from development areas are carried out by sustainable transport modes to limit impacts on the transport network and the environment. Growth areas should continue to be selected so that new development is co-located with more highly accessible public transport, and to minimise the need for residents to own a private vehicle. Adequate transport investment is required to ensure development takes place on a sustainable basis, is accessible for all users, and does not place undue pressure on transport networks. Improved connectivity and junction improvements, as well as developing more bespoke strategies and frameworks, is required to support these growth areas.

The London Environment Strategy 2018 aims to transform London's air quality to become the best of any major World City by 2050, controlling current emission sources, mainly related with road transport. This strategy sets out specific initiatives that will have direct effects on Brent's air quality, such as transforming London's bus fleet to zero emission by 2040. The current bus fleet transformation plan only covers 17% of Brent's Bus Routes to 2020. All taxis are planned

[467] GLA (2018) London Environment Strategy.
[468] EU (2017) Policy levers for a low-carbon circular Economy.
[469] Carvalho and Fankhauser (2017) UK export opportunities in the low-carbon economy.
[470] GLA (2017) The London Plan: The Spatial Development Strategy for Greater London. Draft for public consultation & LWARB (2017) London Circular Economy Route map.

to reach zero emissions by 2033, and all vehicles to reach zero emissions by 2050.[471] In addition, it is proposed to expand the Ultra-Low Emission Zone (ULEZ) London-wide for buses, coaches and lorries by 2020, and to the North Circular Road for cars, minibuses and motorbikes by 2021.[472] The North Circular is the busiest, most congested and polluted road in Brent, with NO_2 values exceeding allowable limits. However, the North Circular Road only represents 1% of London road network, and in order to secure air quality improvements in the shortest possible time, the Mayor encourages targeted local measures such as local road closures and vehicle restrictions, particularly on fossil-fuelled vehicles; as well as work with London Councils on possible changes to the London Control Scheme.

The London Infrastructure Plan 2050 sets out plans to provide a projected 70% increase in rail and tube capacity serving London's economic heart, serve 1.5 million new homes, improve the capital's international connectivity and dramatically improve transport's contribution to Londoners' quality of life.[473] As a borough, Brent has little control over TfL new strategic infrastructure investment and expansion to address the transport and accessibility needs across London and within the borough. Brent does however have an important role to play in reviewing the evidence, identifying priorities and lobbying GLA and TfL, and in delivering Local Implementation Plan (LIP) projects. Brent can also focus on increasing capacity at existing stations within the borough, enabling and improving the number of trains that can run in Brent.

Given current car use rates, if accessibility is not improved in areas with lower PTALs, it is projected licensed car registered in Brent could increase by up to 21% by 2038, generating additional demand for parking in the borough, and negative environmental impacts from increased traffic, congestion and pollution. To curb car use, sustainable modes of transportation should be encouraged, especially active modes of transportation. The expected levels of growth over the next 20 to 30 years will place more pressure on the road network, so if it is to be accommodated without affecting the quality of life of Brent residents, more journeys must take place by sustainable modes. These include walking, cycling and public transport.

Brent's population projections also indicate an increasingly ageing population. Transport accessibility should be considered in light of accessibility parameters, including step free access that caters to a population whose current preferred mode of transport is the car.

Car Clubs

Car Clubs have a significant potential for growth in Outer London where there is high private car ownership. Such schemes could help to meet city mobility needs, reducing reliance on private and commercial cars, reducing parking pressures and addressing environmental problems through more efficient use of cleaner vehicles. There is evidence that Car Club members drive significantly fewer miles than other drivers, and are early adopters to changing patterns of mobility using public transport, walking and cycling.

The Council's Long Term Transport Strategy includes a commitment to draw up a Car Club Management Plan that will aim both to provide encouragement for Car Clubs in Brent, and provide a framework by which space on the highway can be equitably allocated between competing Car Club operators and private vehicle owners.

In 2018 Brent Council resolved to implement a flexible car club. Car Clubs are able to provide a number of benefits, in London, a single Car Club replaces at least 10 cars. In 2016, for each round-trip using Car Clubs, 10.5 cars were removed from the road as a result

[471] GLA (2017) London Environment Strategy. Draft for public consultation.
[472] TfL (2017) Press release. GLA Mayor plans to introduce ULEZ in April 2019.
[473] GLA (2014) London Infrastructure Plan 2050.

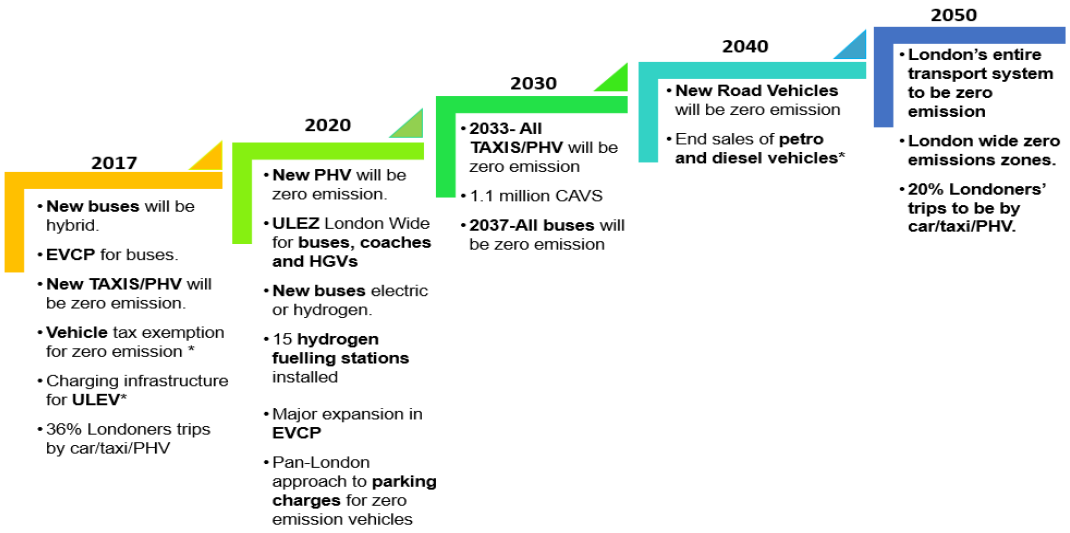
of a Car Club members selling their cars, equating to almost 26,400 fewer vehicles in the city.[474] A study found that the average age of vehicles disposed of by its members was 14.4 years. The removal of older vehicles will assist in improving the air quality of our streets and making them more pleasant environments. In addition, trends also indicate a widening of the flexible car club member profile to include a larger proportion of older members and those with families[475].

The Council facilitates the provision and enforcement of on-street Car Club bays in the borough, and will seek to increase their number where there is a clear demand. The Long Term Transport Strategy includes a target to increase the number of Car Club vehicles available to Brent residents by 20% by 2035.[476]

Electric Vehicle and Charging Stations

Electric Vehicles and adequate supporting charging stations infrastructure will play a key role to achieve national and local environmental targets, particularly zero emission road transport planned to be completed by 2050 as is shown in Figure 236 below.

Figure 236: Mayor's Zero Emission Transport Plan



Note: (*) Measures included in the National Policy for zero emissions. Source: GLA (2018) Mayor´s Transport Strategy

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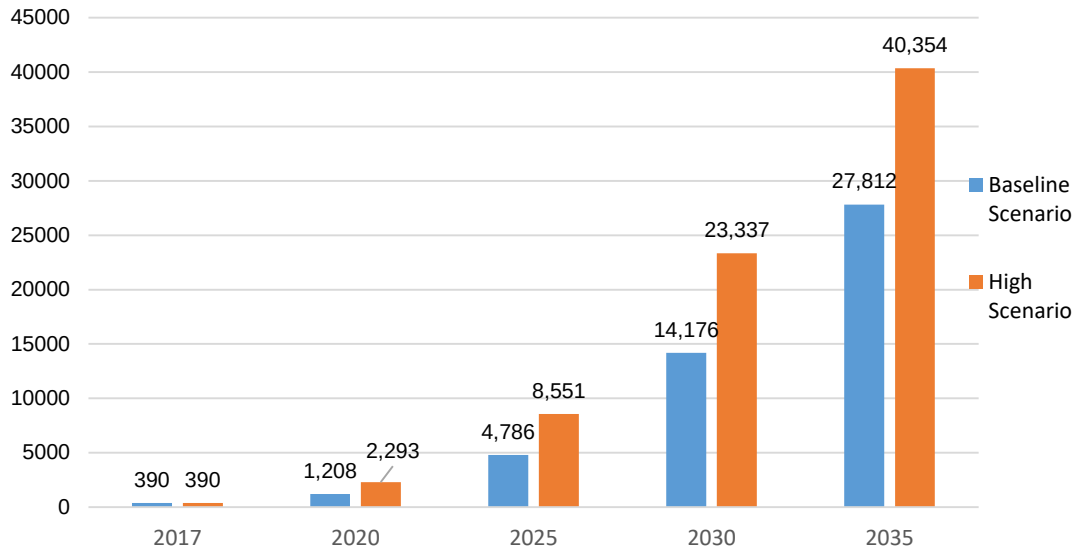
In London and Brent the number of ULEVs has increased despite the limited EVCP infrastructure available. Based on employment level, historic hybrid sales and income in Brent, GLA estimates that by 2020 there could be between 1,208 and 2,293 ULEVs, which would represent roughly 1-2% of the number of vehicles on Brent's roads, if numbers continue increasing at today's rates. By 2025 there could be between 4,786 and 8,551 ULEVs, which would represent roughly 3.8%-6.8%, of the number of vehicles on Brent's roads today[477]. Despite current and forecasted growth in ULEVs in Brent, these numbers are still too low to meet the target that all road transport is ULEV by 2050, as shown in Figures 237 and 238.[478]

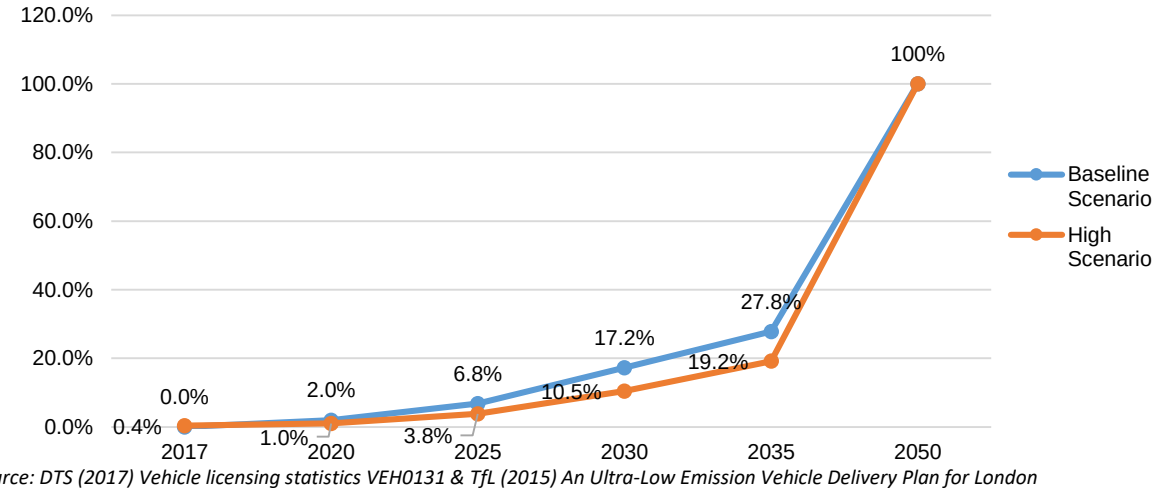
[474] TfL (2017) Car Clubs
[475] Brent (2018) Cabinet Paper Flexible Car Clubs
[476] Brent (2015) Parking Strategy 2015
[477] TfL (2015) An Ultra-Low Emission Vehicle Delivery Plan for London: cleaner vehicles for a cleaner city.
[478] Forecasts not consider a transport mode shift, only took into account economic variables that impact the consumption patterns and historical growth rates

Figure 237: Forecast ULEVs in Brent 2017-2035



Source: DfT (2017) Vehicle licensing statistics VEH0131 & TfL (2015) An Ultra-Low Emission Vehicle Delivery Plan for London

Figure 238: % Cars, Motorcycles and Vans ULEVs in Brent forecast for 2017-2035 and target by 2050



Source: DTS (2017) Vehicle licensing statistics VEH0131 & TfL (2015) An Ultra-Low Emission Vehicle Delivery Plan for London

Higher local incomes and availability of charging infrastructure for electric cars would significantly increase the number of EVs. Additional measures implemented in European cities to support increased take up of environmental friendly vehicles include: differentiated charging roads schemes for diesel cars and EVs, free parking for vehicles with zero emission, permission for EVs to use restricted road spaces such as those for buses, different tax incentives that reduce the initial financial outlay required to buy a new electric car.

Car Clubs provide an important benefit in improving air quality, and electric Car Clubs have the potential for even greater benefits. The Car Club fleet on average emits 29% less CO_2 than the average vehicle, and 99% of Car Club cars are compliant with the ULEZ in London[479]. If EVs are used in the fleet there is both the potential to drive down emissions further and

[479] Steer Davies Gleave (2017) Carplus annual survey of car clubs 2016/17.

increase familiarity with the use of cleaner vehicles to a wider audience. Currently however only 5% of the Car Club fleet available in Brent uses this technology[480].

BlueCity is an electric Car Club and part of French company Bollore's planned to put 3,000 units on London's streets by 2018. BlueCity started operations in Hammersmith and Fulham and currently operates in 18 London boroughs, but not in Brent. BlueCity hopes to deliver its service in all 32 boroughs, however, argues expansion has been delayed over agreements with Local Authorities to provide supporting infrastructure such as EV parking bays.[481]

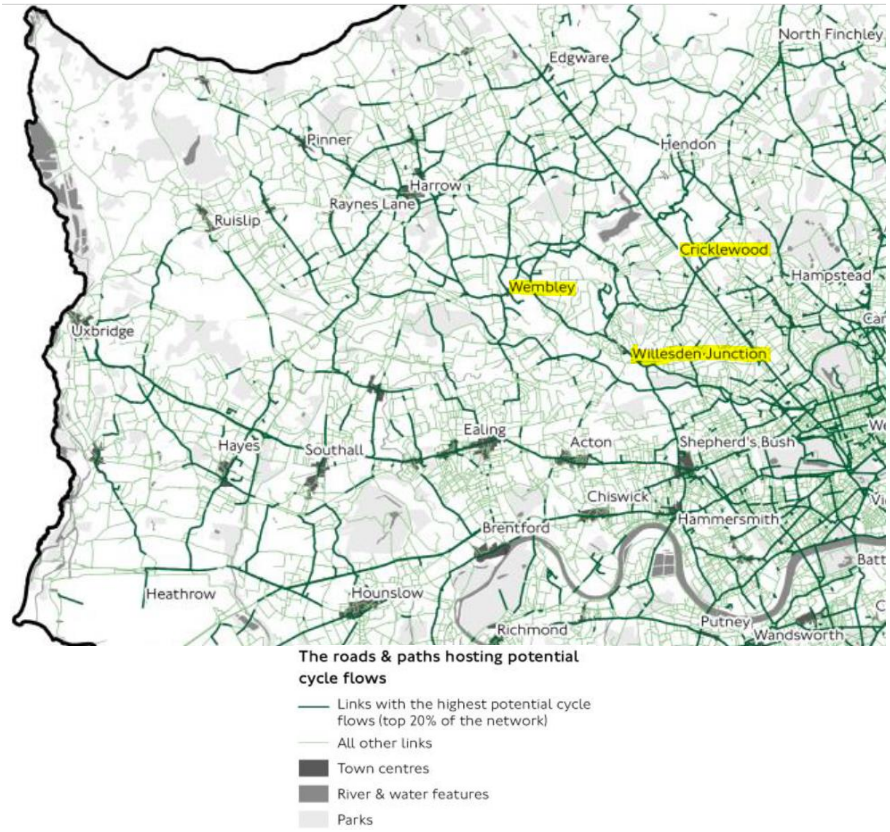
Cycling

Cycling has been prioritised within the Mayor's Transport Strategy as a zero emission and congestion-reducing transport mode that has benefits for both society and the individual. Cycling on London's main roads has risen by 173% since 2001. GLA plans to double cycling over the next 10 years, with significant investment is required to support this growth, Analysis shows that more than half of the potentially cyclable trips in the Capital are in Outer London. These total around 2.4 million a day, most of which are made by car.

The Mayor of London aims to achieve a 400% increase in levels of cycling by 2026 (from a base year of 2000), resulting in an average 5% mode share for cycling across London. To help achieve this, a focus has been placed on the Outer London Boroughs, including Brent.[482] Further, in 2016 TfL implemented the Mayor's Healthy Streets strategy to reduce car use, and increase walking, cycling and use of public transport, including identifying potential routes where cycle flow could be increased such as the North Circular Road (Figure 239).

[480] TfL (2017) Car Clubs
[481] Blue city (2017) News.
[482] Brent (2016) Cycle Strategy 2016-2021

Figure 239: Roads and paths hosting the highest potential cycle demand



TfL (2017) Strategic Cycling Analysis: identifying future cycling demand in London.

Walking

Trips undertaken by walking instead of private vehicles reduce the number of car journeys and therefore lower CO_2 emissions. Walking combined with use of public transport also assists the reduction of both air and noise pollution and delivers a wide range of personal health benefits. These modes work together to improve air quality and help to lower the causes of climate change. Walking in town centres also supports local businesses and jobs.

The careful design of Brent's streets within a wider public realm is essential to creating vibrant, safe and accessible places that encourage walking. To enhance the experience of walking in Brent, the Walking Strategy will work alongside the Brent Placemaking Guide and best practice industry standards of good urban design.[483]

Trend 5: Increased Demand for Green Areas and Environmental Recreation

Given the population projections over the next 20+ years, pressure on resources and the natural environment will continue to grow. Accessibility to green spaces is sometimes limited, increasing inequalities of opportunities for leisure and health outcomes. To maintain and improve quality of life for Londoners, as well as safeguarding economic growth, interventions to protect the natural environment will therefore need to be undertaken. Investment in public parks represents exceptional value for money. Additional to the environmental benefits, for each £1 spent by Local Authorities and partners, citizens could enjoy at least £27 in value. In

[483] Brent (2017) Walking Strategy 2017-2022.

London, recreational activities have an estimated value of £926 million per year, and also contribute to temperature regulation and carbon storage.[484]

To ensure access to green space, green and blue infrastructure in Brent must be protected from urban development, and the quality of space must be improved. Improved quality of green space may additionally have spill-over effects on other areas of environmental significance, such as air pollution. The economic and health benefits of quality green and blue infrastructure are wide ranging. A study undertaken by Natural England estimated that the savings to the NHS through having increased access to green space for every household in England equated to £2.1 billion per annum. Access to green space has considerable distributional effects for households and land owners, with previous analysis from GLA Economics modelling that house prices within 600 metres of a regional or metropolitan park were between 1.9% and 2.9% higher.[485]

Green infrastructure is essential to provide economic, social and environmental benefits, although restriction in open space suitable for green areas is the main barrier. The London Plan encourages planned, designed and managed green and open spaces for new and current developments. Brent Council commits to this aim by implementing open space and tree management policy. However, the Mayor's long term target to make more than 50% of London Green[486] challenges current thinking and strategies in Brent, considering the limited land available and development pressures for new housing. The Mayor encourages new provision or improved access in areas with limited or deficient access to public open space.

The Mayor's target is for tree cover to be increased by 10% by 2050. London's existing trees and woodlands are valued at £133 million per year, due to their environmental benefits, such as trapping air pollutants, storing carbon, provide shading, absorbing rainwater and filtering noise. The cost of replacement is calculated at £6.2 billion, and Brent Planning consider adequate compensation and replacement of loss of trees according CAVAT or i-Tree Eco mechanisms as indicated by the London Plan.

Trend 6: SMART Sustainable Cities

Issues surrounding rising population growth and climate change can be managed through information and communication technologies (ICTs), addressing urbanisation challenges and ensuring sustainability. ICTs could assist by improving energy and water efficiency, minimising resource consumption and operating and managing urban infrastructure.

The SMART city model has been conceptualised as an overarching solution to bring sustainability to cities by making them "smarter", using digital and technological infrastructure, and where access and adequate management of big data play a key role to understand population needs. Although, there is not a universal definition "SMART sustainable city" could be defined as *an innovative city that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.*[487] This concept highlights the importance of using ICTs to improve operational efficiency, generating new economic value to the city and Local Authorities, as well as social and environmental wellbeing.

Brent Council has a Digital Strategy that includes some plans within a "SMART sustainable model" by looking to capitalise on the Internet of Things (IoT) using sensors and monitors to

[484] GLA (2017) Natural capital accounts for public green space in London.
[485] GLA (2016) Economic Evidence Base for London 2016, Chapter 7: The economics of London's environment.
[486] GLA (2017) The London Plan: The Spatial Development Strategy for Greater London. Draft for public consultation.
[487] UNECE (2015) United 4 Smart Sustainable Cities

promote self-care and help vulnerable residents live more confidently and independently in their own homes for longer. In addition, by introducing drones into housing services we will perform quicker and cheaper inspections of high rise aerials, cables and roof gutters, eliminating the need for scaffolding and improving response times for issues reported by residents[488].

The future of SMART sustainable cities is linked with data management; what data is obtained and how it is used to improve resource and asset management. Information obtained from current technologies implemented in Brent include SMART meter and grid technologies to manage demand and supply of water and energy, the "cleaner app" to inform about fly-tipping in the borough, which should be upgraded and complemented with additional innovative ICTs moving forward.

Examples of ICTs used in SMART sustainable models that have direct benefits to the environment include: 3D visualisations of infrastructure, reducing unnecessary road works, CCTV to detect traffic incidents and queuing alerts, open data to inform road traffic to users that could choose alternatives routes including different modes of transport[489], drones to report situation surveillance to data systems or remotely-placed human operators.[490]

Trend 7: Reduced Enviro-Crime and ASB: Working with Communities

Local authority budgets for street cleaning are often restricted, and therefore it is important to involve contractors, business, volunteers and individuals who work with local communities to manage street cleaning. Working in partnership with local residents improves community cohesion and increases the quality of the environment. Research suggests that such efforts should be reinforced in areas with higher deprivation and lack of access to green spaces, which often have a poor quality local environment and higher ASB rates.[491]

Some best practice initiatives implemented in England that could be analysed on introduced into Brent include:

- Developing an increased sense of community ownership. e.g. LB Islington cleaned 1,000 m^2 of graffiti in two days by inviting local young people to paint an agreed mural; LB Lambeth implemented a community-driven initiative named "Community Freshview" where residents propose ideas to improve the quality of the environment and the Council helps them to implement them with the support and direction of two Council officers who provide advice and all the necessary tools and materials required.[492]
- Training programmes that involved community with experts. e.g. the "citizens juries" programme realised in the south of England that increased the rate of waste recycling
- Map common enviro-crime problems to tackle more effectively hot spots such as the one realised for ASB in Brent. e.g. LB Hackney mapped 'grot spots' that impact on street cleanliness perception, such as cigarette litter and commercial waste from office buildings and bars; the City for London reduced urination and vomit by officers mapping out the locations where this occurs and installing porta-loos in affected areas.
- Campaign to create awareness about waste crime and its negative implications to health and environment. e.g. LB Barking and Dagenham initiative to change resident behaviour with education, publicity and community volunteering to clean-up streets.

[488] Brent Digital Strategy 2017-2020
[489] GLA (2016) The Future of Smart: Harnessing digital innovation to make London the best city in the world. Update report of the Smart London Plan.
[490] Jensen O B (2016) Drone city-power, design and aerial mobility and aerial mobility in the age of smart "cities"
[491] Keep Britain Tidy (2015) How clean is England. The Local Environmental Quality Survey of England 2014/15.
[492] London Councils (2011) Enviro-crime busters: Best practice on LEQ enforcement in London.

In the UK, fly-tipping or illegal waste activities costs over £60 million in clean-up costs and enforcement actions, with 70% of Local Authorities describing these activities as a growing problem. Although the budget for cleaning is restricted, investment into tackling waste crime could have a direct return to the public sector finances. A recent report by the Environmental Services Association suggested that for every £1 invested on tackling waste crime there could be a £4.40 return. [493] Effective and targeted resource allocation is key.

Community-led initiatives should also be encouraged to tackle ASB. In Brent, current thinking is to implement "the community watch model", a programme that promotes the recruitment of community members to self-police their own neighbourhoods, with potential positive effects including developing a sense of community and increasing levels of social awareness and involvement in local issues.

[493] POST (2017) Environmental crime.

Responses

Previous sections have examined the current baseline and future trends for the Environment in Brent. Much information is framed within the context of climate change as presenting difficult challenges to be addressed in order to supply resources and deliver environmental services to the residents of Brent. Many of these challenges can however be reframed as opportunities through the provision of innovative green infrastructure into the future. By addressing the environmental challenges in Brent, the borough can simultaneously seize opportunities to secure health, connectivity and economic benefits for its residents, protecting and enhancing the environment and making Brent a better place to live for all.

Brent must focus on creating urban developments that are planned, designed and managed so as to deliver a range of benefits, including: healthy living, mitigating flood risk, improving air and water quality, cooling the urban environment, encouraging walking and cycling, reducing resource consumption, and enhancing biodiversity and ecological resilience.

Sustainable Transport

Accessible and frequent public transport and high quality facilities for walking and cycling influence the way people travel. Encouraging their use would reduce environmental impacts and parking and traffic management pressures generated by the use of private motorised vehicles. Adapting sustainable transport capacity to meet the needs of a growing population will be a significant challenge for Brent. London's transport network is controlled and financed by TfL, however the Council can seek to plan and manage the location of new developments and growth in areas well-connected to public transport. The Council can also analyse transport needs in more densely populated areas, identify strategic and local priorities, and lobby GLA and TfL for targeted investment, including under the Local Implementation Plan (LIP). Brent must also create strategies to facilitate modal shifts in order to adapt to increase capacity and encourage sustainable transport use, rather than continued use of motorised vehicles.

Trips by tube originating in Brent are currently an average distance of 11.75 km, and commuting out of the borough far outweighs commuting trips in. Distances of 11.75 km are not likely to be entirely shifted to walking or cycling, but it is possible to encourage inter-modality, so that more parts of trips are taken via bicycle or walking in connecting with a transit station. Road safety is one of the main barriers to increase the number of people cycling and potential users indicate that training could reduce this barrier, therefore increased training campaigns in combination with the specialist cyclist from the community that use current paths, could increase the number of cyclist in roads. Promotion of current cycle paths and improved cycle facilities and infrastructure, would also help facilitate this modal shift.

Retention of local employment and jobs within the borough also importantly limits the amount of out-commuting and strain on the transport system, while supporting local commuting distances that are short enough to be appropriate for walking and cycling. To accommodate the inevitable rise in tube and train journeys occurring in Brent, the borough should work to improve the capacity at existing stations and continue to lobby GLA and TfL with respect to expansion of local transport infrastructure.

Demographic shifts toward an ageing population must also be considered when designing a sustainable transport strategy. Older populations in Brent are currently more likely to choose the car as their primary choice of transport and future technological improvements such as driverless cars could enable older people to continue driving. Issues relating to mobility impairment, such as lack of step free access at tube stations, must be addressed in order to meet the transport needs of an ageing population. In order for an ageing population to able to adequate access everyday needs, improving the walkability of existing urban developments

and properly planning for the walkability of new developments, including easily accessible goods and services, must be a focus for the borough. The Council should encourage walking and cycling whenever possible, to provide health benefits and reduce social isolation, and to that effect age friendly infrastructure with an integrated approach to the planning and design of road networks, cycle lanes, safe crossing and level pavements is recommended.[494]

Given the population pressures, a focus on sustainable and accessible urban design that includes dense, multi-use high street developments would enable modal shifts towards walking and cycling while reducing carbon emissions and improving air quality. A shift towards active modes of transportation would likely lead to improved health in the borough by improving accessibility to everyday physical activity and simultaneously reduce air pollution related illness.

Climate Change

To achieve the Mayor's carbon emission reduction target of 60% by 2025 and national carbon emission reduction targets of 80% by 2050 relative to 1990 levels, and to move towards a zero carbon city, Brent already implements some actions in line with the Mayor Environment Strategy (MES). Brent should intensify related transport infrastructure provision and management improvements, such as street parking permit charges based on vehicle emissions, car free developments and EVCP infrastructure; and energy provision and efficiency. Brent could also move to pilot and deliver others interventions mentioned in the MES and implemented in other boroughs, such as restriction on fossil fuel vehicles through road charging schemes similar to the Congestion Charge and Low Emission Zone, or selective local road closures in areas with increasing levels of congestion or where public transport is accessible, such as town centres, housing estates and high streets. Other proposed fiscal measures could include increasing surcharges on resident parking permits with diesel vehicles, and reducing tariffs for those with electric vehicles.

Construction represents a growing source and proportion of air pollution. It is therefore critical to reduce the pollution generated both on and off construction sites. New clean technology has the potential to replace ageing fleets of diesel diggers, excavators and inefficient generators and lighting rigs. Offsite factory manufacture can drastically reduce waste materials, noise, dust and litter on site – and reduce defects and shorten build times. The Council can better recognise innovation in building technology and cleaner construction when procuring development partners to deliver regeneration and development across the borough.

SMART technologies could be harnessed to achieve environmental targets working together with industry, academia and citizens, with ICTs providing solutions in an effective manner.[495] The current pilot planned in Brent to measure air quality would effectively monitor carbon emissions, but more ICTs could be used such as current drone infrastructure for aerial mapping and monitoring, plant conservation, planning and regulation enforcement activities.[496]

Energy Mix

Population growth and the electrification of the heat and transport sectors will increase energy demand in Brent. In order to achieve the national and local carbon emission targets, and support decarbonisation of electricity and gas, Brent must must not only maximise energy efficiency in the built environment and encourage behavioural change in energy use by consumers, but oversee a transformation in the energy mix. It is important to encourage the

[494] ILC (2015) The future of transport in an ageing society.
[495] BEIS (2013) The Smart City Market: Opportunities for the UK.
[496] Sensefly (2017) Drones for environmental protection & Conservation.

use of clean and renewable energy sources such as energy from waste, solar PV and thermal systems, as well as combined electricity storage technologies such as hot water cylinder to store heat, batteries to store electricity generated off-peak or solar CHP concentrating solar PV-thermal hybrid technologies.[497]

To deliver increased solar energy generation it is important to work with the Mayor, homeowners and landlords, developers, businesses, charities and private investors. Planning permissions for new developments are fundamental to securing the use of these kind of technologies, requiring developers to deliver new on-site renewable energy. Brent should also promote to households and businesses the financial, social and environmental benefits of generating electricity and hot water with renewable sources. Benefits include local and national grants available for installation cost, and for delivery on the existing built environment, and help and advice for households and businesses to make informed decisions about investment in green energy technologies. The Council could also replicate the RE:FIT London Programme at a local level to provide an expert free of charge, but working with academia and communities to support citizens to get energy renewable projects up and running.

Delivery of district energy programmes planned in Brent such as for South Kilburn and Wembley should be prioritised and accelerated, then rolled out and implemented in more opportunity areas and major new developments, including business and industrial areas, in order to reduce domestic and commercial energy consumption. These programmes should consider the new combined heat and power system (CHP) criteria and the London Environment Strategy to reduce Atmospheric Emissions such as through ultra-low NOx gas boilers.[498] Combined cycle gas turbines can achieve 70-80% heating efficiency, maximising power production[499]. Similarly, the New London Plan indicates that boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production from solar technologies including photovoltaic and thermal. Major developments should also deliver communal heating systems that use clean heat or zero power emission sources.

Circular Economy

The circular economy model shows positive impacts in London, including Brent, building economic, natural and social capital, and having the scope to reduce CO2 emissions and environmental impacts. Potential innovations include increasing emphasis on reducing carbon emissions through the use and reuse of resources before they become waste, including the manufacture of goods to higher quality standards, and the establishment of clean-tech hubs in the boroughs strategic industrial locations including Park Royal and Wembley.

Waste management, including provision of adequate disposal facilities that work effectively for residents, should be addressed in new residential developments from the design stage. Construction accounts for half of the waste production, while households account for 17% waste production, in London. With an increasing population and the proposed New London Plan 2,915 annual housing target for Brent, the Council must prioritise waste management and explore the potential to generate low-carbon energy from suitable remaining waste.

Green & Blue Infrastructure

For green and blue infrastructure management, issues related to flooding, water supply, and green space maintenance should be integrated into a comprehensive strategy. To address flooding, river and sewage flooding should be addressed through further integrated sustainable urban drainage systems (SUDS) and green spaces should be designed and

[497] Kalam, King, Moret et al (2012) Combined heat and power systems: economic and policy barriers to growth.
[498] GLA (2018) London Environment Strategy.
[499] Kalam, King, Moret et al (2012) Combined heat and power systems: economic and policy barriers to growth.

adapted to accommodate flood water during heavy rainfall events. Gray water recycling, green roofs, and swells should be better integrated into urban design to retain rainwater and put less strain on the drinkable water supply. Existing green spaces can provide further benefits through retrofitting, improving quality and increasing accessibility. Improving green spaces in the borough has the potential to lead to public health improvements and help mitigate against heat island effects from climate change. Increasing the number of trees in the borough in highly urbanised areas could extend the benefits of green spaces, created shade and improving air quality along busy traffic corridors. It is important to continue working with communities to encourage their participation in Mayor's grants such as "Community Tree Planting and Green Space", and the maintenance of the trees and green areas in their neighborhood. As Brent is densified and population increases, the need for quality accessible green space will become more intensified. Green space improvements for recreation and health should be integrated with environmental management to address flooding, air quality, and biodiversity issues in the borough.

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