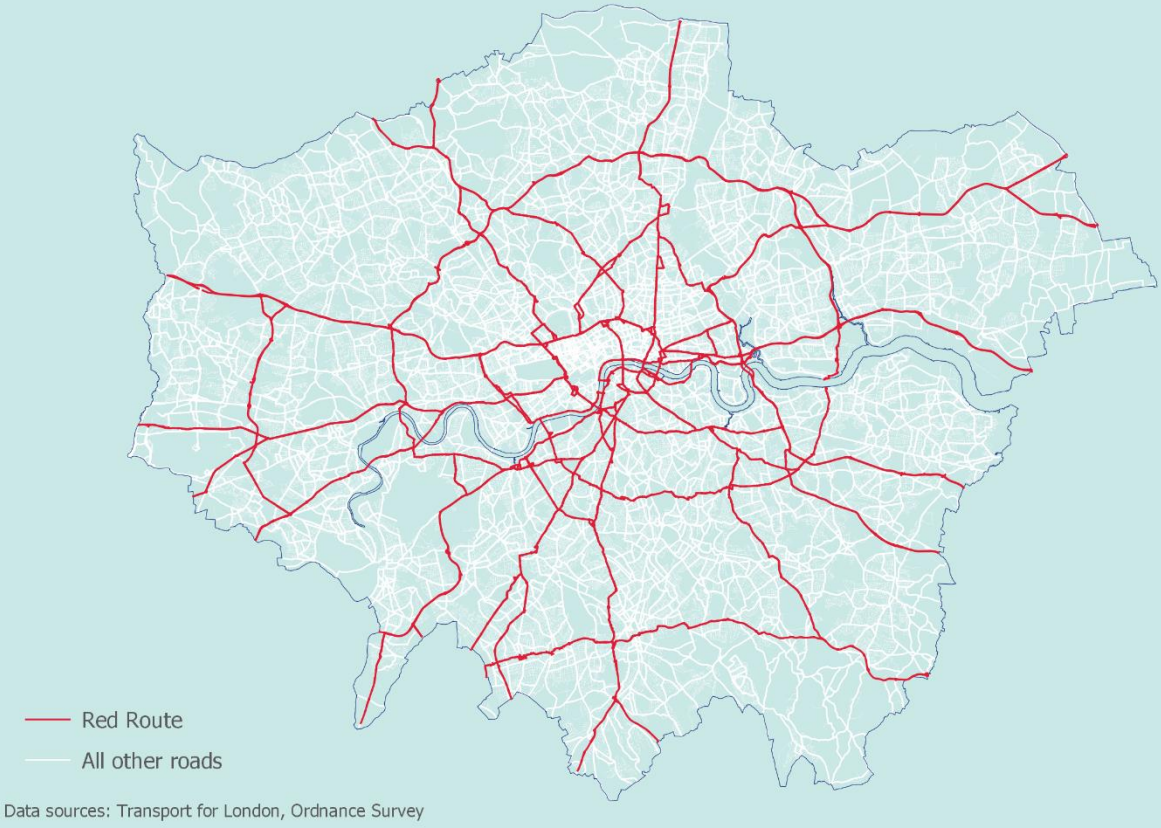
Rethinking London's Red Routes: From red to green

New health index highlights need to tackle air pollution from major roads



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About Environmental Defense Fund Europe

One of the world's leading international nonprofit organizations, Environmental Defense Fund (edf.org; globalcleanair.org) creates transformational solutions to the most serious environmental problems. To do so, EDF links science, economics, law, and innovative private-sector partnerships. With more than 2.5 million members and offices in the United States, China, Mexico, the United Kingdom and the European Union, EDF's scientists, economists, attorneys and policy experts are working in 23 countries and across the E.U. to turn our solutions into action.

About Centric Lab

Centric Lab (thecentriclab.com) works as a research & data-driven lab to help organisations make effective decisions for supporting mental and physical health, specifically for communities that are the most susceptible to poor health outcomes. Our lab focuses the stress response, which is a whole human system response (brain and body). This allows us to understand how the places people interact with affect their health outcomes through their exposure to environmental and psycho-social stressors.

Summary

A swathe of regulations and investment, or lack there of, over a long period of time have prioritised motor traffic in London. In the 1990s, the Government introduced its 'Red Routes' policy to designate 'clearways' in the capital on which through traffic movements would gain greater priority over local journeys. The Red Routes – also known as the Transport for London road network (TLRN) – cut across the capital and carry up to a third of traffic on a typical day.

The prioritisation of motor traffic significantly impacts London's environment and creates health inequities in the city. Motor vehicle dependency remains high amongst residents and the number of miles driven by commercial vans has risen exponentially in recent years. Moreover, the Red Routes network was established in a time mostly unrecognisable today – when diesel did not have a prominent use, estimates of how the city would grow were more conservative and e-commerce deliveries were unheard of.

Londoners living, working, visiting and going to school near to a busy road are exposed to far greater levels of air pollution than elsewhere in the capital. This is a particular case for the Red Routes, where, in comparison to an average road in London levels of nitrogen dioxide (NO_2) pollution are 57% higher and levels of fine particulate matter ($PM_{2.5}$) are 35% higher.[1] The Red Routes will also likely be some of the last areas in the UK to meet air quality thresholds as recommended by the World Health Organization.

In December 2020, an inquest in London recorded what is thought to be the world's first case of air pollution listed as a direct cause of death. Nine-year old Ella Adoo-Kissi-Debra, who had persistent asthma attacks in the last two years of her life, had grown up only 25 metres from the South Circular, a busy Red Route. This case highlights the consequences of health inequities; Ella was a young Black girl and research has shown that people who are racialised as Black are disproportionately exposed to higher levels of air pollution.[2] Additionally, the legal implications of this case are groundbreaking for moving air pollution policy forward.

The health impacts of transport-related air pollution are multifactorial and systemic. To understand the full extent of how air pollution impacts a person's life, proximity to pollution sources must be considered alongside other pollution types (e.g., noise and light), as well as

[1] https://www.globalcleanair.org/files/2021/03/EDF-Europe-deprived-and-BAME-communities-methodology.pdf
[2] https://www.london.gov.uk/sites/default/files/impact_of_les_-_addendum_ethnicity_and_exposure_ammendedfeb21.pdf

intervening social and behavioural stressors. Examples of these stressors include feeling physiologically safe, legibility and socio-economic differences.

Air pollution and environmental stressors from the Red Routes network are affecting Londoners' health in different ways. Data analysis is needed to better understand these impacts and to identify who is at greatest risk. Environmental Defense Fund Europe commissioned Centric Lab to undertake a health assessment of the Red Routes network. The findings from this assessment are presented in this paper, alongside a data matrix available for download.[3]

The health assessment brings to light people's lived experience along the Red Routes. For example, it identified how the A12 between Poplar and Bromley By Bow is a particular concern for the neurodiverse community (e.g., people on the autism spectrum or with dyslexia), as air pollution impacts are compounded by complex, disorganised and noisy environments. Similarly, the A13 between Whitechapel and Limehouse can be overbearing for children owing to environmental stressors and high levels of air pollution affecting their early stages of development. The assessment concluded all parts of the Red Routes are a priority for intervention and action should be taken to make them significantly healthier and safer.

As the capital strives for cleaner air and considers a firm action plan to decarbonise the city, data suggests the Red Routes policy is ripe for a review. Red Routes continue to be designated primarily areas for motor movement, conflicting with the growing number of people who live and conduct daily activities by these roads. Policymakers must come together to assess whether the network is still fit for purpose so that we make London healthier and more equitable.

[3] https://www.edf.org/content/edf-europe-centric-lab-health-assessment-matrix

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Current policy

For decades, planners have sought to prioritise or protect space for motor traffic in cities. For example, legislation previously safeguarded almost 900 miles of roads in London for widening so the city could continue to accommodate traffic growth.[4]

In the 1990s, policymakers acknowledged the negative impact that widening and building new roads in cities could have (i.e. by encouraging more traffic), but still wanted to keep traffic moving. Also, London's roads had become heavily congested, partly owing to the lack of a direct authority covering traffic after the Greater London Council was abolished.

As a result, the Government initiated in 1991 London's 'Red Routes,' a network of major priority roads cutting across the city. The roads aimed to reduce congestion and encourage traffic flow, enabling freight and other vehicles to move freely across the city. Single or double red lines were painted on the routes to signify restrictions to vehicles waiting, parking and loading. Traffic flow on these roads has been heavily prioritised ever since.

Today the Red Routes make up only 5% of all the capital's roads but carry a third of London's traffic on an average day. In addition to dangerous levels of air pollution (see next section), funneling traffic on these roads has unfair economic consequences for local high streets and town centres, often severed by six lanes of traffic running through them (e.g., Holloway Road in Islington). The setup creates a high level of road danger – around 29% of all collisions and 37% of all road traffic fatalities in London occur on the Red Routes.[5]

The Red Routes are more than 'roads'

According to Transport for London, a Red Route is a major 'road.' A road in the urban lexicon is defined as an essential highway whose main function is to accommodate movement of motor traffic. On the other hand, streets are those for 'place' or living; motor traffic movement becomes less of a priority in this demarcation.

These distinctions have been used to justify sustaining traffic on big roads including Red Routes. Yet the Red Routes are often places where people live and dwell, and near which up to 50,000 children go to primary school. By failing to acknowledge that Red Routes are also residential areas, policies continue to contribute to health inequities.

[4] https://www.roads.org.uk/ringways/the-end
[5] https://content.tfl.gov.uk/vision-zero-action-plan.pdf

After the establishment of the Greater London Authority, the management of the Red Routes was handed to Transport for London (TfL) as the strategic highways authority. TfL oversees the day-to-day management of the Red Routes (the TfL Road Network) and any improvements on behalf of the Mayor of London, rather than the local authority. Local authorities have responsibility over the other 95% of roads in the capital, spanning from quiet cul-de-sacs to busier A-roads. Unsurprisingly, residents' complaints often get bounced as a blame game between authorities.

Figure 1 A tweet from Islington Council regarding a resident's concern along a Red Route

Thirty years since the introduction of the Red Routes network, little has changed in terms of how the network operates. They are often hostile environments for anyone walking and cycling and a major source of air and noise pollution, alongside other social and behavioral stressors.

Figure 2 A resident's tweet regarding the lack of progress or change along a Red Route

Recently, the advent of Low Traffic Neighbourhoods in 2020 – a Government policy to discourage drivers taking shortcuts on smaller roads and to enable walking and cycling – has led to concerns about traffic and congestion on the main roads. Low Traffic Neighbourhoods have exposed a vacuum in policy to actively reduce traffic on the busier roads, especially the Red Routes. Reducing traffic on smaller roads and main roads must go hand-in-hand.

Even where improvement schemes exist, there is often very slow progress. For example, current plans to transform the one-way, six-lane Vauxhall system and improve the area for pedestrians and cyclists will not be complete until 2025 – ten years after an initial consultation.[6]

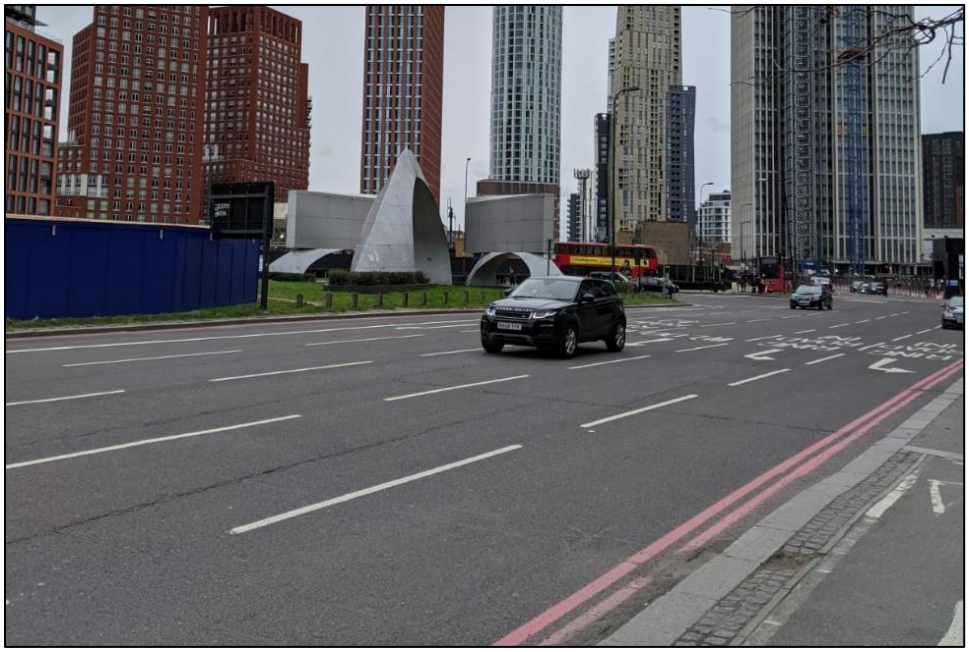


Figure 3 The six-lane one-way system along a Red Route in Vauxhall

The Red Routes are challenging to address because of the broad policy to prioritise vehicle traffic along these roads. They are often excluded when developing progressive policy, such as Low Traffic Neighbourhoods or Zero Emission Zones. Recent schemes to address rising traffic levels have often been targeted on already less congested roads. This cannot be the only intervention as it doesn't solve the air pollution equitability problem and in some circumstances has put more of a health burden on residents living on Red Routes.

A comprehensive plan and clear targets to reduce traffic across the city, particularly on Red Routes, is critical. Vehicle use continues to increase – in 2019, there were 3.9 billion more miles driven on London's roads than in 2009.[7] A TfL Liveable Neighbourhoods programme has

[6] https://tfl.gov.uk/travel-information/improvements-and-projects/vauxhall-gyratory
[7] https://roadtraffic.dft.gov.uk/regions/6

started some projects that include action on main roads and Red Routes, but progress has been very slow. Moreover, a mere reduction in traffic doesn't necessarily equate to quantifiably cleaner air. Action is needed to address the health burden that air pollution is putting on all Londoners.

Taking a closer look at the Red Routes network, there are key pressures that need be addressed:

1) **Goods and services** – with rising numbers of delivery vans and construction vehicles on the streets, there is an urgent need to work with industry and consider more efficient ways for goods and services to enter the city. It is also important that local high streets fulfill the necessary needs and demands of local communities. As currently planned, the Red Routes network conveniently enables road transport freight to move across the city. Meanwhile, more and more goods are being made available for delivery within 24 hours at very low cost – providing an incentive to stay home rather than visit the local high street.

   A TfL study has shown that 39% of vans driving across London are only a quarter full,[8] leaving plenty of space to optimise efficiency. Figure 4 demonstrates how the total number of kilometres driven by commercial vehicles – Heavy Good Vehicles (HGVs) like lorries and Light Goods Vehicles (LGVs) like vans combined – has risen in London.

Freight and servicing vehicles kilometres in Greater London, indexed against 2009 levels

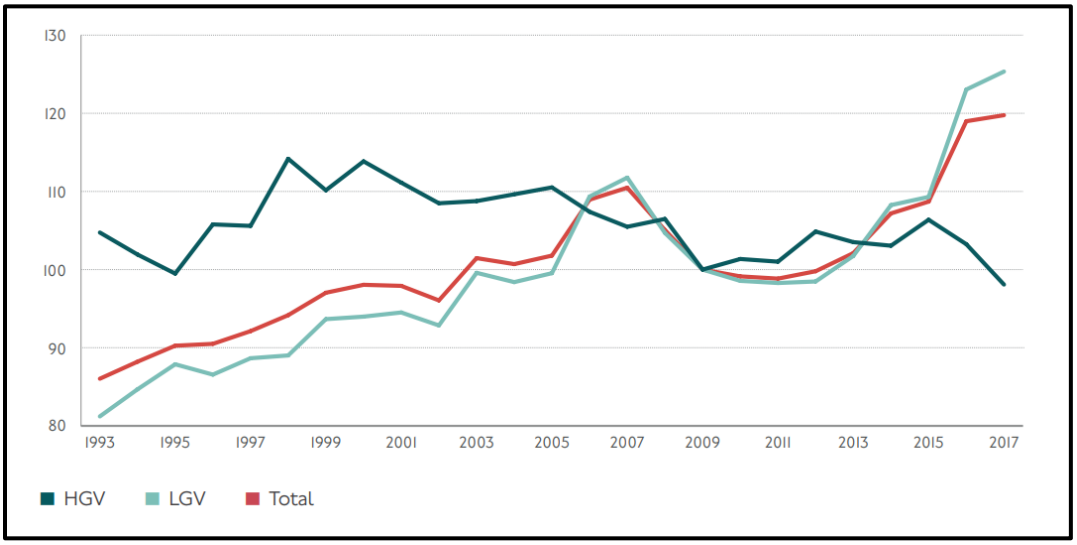


Figure 4 A chart from the Mayor of London and TfL's 2019 Freight and servicing action plan

[8] http://content.tfl.gov.uk/technical-note-05-what-are-the-main-trends-and-developments-affecting-van-traffic.pdf

2) **Car use and ownership** – with 2.6 million cars registered in London,[9] more efforts are needed to raise awareness on the need to reduce redundant and unneccessary car journeys. However, to do this, it is important to introduce equitable mobility zones. This means that a wider transport infrastructure must be considered to reduce the need for a car. Cars can be a tool for equitable mobility, especially for those with mobility challenges, which needs to be highlighted and supported. It is also important to avert a car-led recovery from the pandemic, the consequences of which will last generations. The number of miles driven by cars in London increased nearly 20% – by 2.6 billion miles – between 2009 and 2019, which is a phenomena that is worth addressing to understand how to create meaningful and equitable solutions.[10] Increased car traffic can lead to congestion (and subsequently air pollution) as well as delays to bus passengers, which makes public transport less convenient. This is a big issue given that public transport accessibility is critical to reducing overall car ownership levels – Figure 5 demonstrates a clear association between the two.

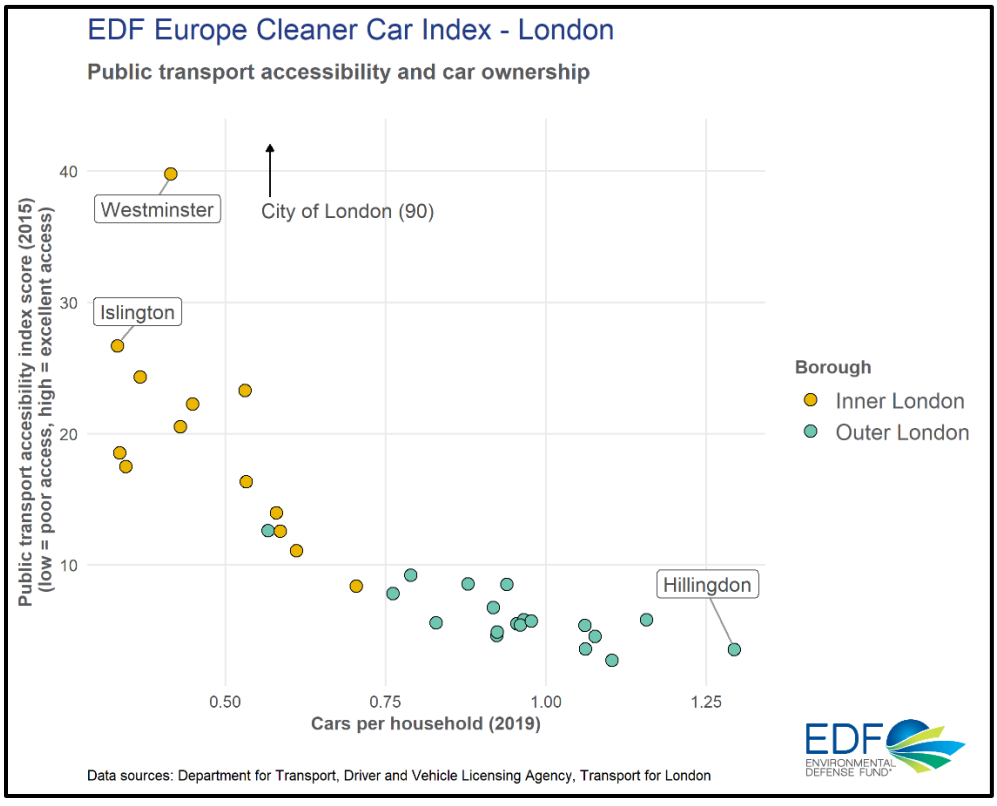


Figure 5 A chart from EDF Europe's Cleaner Car Index depicting the link between public transport accessibility and car ownership in London

[9] https://www.edfeurope.org/news/2020/14/10/revealed-best-and-worst-parts-london-green-cars
[10] https://roadtraffic.dft.gov.uk/regions/6

3) **Walking, wheeling and cycling (active transport)** – there is huge potential to create urban affordances that support people in adopting healthier, safer, quicker and more affordable ways to get around the city. The safety issues are especially important considering many marginalised communities (women, LGBTQ+, disabled, neurodiverse) are not objectively safe using current active transport options. Nearly 50% of car trips made by London residents could be cycled in around 10 minutes and a third made by drivers or passengers could be walked in under 25 minutes.[11] It is important to note that this is a passive statistic that does not necessarily reflect the lived experience. For example, out of the 50% that could be a cycle ride – the decision could have been significantly impacted by safety, weather or a change in personal mobility, for example. Therefore, research into the lived experience and behavior aspects of car use is paramount in helping the equitable, fair and safe transition from the car. In 2021 the charity Sustrans has stated the vast majority of Red Routes are currently 'not safe for people to walk or cycle on,' despite often being the most direct route from A to B.[12] For example, they do not meet the safety criteria TfL have set out in the Cycle Route Quality Criteria and Healthy Streets Indicators. Additionally, there is a link between car ownership and physical activity, as demonstrated in Figure 6.

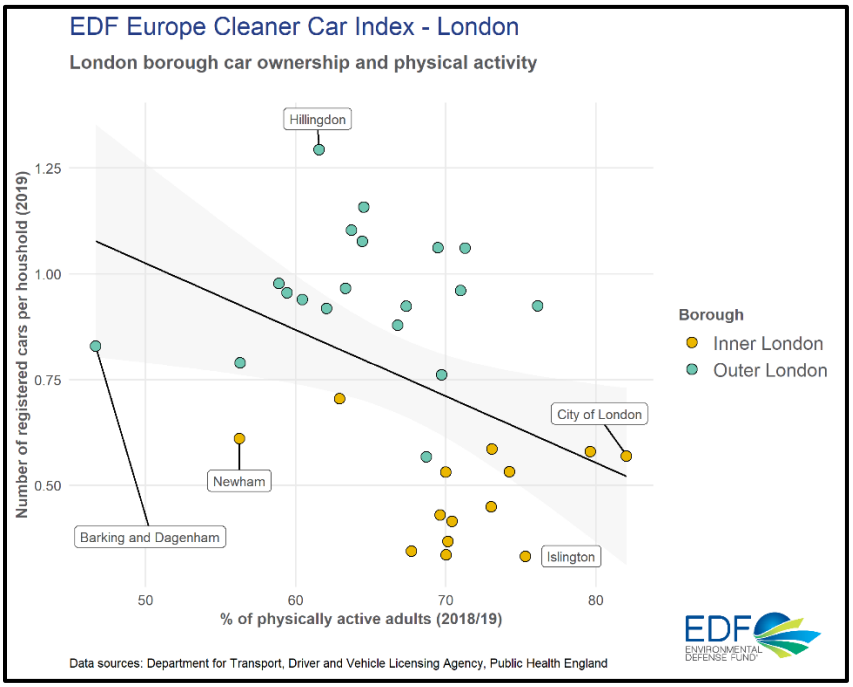


Figure 6 A chart from EDF Europe's Cleaner Car Index depicting the link between car ownership and physical activity

[11] http://content.tfl.gov.uk/healthy-streets-for-london.pdf
[12] https://www.sustrans.org.uk/campaigns/our-manifesto-for-london-2021

Air pollution on the Red Routes

Air pollution across London is harming people's health. An estimated 4,000 deaths in London were attributable to toxic air in 2019,[13] and many more people continue to suffer from daily impacts of lung and heart disease. Taking a closer look at the major roads, exposure to air pollution from living near these busy roads, like the Red Routes, is estimated to stunt lung growth in children and to increase the risk of heart attack.[14]

Ruth Fitzharris, a London mother of a young son, has felt these dangerous impacts first-hand. In the past few years her son had 12 asthma attacks, two of them life-threatening. Ruth says she was informed by the head of a severe asthmatic clinic that air pollution was a significant contributory factor to her son's condition. Additionally, her consultant pediatrician with specialism in respiratory medicine advised her to avoid main roads when possible.

Channeling large volumes of vehicles, especially diesel, through the Red Routes every day means these roads are likely to be some of the last areas in the UK to meet air quality thresholds as recommended by the World Health Organization. It is also a legal matter. In March 2021, the Court of Justice of the EU ruled that the UK has persistently broken legal limits on air pollution for a decade.[15] Levels of NO_2 were illegally high in 75% of towns and cities, including along the Red Routes in London.[16] Hanger Lane, Brixton Road and Marylebone Road are all examples of Red Routes that recorded unsafe and illegal levels of NO_2 in 2019 and 2020.[17]

These roads clearly stand out when London's NO_2 and $PM_{2.5}$ air pollution is modelled and mapped (see Figures 7 and 8).

The Red Routes contribute to the unequal health burden of air pollution in London. Recent analysis shows that Londoners living and working on or near Red Routes are exposed to higher levels of air pollution – and therefore greater health risks – than people on quieter roads. On average, a Red Route has 57% more NO_2 and 35% more $PM_{2.5}$ pollution than an average road in London (see Figures 8 and 9).[18]

[13] http://erg.ic.ac.uk/research/home/resources/ERG_ImperialCollegeLondon_HIA_AQ_LDN_11012021.pdf
[14] https://www.kcl.ac.uk/news/living-near-a-busy-road-can-stunt-childrens-lung-growth
[15] https://www.clientearth.org/latest/press-office/press/top-court-confirms-uk-has-broken-air-pollution-law/
[16] https://www.clientearth.org/latest/press-office/press/new-data-shows-75-of-uk-zones-illegally-polluted-don-t-pause-action-now-say-lawyers/
[17] https://londonair.org.uk/LondonAir/Default.aspx
[18] https://www.globalcleanair.org/files/2021/03/EDF-Europe-deprived-and-BAME-communities-methodology.pdf

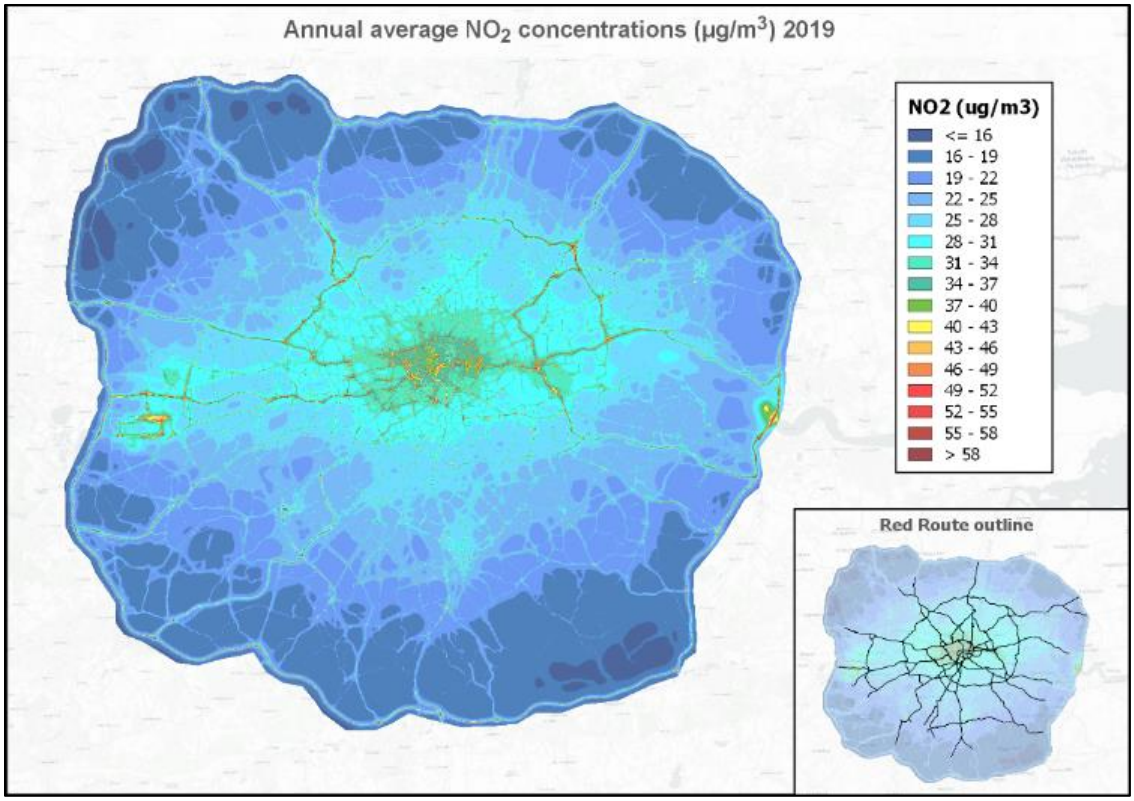


Figure 7 A map of modelled NO2 pollution concentrations across London

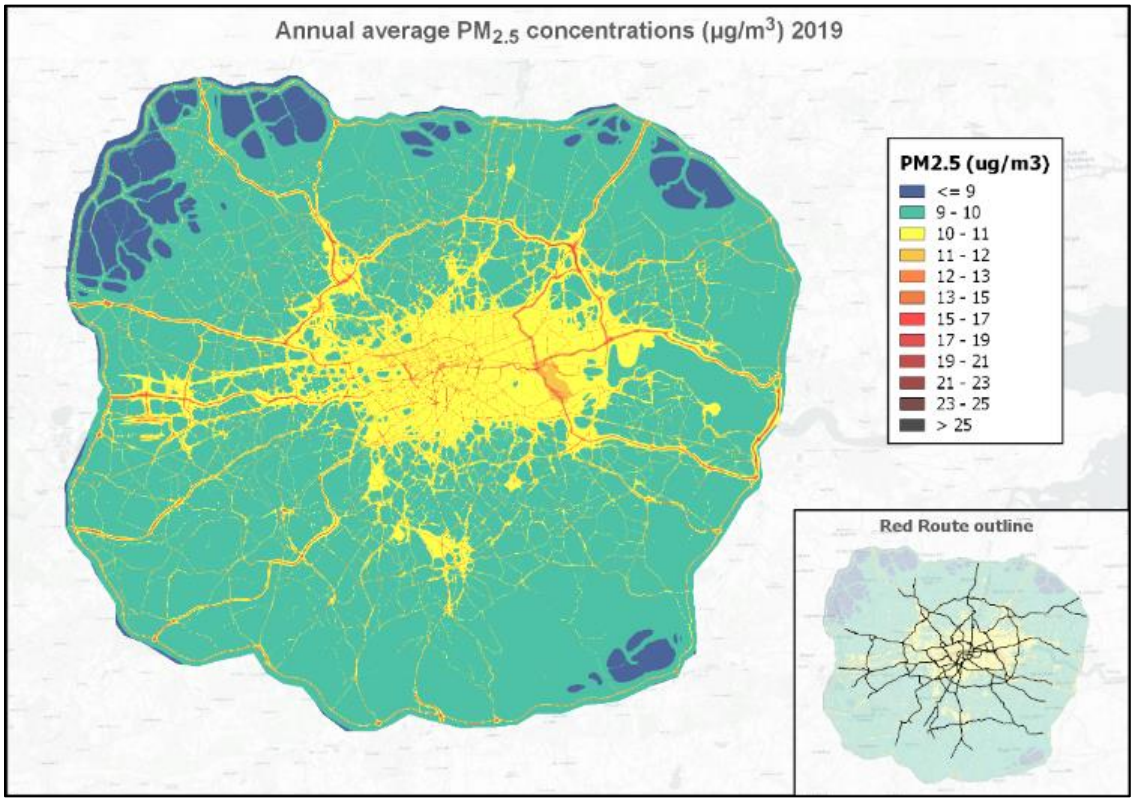


Figure 8 A map of modelled PM2.5 pollution concentrations across London

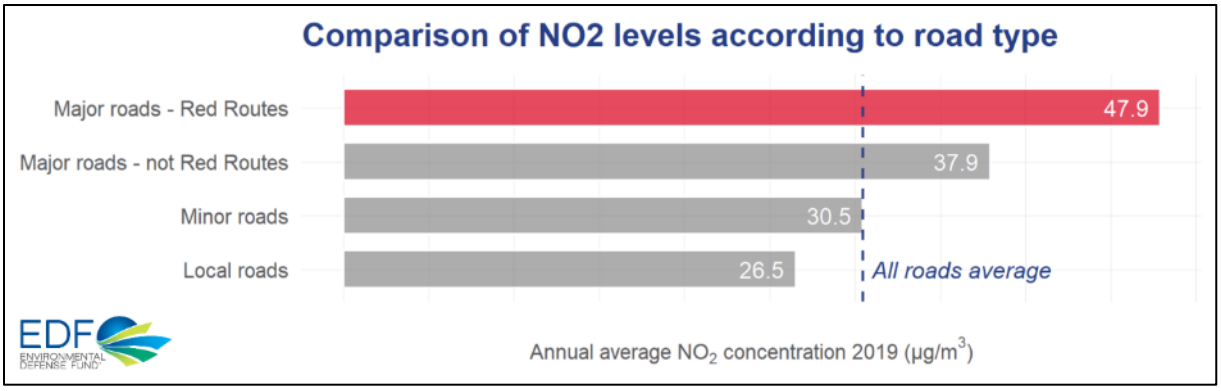


Figure 9 A chart depicting average NO2 pollution levels by road type

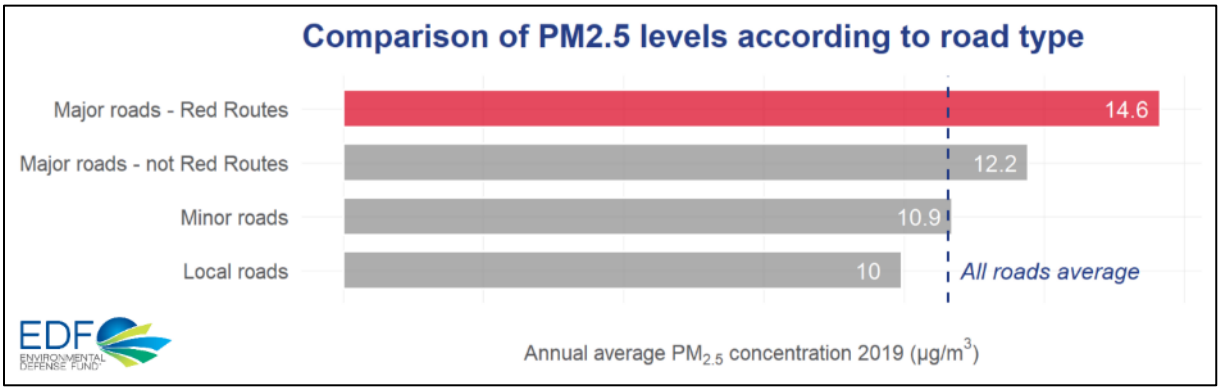


Figure 10 A chart depicting average PM2.5 pollution levels by road type

The impact is felt amongst the most vulnerable populations:[19]

- Children at primary schools near a Red Route are exposed to 17% higher levels of NO_2 and 5% higher $PM_{2.5}$ than primary schools not near Red Routes. And nearly all primary schools in areas exceeding legal limits are on or near a Red Route.
- Patients in hospitals near a Red Route are exposed to 32% higher levels of NO_2 and 7% higher $PM_{2.5}$ than hospitals not near Red Routes.
- Residents of care homes near a Red Route are exposed to 22% higher levels of NO_2 and 12% higher $PM_{2.5}$ than care homes not near Red Routes.

Whilst levels of air pollution have fallen over the past few years, the Red Routes policy means there will continue to be large differences in the amount of air pollution – and therefore health inequities – that people experience in the city. It is also important to note that the World Health Organization has said that there are no safe levels of air pollution. This means that air pollution presents a health hazard from first contact.

[19] https://www.globalcleanair.org/files/2021/03/EDF-Europe-Red-Routes-methodology.pdf

Linking air pollution with other environmental stressors

Air pollution is one of the most insidious environmental stressors facing modern urban life.

Air pollution affects our health through two biological pathways. The first affects the function of our organs directly. Air pollution comes into our body through our inhalation, then it travels from our lungs to our cardiovascular system, which then moves the particles into the bloodstream. Through the bloodstream air pollution particles travel to all of our tissues, affecting the function of every single organ.

The second pathway is systemic, as a person inhales pollution particles, first contact sets off a biological relay of stress responses to adapt and heal the body from the stressor. This process is called allostasis – over time and with continual exposure, a person will begin to experience a "wear and tear" or allostatic overload. This load on the body causes dysregulation to various biological systems, which in turn is one of the main pathologies to disease, such as diabetes, obesity and depression.

Air pollution also affects the body directly. Particles circulate to every organ and blood stream, meaning they can affect every single biological system in the body. As a result, air pollution is linked to almost every major disease including cancer, dementia and Parkinson's.

The health impacts of air pollution are multifactorial and systemic. A person's proximity to pollution sources is instrumental to their levels of physiological exposure. However, there are intervening social and behavioural stressors that must also be considered to understand the true extent of its impact.

Sources of air pollution

- Road material, quality and design
- Vehicle traffic
- Domestic woodburning
- Heating and cooling systems
- Construction
- Industrial plants
- Aviation and river vessels
- Agriculture

Social and behavioural stressors

- Feeling physiologically and physically safe
- Caretaking duties
- Legibility and wayfinding
- Mental illness
- Mobility differences
- Socio-economic differences
- Time poverty
- Lack of green space

The combination of the level of exposure to air pollution and a person's lived experience often leads to the greatest health inequities. This is a particular concern for the Red Routes network given the high levels of air pollution and the hostile environment caused by vehicle traffic, such as perceived road danger and finding it difficult to hold a conversation.

For example, levels of noise pollution from major road sources including the Red Routes are high, which is often overlooked despite causing psychological and physiological distress (see Figure 11). Guidelines developed by the World Health Organization strongly recommend reducing noise levels produced by road traffic below 53 decibels, as road traffic noise above this level is associated with adverse health effects.[20]

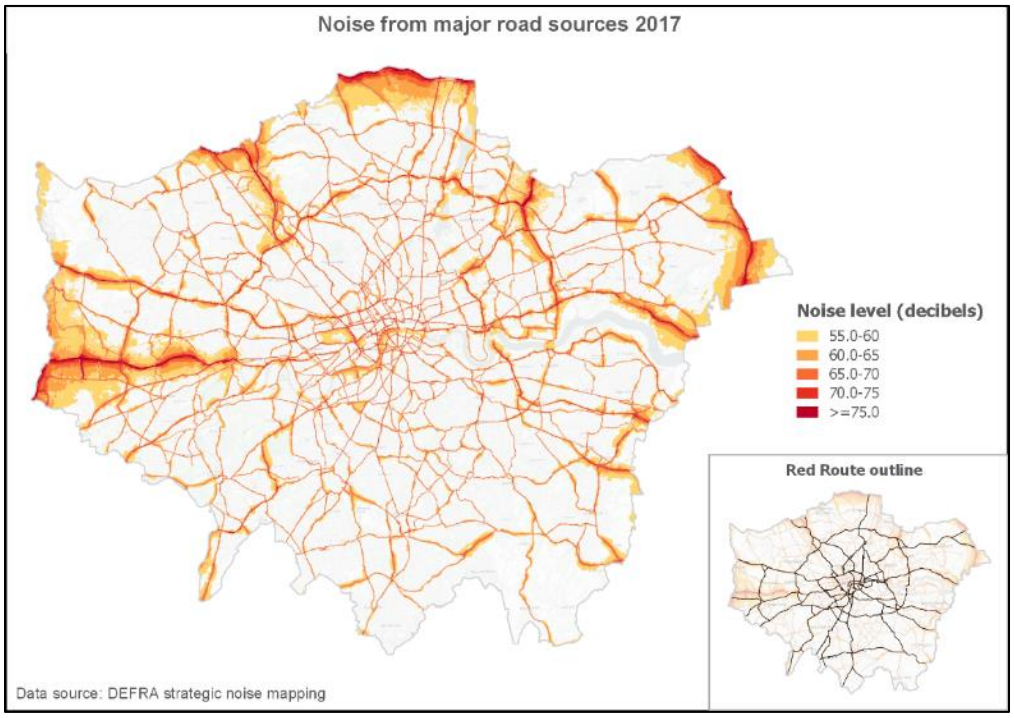


Figure 11 A map of modelled noise pollution concentrations across London

[20] https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

A health assessment of the Red Routes

An initial health assessment of London's Red Routes was undertaken by Centric Lab so authorities can begin to understand the health burden experienced by people living on the Red Routes network. The outcome of this work and data analysis is intended to provide a snapshot of the lived experience along these roads and to inform future policy thinking.

The health assessment acknowledges three key factors:

1. Although they are strategic roads, Red Routes are also residential streets with communities who live there.
2. It is essential to acknowledge the communities that reside on Red Routes, understand their lived experience and platform their concerns.
3. It is essential to go beyond single datasets; identifying the different experiences, compounding stressors and other drivers beyond traffic pollution that are affecting people's health.

The objective was to gain the clearest and most inclusive representation of the lived experience along the Red Routes. Centric Lab used a matrix method[21] rather than a scoring system (i.e. from best to worst) to create flexibility and accuracy. The matrix allows users to look at 'scenarios' to showcase the range of inequalities that can put people at risk of poor health outcomes.

Seeing the city as one macrocosm can lead to blanket one-size-fits-all policies, such as when the Red Routes were introduced, which may not reflect the variability of the lived experience, nor the local context. The difference between the North and South Circular roads is a case in point. The matrix provides an in-depth and nuanced lens to make more informed decisions and policy recommendations.

Using multiple factors helps to build a wide picture of different experiences on the Red Routes. These various filters (data points) were identified as being the most relevant to health and inequity determinants.

Looking beyond air pollution data is important because air pollution is highly prevalent across the network and therefore not as useful of a discriminating factor. The following datasets were used to inform the assessment:

[21] https://www.edf.org/content/edf-europe-centric-lab-health-assessment-matrix

- Index of Multiple Deprivation (IMD) – a measure that incorporates a broad range of living conditions, including income, health, and access to resources
- Street Risk Score (SRS) – a measure that looks at air, light, noise and thermal conditions
- Population (elderly / young)
- Public Transport Accessibility Levels (PTAL) – a measure that considers accessibility to the public transport network from any point in London, considering both walk access time and service availability
- Population density
- Proportion of Black, Asian and Minority Ethnic residents
- Car ownership levels

The assessment recognised the way people use roads and vehicles is driven by social and behavioural stressors, like those listed earlier. More detail on the can be found in Appendix 3.

Health impact scenarios

Users of the data matrix can create different 'scenarios' to understand the different types of health impacts and inequities occurring on the Red Routes. A summary of the scenarios and datasets can be found in Appendix 1.

For this health assessment, Centric Lab adopted a data-led approach to identify five scenarios with priority segments of the network requiring intervention. Looking at Google Streetview, the built environment on these segments has hardly changed at all over the past decade:

Neurodiversity

The A12 between Poplar and Bromley By Bow *(segment RR12)* was identified to be especially challenging for people in the neurodiversity community, which can include being on the autism spectrum, dyslexia, tourettes and dyspraxia.

This community is made vulnerable through complex, disorganised, noisy environments as experienced in very dense places. In turn this can drive people in the neurodiversity community indoors, which takes away their agency and ability to find a job, as well as increases loneliness.

Dataset: Population density x Stress Risk Score x IMD

Mobility equity

The assessment identified A312 between Northolt and Cranford (RR82) as lacking in mobility equity, where it is difficult for people to be able to get around in a safe and healthy way.

This scenario considers how mobility exposes people to stressors. For example, long commutes to work can lead to greater exposure to air pollution. The longer a person must wait for public transport can elongate exposure and stress.

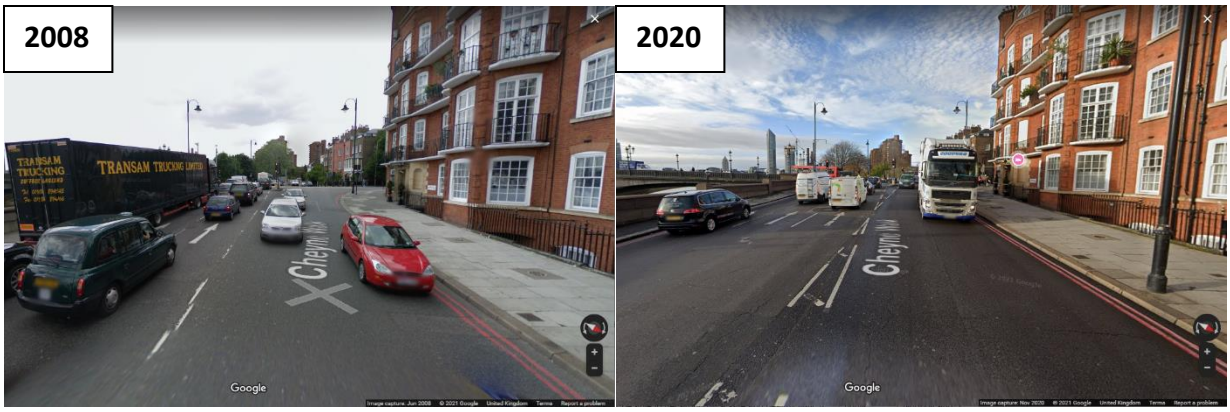
Poor transport links can also pose a physical and psychological hazard to those in marginalised communities such as transgender people, Muslim women, young people, parents and the elderly. This hazard can be categorised as a psychosocial stressor.

Dataset: Level of public transport accessibility x Stress Risk Score x IMD

Susceptibility

This scenario looks at people who are most at risk of poor health outcomes. The assessment identified A3220 between Chelsea and Pimlico *(RR113)* to be particularly problematic for the dense population of elderly people living nearby. The elderly are vulnerable owing to their systems having far less capacity to adapt to environmental stressors, which can be exacerbated by comorbidities such as dementia, Parkinson's or cardiovascular problems. The elderly may

also walk slower and feel safer on busier roads where more people are visible, which exposes them to environmental stressors for longer, including air pollution.



The assessment identified A13 between Whitechapel and Limehouse *(RR7)* as particularly problematic for the population density of children living nearby. Children's systems are in early development alongside air pollution exposure, which means allostatic load can set in at a very early age. In turn this leaves a person susceptible to poor health outcomes at a later stage in life.

Dataset: Population density of age groups (0 – 15 and 65+) x Stress Risk Score x IMD

Race-based inequity

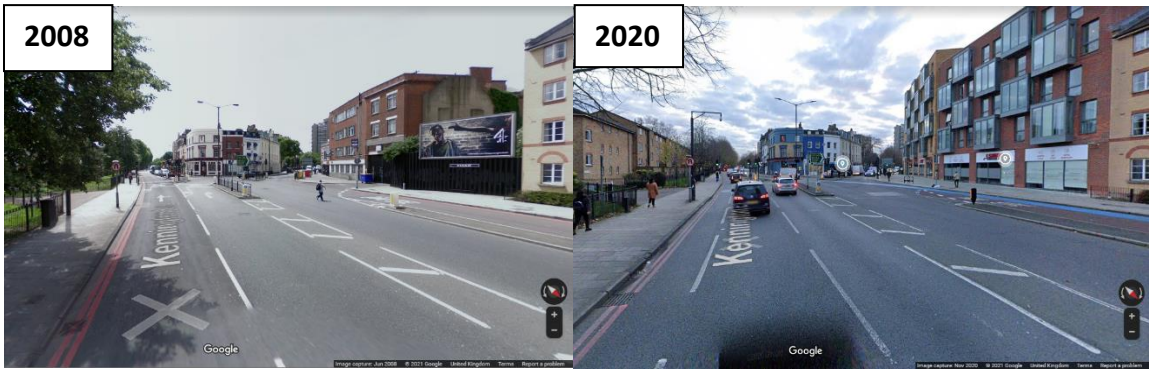
This scenario seeks to highlight how Black, Asian and minority ethnic communities are marginalised and to ensure that the impacts of structural racism are considered in decision making. The assessment identified A13 between Limehouse and Poplar (RR9) as an area for priority intervention.

Dataset: Proportion of Black, Asian and minority ethnic residents x Stress Risk Score x IMD

Car ownership

This scenario looked at the relationship between car ownership, environmental stressors and deprivation, which is relevant to ensuring equitable mobility. The assessment results for this scenario were not as linear as others; however, there was a clear narrative where areas of high deprivation and high environmental stressors have significantly lower than average car ownership. The reverse is also shown. This points to how those who own cars are often not the people dealing with the impacts of air pollution and environmental stressors.

The assessment identified A3 between Elephant and Castle and Kennington (RR108) as an area for priority intervention.



Dataset: Index of Multiple Deprivation x Stress Risk Score x Car ownership levels

Understanding the lived experience

To provide a more lived-experience lens, the health assessment includes three day-in-the-life personas that are presented at the end of the whitepaper. These personas are intended to help decision makers understand the multifactorial impact of the Red Routes on different communities.

Time for change

Prioritising roads and traffic over space for people and other modes of transport has a long history in the UK. Even today, the Government has set aside a controversial fund of £27 billion for building new road capacity or enhancing existing road schemes, and the Mayor of London is progressing the controversial Silvertown Tunnel under the Thames.

As the 30th anniversary of the Red Routes policy approaches, the decision to prioritise traffic flow in London now seems shortsighted and outdated. At the time, policymakers failed to explore more ambitious scenarios that could have created a healthy way for people to live in and move around the city for generations to come.

There is a malaise in London that nothing can be done to transform these roads for the better. And to put matters in more urgent terms, this year the city is entering the rehabilitation stage of the pandemic, especially for those experiencing long COVID-19. These individuals will require the support of healthy habitats to shorten recovery time and lessen the symptomology. In a similar vein, local businesses impacted by the pandemic restrictions and blighted by the Red Routes will need more support than ever to invite customers.

This initial health assessment of the Red Routes network has presented scenarios of a damaging interaction between environmental stressors and high levels of air pollution, supporting the need to act and adopt a 21st century approach to these roads. Maintaining the status quo does a disservice to the health of all Londoners and especially those that live, work and go to school by these roads.

London also needs much firmer action to decarbonise these roads if it is to achieve its climate goals. Vehicle trips on the Red Routes are also estimated to account for nearly a third of all the capital's CO_2 emissions from road transport.[22]

Transforming the Red Routes will not suit a one-size-fits-all approach and must form part of a green recovery that undoes decades of damage. A clear traffic reduction plan is necessary – one in which polluting lorries can no longer cut across the city and parking for cars becomes parks for people.

A framework for action was started in 2012, when the previous Mayor of London established an industry-wide Roads Task Force to adopt new approaches to London's road network.[23] The Task Force:

- Reported on the need to deliver 'more people-focused, inclusive places' and to 'transform conditions for more sustainable modes of transport;'
- Required 'a truly transformative change', with 'at least £30bn of investment over the next 20 years or so;' and
- Gave specific regard to London needing a plan for the Inner Ring Road (e.g., Euston Road) to be 'developed as a matter of urgency.'

Ten years on, it is difficult to see how much of this ambition has been taken forward.

Policy considerations

Rethinking the Red Routes will require:

- Introducing short-term changes to improve health of those living, working and going to school on Red Routes, such as more greenery, sustainable drainage and climate resilience, converting car parking into more walkway or parklets, and potentially pollution or noise barriers as a temporary mitigation.
- Prioritising healthier alternatives to the car by delivering safer walking and cycling infrastructure across the network, reducing speed limits, better public transport connectivity and bus priority (including 24 hour bus lanes as default). The London

[22] London Atmospheric Emissions Inventory 2016
[23] https://tfl.gov.uk/corporate/publications-and-reports/roads-task-force

Assembly recently found that 261 signalised junctions in London only have signals for motor traffic, and not for people to cross roads; many of these were on Red Routes.[24]

- Reevaluating the size of the network, especially in central London to ensure it remains globally competative, where there is potential to reallocate more space for people and to 'deprioritise' motor traffic, such as happened in Trafalgar Square. See Appendix 2 for an example along the Seine in Paris.
- Prioritising cleaner and quieter vehicles, including rolling out zero-emission buses where they are needed most urgently to protect health.
- Implementing new approaches for freight and ensuring industry works closer together. This may include a better use of strategic industrial land to consolidate deliveries, helping to support more cargo bikes and electric deliveries, and measures that limit movements at certain hours to reclaim road space only used at peak times.
- Helping to broaden the base of London's commercial activities, which are currently highly centralised and often contribute to a large proportion of traffic being driven through Inner London neighbourhoods.
- Creating a longer-term vision to transform the most archaic sections of the network, especially the most destructive infrastructure like flyovers through town centres, as seen in Hammersmith. See Appendix 2 for an example in Seoul, which removed a city centre flyover.
- Establishing new funding streams to pay to maintain and transform the Red Routes, including developing a fairer road pricing system. TfL currently allocates revenue from public transport to help maintain and upgrade the Red Routes network[25] that could be otherwise spent on improving public transport accessibility, walking and cycling. A particular challenge is that London does not benefit from any of the £500 million vehicle excise duty paid by Londoners, which the Government allocates to road improvements elsewhere in England.[26]
- Reestablishing and/or reforming the Roads Task Force with specific traffic and pollution reduction targets for the Red Routes and to determine which policy changes at which levels are necessary to achieve targets. This may also require a review on the purpose of

[24] https://www.london.gov.uk/press-releases/assembly/all-junction-crossings-must-be-safe
[25] http://content.tfl.gov.uk/tfl-business-plan-2019-24.pdf
[26] https://www.london.gov.uk/press-releases/mayoral/mayor-ministers-must-play-fair-by-london

London's main roads, and who should control them (e.g., the discussion following the Royal Borough of Kensington and Chelsea's decision to remove a pop-up cycle lane).

Further research

In order to meet health and equitable mobility needs for Londoners, further research is needed.

What are the lived experience factors that contribute to car use? The lived experience is often not reflected in the conversation about car use. It is important to identify the factors that contribute to a person's perceived need for a car, which could include poor transport links, shift work, mobility challenges, weather or various levels of convenience. What are the most effective equitable mobility infrastructural affordances needed to reduce air pollution?

In order for people to actively engage with the urban realm, they have to be given the affordances. If the city wants people to walk, pavements and crossing need to be equipped to safely and comfortably accommodate more foot traffic. A multifactorial approach is needed, which requires research into what are the most effective factors that will afford people the ability to use active transport.

Identifying air pollution as a hazard

This is the next step in the legal and policy side of air pollution. There are no safe levels of air pollution and in many cases even a reduction in overall air pollution (average) does not have the desired health effect. Therefore, we need to define air pollution as a hazard to health, not a risk to health. This is analogous to asbestos, which were legally deemed a hazard, meaning that the construction industry can no longer construct with this material. Labeling air pollution a hazard would make a difference in current policy and set a new mental understanding of the danger air pollution presents to people and the environment.

Road analysis

A detailed analysis into road quality, materiality, greening, lights, traffic distribution, and scheduling should be considered to ensure that Red Routes are operating with more efficiency – reducing traffic and noise. There are multiple factors that contribute to traffic not just quantity of cars.

London must start this conversation now. Unless leaders at every level, including this Government, quickly work together to adopt a bold vision for the Red Routes, the capital is at risk of being left behind in a global movement to transform polluted roads to improve people's health and protect the climate.

Appendix 1: Summary of health impact scenarios

Health impact scenario	Description	Dataset	Priority Red Routes segment for intervention
Neurodiversity	This scenario looks at people who may be in the neurodiverse community. This can include being on the autism spectrum, dyslexia, tourettes, to dyspraxia. This community is made vulnerable through complex, disorganised, noisy environments as experienced in very dense places. In turn this can drive them indoors, which takes away their agency, ability to find a job, and increase loneliness.	Population density SRS IMD	Between Poplar and Bromley-by-Bow *(RR12)*
Mobility equity	This scenario looks at how easy it is for people to be able to get around in a safe and healthy way. It considers how mobility exposes people to stressors. For example, long commutes to work can lead to greater exposure to air pollution. The longer a person must wait for public transport can elongate stress. Poor transport links can also pose a physical and psychological hazard to those in marginalised communities such as transgender people, Muslim women, young people, parents and the elderly. This hazard can be categorised as a psychosocial stressor.	Level of public transport accessibility SRS IMD	Between Northolt and Cranford *(RR82)*
Susceptibility	This scenario looks at people who are most at risk of poor health outcomes. The elderly are vulnerable owing to their systems having far less capacity to adapt to environmental stressors. This is exacerbated by comorbidities such as dementia, Parkinson's or cardiovascular problems. The elderly may also walk slower and feel safer on busier roads, which exposes them to environmental stressors for longer, including air pollution. For children, their systems are in early development alongside air pollution exposure, which means allostatic load can set in at a very early age. In turn this leaves a person susceptible to poor health outcomes at a later stage in life.	Population density of age groups (0 – 15 and 65+) SRS IMD	For children: Between Whitechapel and Limehouse *(RR7)* For elderly: Between Chelsea and Pimlico *(RR113)*
Race-based inequity	This scenario seeks to highlight how Black, Asian and minority ethnic communities are marginalised and to ensure that the impacts of structural racism are considered in decision making.	Proportion of Black, Asian and minority ethnic residents SRS IMD	Between Limehouse and Poplar *(RR9)*
Car ownership	This scenario looks at the relationship between car ownership, environmental stressors and deprivation. This is relevant to ensuring equitable mobility. The assessment results for this scenario were not as linear as others, however, there is a clear narrative where areas of high deprivation and high environmental stressors have significantly lower than average car ownership. The reverse is also shown. This points to how those creating the stressors are often not those dealing with the impacts.	Stress Risk Score Car ownership levels IMD	Between Elephant and Castle and Kennington *(RR108)*

Appendix 2: Examples in other global cities

In 2016, the Mayor of Paris declared 'the end of the urban motorway' in the city and introduced a scheme along the River Seine that restricted access to motor traffic. Photo source.

The Poblenou Superblock in Barcelona began a programme of work in the past few years to reclaim roadspace in the city that helps to either limit or slow down motor traffic. Photo source.

In Madrid, a busy road was tunneled underground and opened in 2015 to create ten kilometres of long parkland area connecting people to the river. Photo source.

Around 15 years ago the Mayor of Seoul partly demolished an elevated road to restore a stream running through the city and elsewhere being turned into a skygarden. Photo sources.

Appendix 3: How to use the data matrix

The data matrix is available for download here.

The matrix can be used to create different "scenarios" to understand various types of inequities that are occurring on the Red Routes. Within each scenario, there is a rating for comparative reasons.

In the identification of the different scenarios, the matrix can be used to make decisions around areas to prioritise in relation to specific challenges. Seeing the city as one macrocosm can often lead to blanket one-size-fits-all policies, which may not reflect the variability of the lived experience.

The goal of this work is to provide an in-depth and more nuanced lens to make more informed decisions and policy recommendations.

LIMITATIONS

1. It is important to state that there are always limitations when using data. Data is not a substitute to actual lived experience and if there was a need for more nuanced information, it would be our recommendation to follow up this work with a survey.

2. Technically all areas on Red Routes are priority and it is recommended that within ten years they become significantly healthier and safer.

3. References to priority means prioritising specific health needs for specific communities along the Red Routes based on the recommended scenarios.

ETHICS OF USE

1. It is important for this work to comply within an antiracist/ classist framework. This means acknowledging the intersection between structural racism, poverty and health within urban environments.

2. The matrix format can only be used within the context of Red Routes and its health implications. It cannot be used in the context of any other assessment.