MDA No.: 1378

Title: Clean Air for All Londoners

1. Executive Summary

1.1 At the Environment Committee meeting on 27 January 2022 the Committee resolved that:

Authority be delegated to the Chair, in consultation with party Group Lead Members, to agree any output arising from the discussion.

1.2 Following consultation with party Group Lead Members, the Chair agreed the Committee's report *Clean Air for All Londoners* as attached at **Appendix 1**.

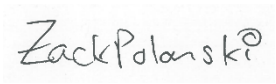
2. Decision

2.1 **That the Chair, in consultation with party Group Lead Members, agree the Committee's report *Clean Air for All Londoners*, as attached at Appendix 1.**

Assembly Member

I confirm that I do not have any disclosable pecuniary interests in the proposed decision and take the decision in compliance with the Code of Conduct for elected Members of the Authority.

The above request has my approval.

Signature: 

Printed Name: **Zack Polanski AM**

Date: **23 March 2022**

3. Decision by an Assembly Member under Delegated Authority

Background and proposed next steps:

3.1 The terms of reference for this investigation were agreed by the Chair, in consultation with relevant party Lead Group Members and Deputy Chairs on 24 January 2022 under the standing authority granted to Chairs of Committees and Sub-Committees. Officers confirm that the report and its recommendations fall within these terms of reference.

3.2 The exercise of delegated authority approving the report *Clean Air for All Londoners* will be formally noted at the Environment Committee's next appropriate meeting.

Confirmation that appropriate delegated authority exists for this decision:

Signature (Committee Services): F.Bywaters

Printed Name: Fiona Bywaters

Date: 23 March 2022

Telephone Number: 07825 028 318

Financial Implications: NOT REQUIRED

Note: Finance comments and signature are required only where there are financial implications arising or the potential for financial implications.

Signature (Finance): Not Required

Printed Name:

Date:

Telephone Number:

Legal Implications:

The Chair of the Environment Committee has the power to make the decision set out in this report.

Signature (Legal): 

Printed Name: Emma Strain, Monitoring Officer

Date: 14 March 2022

Telephone Number: 020 7983 6550

Supporting Detail / List of Consultees:

- Tony Devenish AM (Deputy Chairman)
- Léonie Cooper AM
- Hina Bokhari AM

4. Public Access to Information

4.1 Information in this form (Part 1) is subject to the FoIA, or the EIR and will be made available on the GLA Website, usually within one working day of approval.

4.2 If immediate publication risks compromising the implementation of the decision (for example, to complete a procurement process), it can be deferred until a specific date. Deferral periods should be kept to the shortest length strictly necessary.

4.3 **Note**: this form (Part 1) will either be published within one working day after it has been approved or on the defer date.

Part 1 - Deferral:

Is the publication of Part 1 of this approval to be deferred? NO

Part 2 – Sensitive Information:

Only the facts or advice that would be exempt from disclosure under FoIA or EIR should be included in the separate Part 2 form, together with the legal rationale for non-publication.

Is there a part 2 form? NO

Lead Officer / Author

Signature: 

Printed Name: Ana Maria Noguera

Job Title: Senior Policy Advisor

Date: 22 March 2022

Telephone Number: 07894954256

Countersigned by Executive Director:

Signature: 

Printed Name: Helen Ewen

Date: 23 March 2022

Telephone Number: 07729 10898

Appendix 1

Clean Air for all Londoners

Environment Committee

LONDONASSEMBLY

Environment Committee

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Foreword

Zack Polanski AM

Chair of the Environment Committee

Very little is more crucial than the air we breathe. As elected representatives we have a responsibility to ensure the health and safety of Londoners. It is well documented that toxic air has a harmful effect on our health, in particular it can be the cause of and exacerbate dangerous respiratory diseases including asthma. Both through medical expertise and the moving campaign work of Rosamund Kissi-Debrah, whose 9 year old daughter died from London's toxic air, it is increasingly highlighted how particularly damaging this can be for children's health.

This report examines the current state of London's air pollution in the context of the World Health Organisation's (WHO) guidance, national legal limits and the Mayor's efforts to tackle toxic air. This work follows two detailed panel investigations into London's air pollution conducted in January and February 2022.

The new WHO guidelines have highlighted that legal air pollution limits do not necessarily equate to safe limits, particularly in relation to particulate matter. The WHO have made it very clear that there is no level at which air pollution is actually harmless. Therefore, any improvements we make to air quality will always have a beneficial impact and we must continue to strive to do so.

This report follows on from the Committee's report in February 2021 "Clearing the air: pollution in London". Air pollution is still a prevalent issue in the capital. On 14th January, the Department for Environment, Food and Rural Affairs' UK Air Website released a severe warning for London, cautioning against outdoor exercise due to unusually still air around the capital, meaning that the high levels of pollution from transport and other sources were concentrated above the city and not dispersed as they normally would be. We must tackle this head on - as it's unacceptable for us to warn people against going outside.

We all want to prevent health problems resulting from exposure to emissions and breathing in toxic air. To ensure the health and improve the safety of Londoners we must remain focussed on tackling emissions and improving air quality in our capital.

This report will look at the Mayor's initiatives focused on reducing levels of unsafe and unhealthy air pollution in London, and evaluate which of these have been effective and what could be improved. It will assess the progress of the Mayor's work on air quality to date with reference to the new WHO guidelines.

Acknowledging the different sources of pollutants, the report will look at non-transport sources of emissions in London, such as domestic wood burning and incineration. It will also look at transport emissions and initiatives to reduce these, including the Ultra Low Emission Zone, road filtering, Non-Road Mobile Machinery and deliveries.

The recommendations represent the Environment Committee's consensus view on what further steps should be taken to bring London's air pollution in line with the new WHO advised pollution limits - an absolute necessity to improve the health and wellbeing of those in the capital.

Executive Summary

Since the Mayor's election in 2016, air pollution has been a key part of the Mayor's programme. This includes raising awareness, collecting data and supporting reductions in emissions. A particular focus has been on motor transport pollution; however, London's air quality is impacted by emissions from a number of different sources.

In 2016, over two million Londoners lived in areas which exceeded air pollution limits.[1] By 2019, the number of people living in areas that exceeded these legal limits had reduced by 91 per cent, but at that time there were still 174,000 people in London living in areas with polluted air.[2]

London's poor air quality led to over 1,700 hospital admissions for asthma and serious lung conditions between 2017-2019.[3] During that same period, seven per cent of all asthma admissions of children in London were a result of air pollution.

Recent research from Imperial College London links unsafe levels of air pollution to an increased risk of Covid-19.[4] There is evidence that long-term exposure to air pollution, prior

[1] TFL, Travel in London Report 14 , September 2021
[2] TFL, Travel in London Report 14 , September 2021
[3] Mayor of London, Health impact assessment of current and past air pollution on asthma in London. 28 February 2022
[4] GLA press release. Air pollution linked to greater risk of Covid-19 hospitalisation. September 2021

to the pandemic, increases people's susceptibility to poorer outcomes from Covid-19 hospitalisation.[5]
This report looks at how London's air quality is affected by emissions from various sources, including domestic combustion and incineration as well as transport. Since 2003, particulate emissions from domestic wood burning have more than doubled.[6] In 2019, 17 per cent of London's particulate matter was due to domestic wood burning. In May 2021, restrictions came in from the Government which curb the ability to buy both coal and wet wood for home burning.

In 2019-20, although London sent the smallest proportion of local authority waste to landfill (2.7 per cent), it also sent the largest proportion of the total local authority-collected waste to incineration at 63.3 per cent (2.3 million tonnes), burning half its waste for energy. [7] The Environment Committee's recent investigation and report *Too Good to Waste* looked at London's waste in more detail and set out six recommendations with a focus on reducing waste by increasing reuse, repair and recycling, moving London to a circular economy. Incinerators tend to be placed in industrial areas, and they are generally three times more likely to be in poorer areas.[8] Evidence for their direct impact on public health is limited, and we heard in our evidence gathering sessions that "a properly operated modern incinerator should have minimal impacts on health". [9]

The Mayor's 2018 London Environment Strategy pledged that London would have the best air quality of any major world city by 2050[10] and outlined proposals for improving it. The Mayor has recently published a report by Element Energy, which looked at how to achieve Net Zero in London by 2030.[11] The Mayor's updated pathway for 2030 outlines that to meet climate change targets, car traffic must reduce by at least 27 per cent in London by the end of the decade.[12] Policy to support this target would include introducing London-wide road user charging by the mid-late 2020s**;** location of services, housing and employment in selected areas to reduce travel need by 2030; traffic and parking control measures; significant improvement in public transport; supporting the consolidation of freight and making use of sustainable solutions for last mile deliveries in selected areas, among others.

Strategies to improve air pollution mainly focus on nitrogen oxide (NO2) and particulate matter (PM). There are serious risks to health from exposure to both NO2 and PM, but also from ozone (O3) and sulphur dioxide (SO2). Harmful levels of these pollutants can lead to respiratory diseases, such as asthma, and potentially fatal heart disease, cancer and strokes.

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[5] Imperial College. Investigating the links between air pollution, Covid-19 and lower respiratory infectious diseases. September 2021
[6] UK Government. Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5). February 2021
[7] DEFRA, Statistics on waste managed by local authorities in England in 2019/20, March 2021
[8] Unearthed, Greenpeace. UK waste incinerators three times more likely to be in poorer areas. July 2020
[9] Environment Committee, Air pollution, Benjamin Barratt, https://www.london.gov.uk/about-us/londonassembly/meetings/ieListDocuments.aspx?CId=305&MId=7061&Ver=4, January 2022
[10] Mayor of London, London Environment Strategy, May 2018
[11] Element Energy, Analysis of a Net Zero 2030 Target for Greater London, January 2022
[12] https://www.london.gov.uk/what-we-do/environment/climate-change/zero-carbon-london/pathways-net-zero-carbon-2030, January 2022

Toxic air pollution is particularly harmful to children and can reduce the growth of lungs in children by as much as five per cent, leading to a range of respiratory problems.

London's bus and taxi network have both seen dramatic decreases in polluting vehicle use since 2017. 4,000 London buses have been successfully retrofitted, emitting up to 95 per cent less NOx emissions and 80 per cent less PM than before.[13] In January 2021, TfL announced that all buses on its network were compliant with ULEZ standards, a total of 9,000 vehicles.[14]

A number of transport initiatives across London have been introduced to improve air quality. School Streets initiatives restrict vehicle access during school drop-off and pick-up times, air quality monitoring of 30 monitors across three London boroughs have demonstrated a clear reduction in air pollution near some schools.[15] Many new local transport schemes have been introduced across London since the first Covid-19 lockdown. Research is ongoing as to how beneficial they have been for air quality.

As well as introducing the expanded Ultra Low Emissions Zone (ULEZ), the Mayor introduced the London-wide Low Emission Zone for heavy vehicles.[16] The Mayor has also worked with TfL and several boroughs to introduce 12 Low Emission Bus Zones, 15 Low Emission Neighbourhoods and the first Zero Emission Zone in Hackney.[17]

Compliance with the ULEZ has been high, so far 92 per cent of vehicles driving into the zone have been compliant,[18] up from 87 per cent in the two weeks before the scheme was launched.[19] Since implementation, on average there were around 47,000 fewer older, more polluting vehicles seen each day in the zone compared to the two weeks before the scheme was introduced, a reduction of 37 per cent. There were also 11,000 fewer vehicles driving at all, each day, however one in four vans in London are not yet compliant.

The scrappage scheme has already helped remove over 12,000 vehicles from the road, including more than 6,700 cars, over 5,200 vans, over 100 HGVs and 20 coaches. In July 2021, the Mayor announced an additional £5 million for scrappage, bringing the funds to a total of over £61 million[20]. The Mayor's announcement about the new scrappage scheme in March 2022 included a "commitment to help charities, small businesses, disabled people and Londoners on lower incomes adapt to the potential London-wide ULEZ, with as big a scrappage scheme as is feasible to help motorists in outer London scrap their older, more polluting vehicles and instead switch to cleaner forms of transport, use a car club vehicle or purchase newer, cleaner models that are ULEZ-compliant. He will also call on the

[13] TfL. TfL Press Release - London's buses now meet ULEZ emissions standards across the entire city. 14 January 2021
[14] TfL. TfL Press Release - London's buses now meet ULEZ emissions standards across the entire city. 14 January 2021
[15] Mayor of London. New studies show School Streets improve air quality. 9 March 2021
[16] GLA, London Environment Strategy: Second Progress Report September 2021
[17] GLA, London Environment Strategy: Second Progress Report September 2021
[18] GLA press release. 92 per cent of vehicles comply with expanded ULEZ one month on December 2021
[19] Mayor of London Expanded Ultra Low Emission Zone - First Month Report, 10 December 2021
[20] Mayor of London. https://www.london.gov.uk/questions/2021/4254. October 2021.

Government to provide extra support for a scrappage scheme in London – like they have done for other cities around the country"[21].

Non-Road Mobile Machinery (NRMM) is tightly regulated following a similar Euro-style set of standards to road vehicles[22] and the government has changed the regulations around Red Diesel in order to reduce emissions. The Mayor's powers to regulate construction sites are limited. Recognising this, the Mayor has put in place a Low Emission Zone which, similarly to the ULEZ regulations, requiring NRMM in the zone to meet a certain 'stage'. The zone covers the Central Activities Zone and Opportunity Areas, including Canary Wharf.

The London Environment Strategy set out that London's freight accounts for ten per cent of PM2.5 emissions and a fifth of its traffic. During the pandemic, there has been an increase in the proportion of online sales,[23] with the number of parcels delivered in London expected to double by 2030.[24] These impacts should be further studied comparing date before, during and post pandemic.

This report follows previous work from the Environment Committee on air pollution, including the report "*Clearing the air: pollution in London"* published last year. This report looked specifically at air pollution in London and the Mayor's progress in this area, outlining 12 recommendations in key areas for improvement, such as air pollution and health, non-transport emissions, and transport-related emissions.

The report looks at these issues in further detail, along with considering the Mayor's initiatives to reduce air quality. The Committee welcomes the Mayor's recent announcement to expand the ULEZ London-wide[25] and the associated scrappage scheme. The following recommendations outline areas for further improvement, including what should be included in the consultation on the expansion of the ULEZ.

[21] Mayor of London. https://www.london.gov.uk/press-releases/mayoral/mayor-sets-out-london-wide-ulez-plans, March 2022
[22] London Assembly, Control of Dust and Emissions 8 July 2014
[23] ONS. Internet sales as a percentage of total retail sales. 18 January 2022
[24] Centre for London. Worth the Weight. November 2021
[25] It should be noted that the Conservative Group dissents from this point.

Recommendations

Recommendation 1

Zero Emission Zones are set to come in within London from 2025 - the Mayor should review the timeline and incorporate these zones as part of the overall picture for emissions reduction, and make clear the part they should play.

Recommendation 2

The Mayor should call on the government for further powers to support a specific target for the reduction of domestic wood burning in London, accompanying his earlier commitment made in November 2021 to provide annual statistics on domestic wood burning to enable closer and more frequent monitoring of progress.

Recommendation 3

The report *Analysis of a Net Zero 2030 Target for Greater London* by Element Energy, along with the Mayor's response *London Net Zero 2030: An Updated Pathway* outline that parking policies are a part of reducing car use. The Mayor should set out how parking policies from TfL, the boroughs and measures such as the Workplace Parking Levy can reduce car use in a fair way that considers disabled people and areas of lower public transport provision.

Recommendation 4

The Mayor should consider how to support Londoners concerned about air pollution in local areas, including those in Air Quality Management Areas (AQMAs), and Air Quality Action Plan (AQAP) with access to new, live pollution monitoring, especially particulate matter and nitrogen oxides such as that supported by the Breathe London Network.

Recommendation 5

Policies that enable more active travel and sustainable transport, particularly walking and cycling, should continue to be supported across London. An evaluation should be published

of the impact of scrappage schemes to date in shifting Londoners' behaviour, including their use of walking and cycling.

Recommendation 6

Monitoring of pollution from London's red route network of roads, which are in the Mayor's control, should be strengthened, incorporating new monitoring of air quality emissions due for the Silvertown Road Tunnel project. A regular report should be produced on the changes in pollution on main roads, to provide an objective measure of progress.

Recommendation 7

The Mayor's updated 2030 net-zero pathway states that measures relating to modal shift originally due by 2041 will now need to be largely met by 2030. In light of this, a clear picture of how this changes existing targets and their contribution to pollution should be provided by the Mayor to aid tracking progress.

Recommendation 8

The forthcoming consultation on further measures including a wider ULEZ and road user charging to reduce London's air pollution, congestion and carbon emissions should include a summary of expected impacts so that Londoners can understand the likely benefits and changes in their area, including details of alternatives that were considered.

Recommendation 9

The Mayor should continue to call on the government for further powers to regulate NRMM via a user-charging scheme akin to the ULEZ, with penalties for non-compliant plant and machinery, including monitoring at construction sites.

Recommendation 10

The Mayor should lobby government for requirements on developers of construction sites to conduct detailed air quality monitoring, which is accurate enough to assess compliance with both legal and safe levels of air pollution (NOX, PM10, PM2.5) as determined by WHO standards set out in September 2021.

Recommendation 11

The Mayor should commission a study to assess how shifts in transport use and the increase in online sales may have changed air pollution since the beginning of the Covid-19 pandemic, due to factors such as an increase in household deliveries and home-working.

Recommendation 12

The Mayor and London boroughs should consider a best practice scheme to champion those businesses who are acting to support clean air in London, and who are embracing zero or low emission practices.

Background

The Mayor has linked improving London's air pollution with the challenge of climate breakdown. He also sees it as a social justice issue, with poor air pollution affecting the poorest Londoners,[26] as set out in his 2016 and 2021 election manifestos.[27] He has advocated for changes nationally and internationally, linking air pollution issues with social justice and wider concerns relating to climate change, including in his role as chair of the C40 international network of cities taking action to confront climate change.[28]

The London Environment Strategy states that 'the Mayor is committed to improving air pollution as soon as possible but recognises pollution will still be unacceptably high for a number of years due to historic policy failure and inaction, which have contributed to the scale of the problem'.[29]

The Mayor's 2018 London Environment Strategy pledged that London would have the best air quality of any major world city by 2050.[30] London's air pollution is reliant not just on the practices carried out in the city, but also beyond its border, from industrial practices in the UK to the emissions of other countries. Therefore, understanding how to tackle air pollution in the capital must be contextualised within a national and international effort to meet net zero

[26] Mayor of London, London Environment Strategy, May 2018
[27] Sadiq Khan, Labour Party, Sadiq for London Manifesto . April 2021
[28] C40 Cities
[29] Mayor of London, London Environment Strategy, May 2018
[30] Mayor of London, London Environment Strategy, May 2018

emissions and reduce waste. This report will outline the importance of clean air for people's health and set out a number of areas where changes in policy could improve air pollution over time.

Monitoring the city's air - the London Atmospheric Emissions Inventory

One of the key datasets for assessing air pollution in the capital is the London Atmospheric Emissions Inventory (LAEI), which covers the area within and including the M25 motorway.[31] It includes estimates of all forms of emissions in London including domestic, commercial, transport and heat generation as well as several smaller sources. Emissions are then input into a model including weather patterns and wider 'background emissions' from outside of London to determine dispersion down to 20-meter areas, producing concentration maps. Some of this information is collected using estimates based on travel data and estimates of the variability in the model of each vehicle type, other data is a scaled down version of national emissions levels.

Recent results for the period from 2016 to 2019 indicate that:

- Particulate emissions have seen an overall reduction of only 1.5 per cent;Nearly 1.2 million Londoners lived in areas meeting the WHO interim guideline of 10 µgm-3 in 2019. In 2016 it was estimated that there were no Londoners living in areas meeting this target;
- However, all Londoners still live in areas above the newly recommended WHO guideline of 5µgm-3;
- Nitrous Oxide (NO2) is now below the legal limit in most of the capital, apart from a series of roads near Heathrow Airport;
- Modelling suggests that there has been a 97 per cent reduction in the number of Londoners exposed to illegal limits of NO2;
- Nowhere in London meets the World Health Organisation (WHO) recommended annual average guideline target for NO2 of 10µgm-3;
- Most of London is below the legal limit of an annual average of 40 µgm (millionth of a gram) for particulate matter;
- On average, levels of NO2 are 13 per cent higher in the most deprived areas of the capital compared with the least deprived.

Updated figures for the period since the last study, which will cover the period of the Covid-19 pandemic, are due to be released later in 2022.

[31] London Datastore. London Atmospheric Emissions Inventory (LAEI) 2019. December 2021

Air Pollution and Health

Air Pollution and Health

The WHO set out its updated Air Quality Guidelines in September 2021.[32] These guidelines provide an assessment for the thresholds for harmful pollution levels and their potential effects on people's health. The WHO's assessments of a pollutant's concentration are given in micrograms per cubic meter (µg/m3) where possible.

Harmful levels of pollution can lead to respiratory diseases such as asthma and potentially fatal heart disease, cancer and strokes. Ambient (outdoor) air pollution was estimated to have led to 4.2 million premature deaths worldwide in 2016. The WHO estimate that of these 'that in 2016, some 58 per cent of outdoor air pollution-related premature deaths were due to ischaemic heart disease and stroke, while 18 per cent of deaths were due to chronic obstructive pulmonary disease and acute lower respiratory infections respectively, and six per cent of deaths were due to lung cancer.' [33]

The WHO guidelines refer to safe indoor and outdoor limits of particulate matter (PM), nitrogen oxide (NO2), sulphur dioxide (SO2), ozone (O3), dust and certain carbons. The new guidelines are more stringent than legal limits currently in place in the United Kingdom. NO2 has been linked to reduced lung function, ozone can cause asthma and sulphur dioxide can also affect the respiratory system as well as produce acid rain. Ozone is a 'secondary pollutant', which results as the product of the reaction between airborne emissions and sunlight.

The main focus of strategies to improve air pollution is on nitrogen oxide and particulate matter. PM affects more people than any other pollutant. It comes in two forms, that which is 10 micrometres (or microns, 1 thousandth of a millimetre) or less across (PM10) or that which is less than 2.5 microns across (PM2.5). PM can be made up of sulphate, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water in a combination of solids and liquids.

Exposure to PM has been linked to cardiovascular diseases, cancer and acute respiratory conditions. The larger form is dangerous, narrow enough to penetrate lung tissue. The smaller form, at 2.5 microns across is small enough to enter the blood stream. The annual PM2.5 limit as given by the WHO has been reduced from 10ug/m3 to 5ug/m3, as of September 2021. Even at a very low concentration small particulate pollution has health impacts, no threshold has been identified below which no damage to health is observed.

[32] World Health Organisation, ambient-(outdoor)-air-quality-and-health. September 2021
[33] World Health Organisation, ambient-(outdoor)-air-quality-and-health. September 2021

Evidence shows that toxic air pollution can significantly reduce lung capacity in children, by as much as five per cent. Analysis from before the Covid-19 pandemic in 2019 showed that children in London are four times more likely to attend schools in areas with high pollution levels than the rest of England. Last June, the coroner for inner south London, Philip Barlow called for UK limits to be brought in line with WHO guidelines (prior to the September update) following the death of 9 year old Ella Kissi-Debrah as a result of exposure to unsafe levels of PM. Growing up in the borough of Lewisham, Ella died in 2013 from severe asthma.

New analysis shows that the capital's poor air quality led to over 1,700 hospital admissions for asthma and serious lung conditions between 2017-2019.[34] Over the same period, air pollution was responsible for seven per cent of all asthma admissions of children in London. Evidence also shows how improved air quality has reduced the number of people admitted to hospital for these diseases by 30 per cent.

National legal limits

In the UK, the legal limits for the concentration of PM and NO2 are higher than those proposed by the WHO.

Figure 1. WHO ambient air quality guidelines compared to national limits

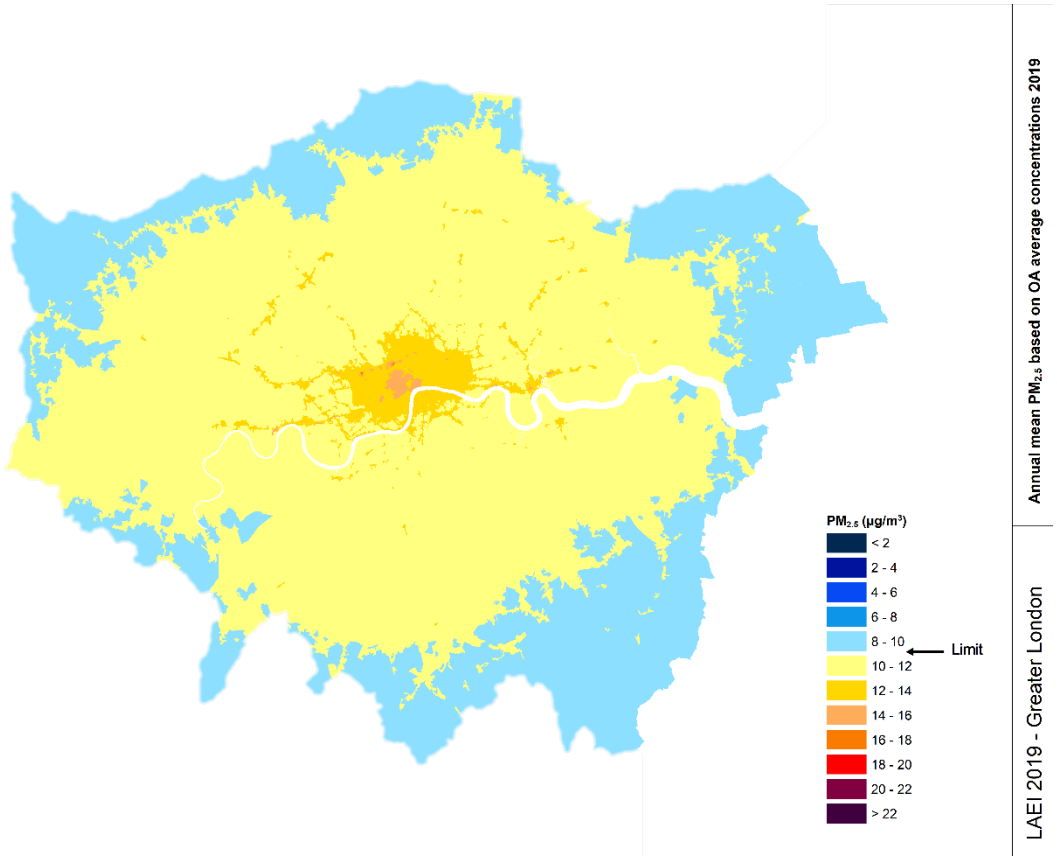
	PM10	PM2.5	NO2
WHO recommended limit 2021	15 µg/m3 annual mean	5 µg/m3 annual mean	10 µg/m3 annual mean
WHO recommended limit 2005	20 µg/m3 annual mean	10 µg/m3 annual mean	40 µg/m3
UK Legal limit	40 µg/m3	25 µg/m3	40 µg/m3

Figure 2 and Figure 3 below demonstrate that in 2019 levels of PM2.5 and NO2 in central London were well above the UK legal limit outlined here.

A new Environment Act received Royal Assent in November, with included new language around air pollution recognising that there is no safe level of PM, however it did not include changes to the limits of emissions. For PM, the UK legal limits are 40 µg/m3 for PM10 and 25 µg/m3 for PM2.5, which is higher than even the earlier 2005 guidelines from the WHO.

[34] Mayor of London, Health impact assessment of current and past air pollution on asthma in London. 28 February 2022

Figure 2. Annual average concentrations of PM2.5 in London based on Output Area average concentrations in 2019



Source: LAEI 2019 – Greater London

Figure 3. Annual Mean NO2 concentrations 2019

Source: LAEI 2019 – Greater London

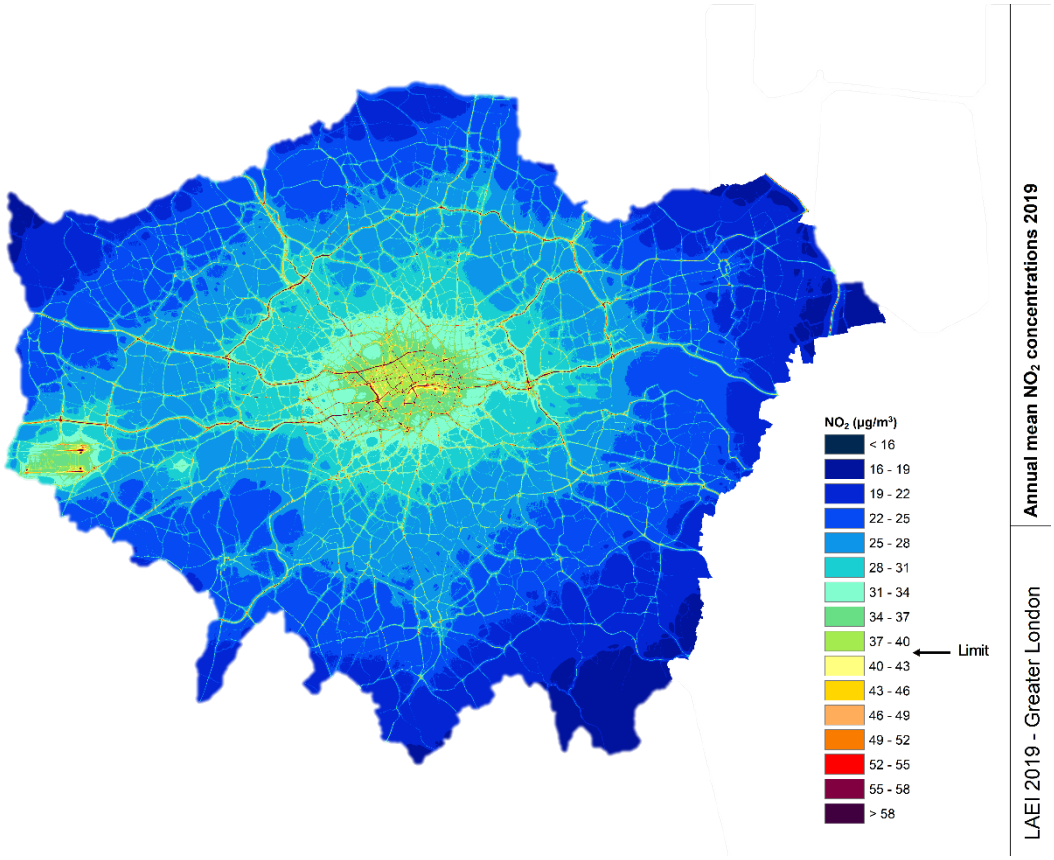


Figure 2 demonstrates that levels of PM2.5 were above the legal limit across most parts of London and well above the limit in central London in 2019.However, there has been a reduction in PM2.5 across the whole of the city, with parts of outer London meeting the limit. Figure 3 shows that levels of NO2 in the capital have reduced across the whole of Greater London, with the majority of the capital meeting the legal limit with the exception of central London.

Air pollution and Covid-19

The Mayor has also promoted the findings of recent research from Imperial College London which links unsafe levels of air pollution to an increased risk of Covid-19. Published in September and commissioned by the Mayor, it is a review of existing research into the connection between air pollution and Covid-19.

It concluded that there is evidence that long-term exposure to air pollution, prior to the pandemic increases people's susceptibility to poorer outcomes from Covid-19 hospitalisation. The evidence is less conclusive when it comes to short term exposure to air pollution and the

importance of particulate matter exposure in relation to contracting the virus. There is already established evidence of the link between air pollution and the risk of acute lower lung infections such as bronchitis but, but PM does not seem to be an important factor in the transportation of Covid-19.

Recommendation 1

Zero Emission Zones are set to come in within London from 2025 - the Mayor should review the timeline and incorporate these zones as part of the overall picture for emissions reduction, and make clear the part they should play.

Non-transport Emissions

Domestic combustion

Domestic combustion is a serious and increasing problem affecting air pollution. Alongside the action that is being taken to reduce transport emissions, to meet the new guidelines set out by the WHO action needs to be taken to tackle other sources of emissions.

According to government statistics since 2003 particulate emissions from domestic wood burning known as PM2.5 have more than doubled.[35] PM2.5 is considered to be the most dangerous form of particulate matter, producing three times more than road traffic and is not visible to the naked eye. In September 2021, after considering updated medical and scientific evidence, the WHO reduced their annual guideline limit for particulate matter from 10 ug/m3 to 5 ug/m3.[36]

With wood burning, there are still a number of myths around its effect on air quality and the resulting effect on people's health. A fire is viewed as something that is natural, something that people have always done. The harm it causes is something that cannot be seen. However, we are gaining new knowledge all the time that is giving us new warnings about how dangerous domestic combustion is and the important of switching to alternatives.

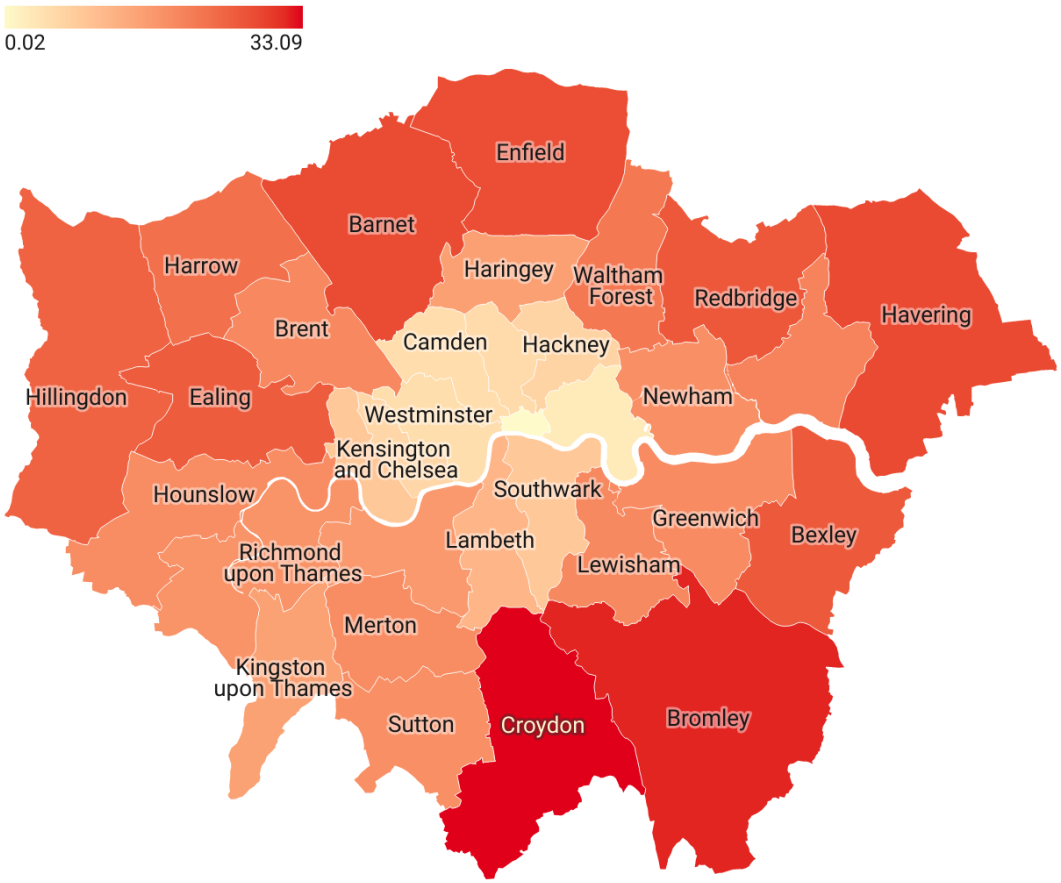
The Mayor currently does not have powers to control or reduce pollution from this source, but has continued to lobby government on this subject. The London Environment Strategy sets out the additional powers required by the Mayor to tackle PM2.5 from non-transport sources.

However, the Greater London Authority has been working with Impact on Urban Health and Kantar on raising awareness of the effects of wood burning. They have been developing a

[35] UK Government. Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5). February 2021
[36] World Health Organisation, ambient-(outdoor)-air-quality-and-health. September 2021

strategy aimed at shifting public behaviour to reduce the negative health impacts resulting from wood burning, this includes a behaviour change and communications campaign.[37]

Figure 4: Estimates of PM2.5 from woodburning – tonnes per borough in 2019



The data also shows an additional 92.29 tonnes from non-GLA sources.

Source: LAEI 2019 • Map data: © Crown copyright and database right 2018 • Created with Datawrapper

Source: LAEI 2019

The latest assessment of London's emissions (2019) concluded that 17 per cent of London's particulate matter is due to domestic wood burning. King's College London 2017 report *Airborne particles from wood burning in UK cities* looked in detail at the effects of wood burning emissions. They outline that taking control of domestic wood burning is an important urban issue.[38]

Figure 4 shows that in 2019 levels of PM2.5 from wood burning were lower in central London boroughs and gradually higher in outer boroughs. In May 2021 the Government introduced restrictions which

[37] https://www.london.gov.uk/decisions/add2553-wood-burning-awareness-raising-london-0 February 2022
[38] King's College London, https://uk-air.defra.gov.uk/assets/documents/reports/cat05/1801301017_KCL_WoodBurningReport_2017_FINAL.pdf March 2017

curb the ability to buy both coal and wet wood for home burning. Sale in smaller amounts under 2 metres squared is now prohibited and when purchasing larger amounts, advice is provided on how to dry the wood before combustion.[39]

Following the introduction of these Government regulations for solid fuels the Greater London Authority has been working with those who sell solid fuels in London, as well as with London boroughs, to raise awareness about the requirements. There has been particular focus on wet wood, which is more polluting than kiln-dried wood.

Government statistics outline that in 2020 domestic combustion was a major source of particulate matter emissions, accounting for 15 per cent of PM10 and 25 per cent of PM2.5. The use of coal in domestic combustion used to be the largest source of particulate matter. The majority of these emissions now come from wood burning in closed stoves and open fires.[40]

The Clean Air Acts have assisted in the reduction of the use of coal for domestic combustion. Coal now accounts for a very small proportion of these emissions, but the use of wood has grown. In 2020 wood burning accounted for 70 per cent of PM2.5 emissions from domestic combustion.[41]

Wood burning contributes significantly to local pollution and the use of wood burning stoves has increased in popularity over recent years. Nearly all London boroughs have declared their area to be a Smoke Control Zone under the Clean Air Act 1993, but it is thought that many living in the capital are not aware they live in a Smoke Control Zone.[42]

In Smoke Control Zones wood and coal should not be burnt as fuel unless the appliance has been tested to ensure it does not create smoke. In the 2018 Environment Strategy the Mayor outlined his plans to reduce emissions from domestic combustion, including wood burning.[43]

Clean Air in London has identified 12 facts about wood burning, climate change and air quality. The full list of these can be found in the Appendix. In December 2021 they called for the banning of domestic wood burning ovens and a new Clean Air Act before the 70th anniversary of the Great Smog in 1952.[44] They highlight the importance of transitioning to clean energy sources.

Domestic combustion, including wood burning, impacts on internal air quality. Use of wood burning directly effects the levels of toxic air inside homes, as well as having wider impacts on the air quality of surrounding neighbours. Indoor air quality monitoring can help in understanding some of the impacts of domestic combustion activity.

[39] UK Government, Restrictions on sale of coal and wet wood for home burning begin , May 2021
[40] UK Government. Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5). February 2021
[41] UK Government. Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5). February 2021
[42] Mayor of London, London Environment Strategy, May 2018
[43] Mayor of London, London Environment Strategy, May 2018
[44] Clean Air London. Ban wood burning in urban areas, December 2021

In November 2021, the London Assembly called for the Mayor to begin a Londonwide awareness campaign to highlight the environmental evidence relating to wood burning fires, and the impact of particular matter in health45.

Mums for Lungs, a grassroots network of parents and other campaigners against air pollution and for children's health across the UK, have written to the Government urging them to phase out wood burning over the next decade where people have alternative sources of heating. They campaign for clear health warnings on wood burners and believe there is a need to end to the selling of wood burning stoves.

[45] London Assembly. Time to recognise the impacts of air pollution from wood stoves | London City Hall. November 2021

CASE STUDY: Eco Stoves

Emissions from heat sources vary depending on a number of different factors, including the age and size of the stove, which fuel is used, technology and location. Firewood quality, most importantly moisture content, and management of the stove, including air supply, can also affect the emissions.

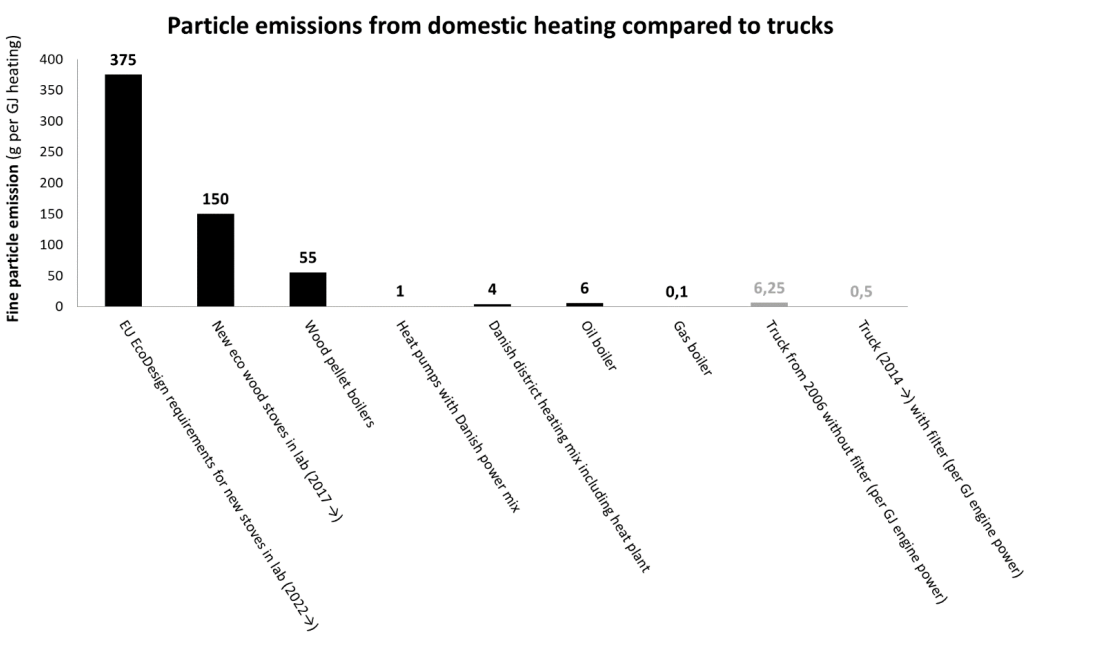
New wood stoves generally emit lower concentrations of particulate matter than older stoves, but they can emit higher levels of nitrogen dioxide and black carbon. Eco stoves are currently sold in the UK with the aim of reducing emissions from wood burning. All new stoves must meet emissions standards and eco stoves have been approved by the Department for Environment, Food and Rural Affairs.

Mums for Lungs have highlighted serious concerns around the DEFRA approved eco stoves. They point to research by the European Environmental Bureau which demonstrates that eco stoves fail to reduce emissions to acceptably low levels.

The research by European Environmental Bureau found that eco stoves are allowed to emit 60 times as much particulate matter as an old truck from 2006 and 750 times as much as a newer truck from 2014 per GJ. In 2022 a new eco wood stove, **wood stoves with the Nordic Swan ecolabel,** is allowed to emit 5 g of fine particles per kilogram of wood. [1] This demonstrates that emissions from wood burning are under regulated compared with the regulation of heavy vehicles.

Mums for Lungs have used this research to highlight serious concerns over lack of clear health warnings on wood burners.[2] People may purchase a wood burner with the label "eco" or "eco design" and therefore think that it is safe without being made aware of the air pollution it can cause within their home and the homes of their neighbours.

Figure 4. Particle emissions (PM2.5) from heat sources (g pollutant per GJ house heating).



Source: European Environmental Bureau, Where-theres-fire-theres-smoke_domestic-heating-study_2021.pdf (eeb.org), September 2021

[1] European Environmental Bureau, Where-theres-fire-theres-smoke_domestic-heating-study_2021.pdf (eeb.org), September 2021

[2] Mums for Lungs, Wood Burning — Mums for Lungs, November 2021

Recommendation 2

The Mayor should call on the government for further powers to support a specific target for the reduction of domestic wood burning in London, accompanying his earlier commitment made in November 2021 to provide annual statistics on domestic wood burning to enable closer and more frequent monitoring of progress.

Incinerators

Incinerators tend to be placed in industrial areas, but according to Unearthed (Greenpeace) they are generally three times more likely to be in poorer areas.[46] In 2019-20 London sent the smallest proportion of English local authority waste to landfill (2.7 per cent). However, it also sent the largest proportion of the total local authority-collected waste to incineration at 63.3 per cent (2.3 million tonnes), burning half its waste for energy.[47]

In April 2020, a report was published by Air Quality Consultants on behalf of the Greater London Authority which looked at the health impacts of incinerators, or 'energy from waste' (EfW) facilities.[48] The report conducted a thorough literature review of 35 research papers published in the prior five years. It concluded that '*any potential health risks associated with direct emissions from modern, effectively managed and regulated EfWs in London are exceedingly low.*'

However, the study also looked in detail at the five incinerators in London, modelling dispersion of particulate matter and nitrogen oxides, based on on-site emissions data recorded by the Environment Agency where possible. It found that concentration of both particulate matter and nitrogen oxides were higher closer to the facilities. In total, 15 deaths of London residents per year are calculated to be attributable to emissions of nitrogen oxides and particulate matter from the five EfW facilities.

During its investigation the Committee heard from Dr Benjamin Barratt from the MRC Centre for Environment and Health, Imperial College London, that while a properly operated modern incinerator should have minimal impacts on health, the key is in ensuring that they are properly monitored. An incinerator must be inspected, regulated and operated to the best available standards, with operators being held to account. A poorly operated incinerator would have a detrimental impact on air quality. Monitoring the incineration of waste is the responsibility of the Environment Agency.

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[46] Unearthed, Greenpeace. UK waste incinerators three times more likely to be in poorer areas. July 2020
[47] DEFRA, Statistics on waste managed by local authorities in England in 2019/20, March 2021
[48] Air Quality Consultants on behalf of GLA, Health Effects due to Emissions from Energy from Waste Plant in London, May 2020

Movements of waste to and from the incinerator must also be considered. According to Dr Barratt, 'The other aspect is around lorry movements of waste to and from the incinerator itself, which is likely to be a greater health risk than the incinerator.' [49] Included in this are aspects such as the route lorries will take, frequency of their movements and emissions from the lorries themselves. Monitoring air quality assists in understanding the impact from this.

A new project is proposed by the North London Waste Authority for the Edmonton incinerator, in the North London borough of Enfield[50] which will see it rebuilt and expanded. The project will see the development of a 'North London EcoPark' built by North London Heat and Power[51] on behalf of the North London Waste Partnership.[52] They claim it will be among the safest and greenest energy recovery facilities in the country[53] and approval followed local consultation.[54] It has experienced some local opposition with a campaign called 'Stop the Rebuild'[55] and a group of doctors and other NHS staff in north London voicing their concerns about the proposals.[56]

On 11 June 2021, when asked for his position on the Edmonton Incinerator (see appendix). In the Mayor said *"I have been clear that London is facing a climate emergency and I will continue to oppose new incineration capacity in London, which is not needed to manage the city's non-recyclable waste. My focus continues to be on increasing recycling services and rates across London. Where incinerators already exist, they should operate to the highest standards and capture energy from waste to heat local houses."*

Bloomberg Philanthropies is providing funding for 60 air quality monitors which will be awarded to local London communities.[57] This is to enable communities to investigate local air quality issues and to drive change, awareness and education around air pollution. The Committee heard that the Edmonton incinerator might be an example where the local community could come together to apply for one of these air quality monitors to help monitor the impact of truck movements to and from the incinerator.

[49] Dr Benjamin Barratt, https://www.london.gov.uk/about-us/londonassembly/meetings/ieListDocuments.aspx?CId=305&MId=7061&Ver=4, January 2022
[50] Guardian, MPs call for halt to Britain's incinerator expansion plans, December 2021
[51] North London Power
[52] Barnet, Camden, Enfield, Hackney, Haringey, Islington, Waltham Forest
[53] North London Power
[54] North London Power
[55] Stop The Edmonton Incinerator Now
[56] My London News, 'I've met people who have developed asthma only after moving to the area': NHS doctors slam incinerator plans in North London, December 2021
[57] Bloomberg Philanthropies, https://www.bloomberg.org/press/mayor-of-london-and-bloomberg-philanthropies-launch-new-community-program-to-tackle-toxic-air/, October 2021

Transport-related Emissions

Pathways to Net Zero

On 18 January 2022, the Mayor published a new report into '*Pathways to Net Zero*' in the capital.[58] It states that in order to meet climate change targets, car traffic must reduce by at least 27 per cent in London by the end of the decade[59]. Walking and cycling could replace a large number of car trips taken – more than a third could be taken instead by a 25-minute walk and two-thirds could be cycled in under 20 minutes, which would bring down emissions and improve health and personal wellbeing by promoting exercise.

The report sets out several proposals, dependent on pathway scenarios which would help the capital meet its targets. The scenarios are dependent on changes in the transport and energy industries, with the expectation that smaller road vehicles will largely be electrified by 2030, whereas larger HGVs will be more likely to be powered by hydrogen.[60] These proposals include encouraging modal shift towards public transport, walking and cycling, London-wide road-user charging and the banning of internal combustion engine (ICE) cars and vans entirely. Freight transport should also be shifted to non-road modes such as rail and river transport, where emissions are low. Last-mile deliveries by light goods vehicles (LGVs) should be replaced by low emission replacements such as delivery cycles. [61]

Recommendation 3

The report *Analysis of a Net Zero 2030 Target for Greater London* by Element Energy, along with the Mayor's response *London Net Zero 2030: An Updated Pathway* outline that parking policies are a part of reducing car use. The Mayor should set out how parking policies from TfL, the boroughs and measures such as the Workplace Parking Levy can reduce car use in a fair way that considers disabled people and areas of lower public transport provision.

Low Emission Bus Zones

As well as introducing the ULEZ since the Mayor's election, in 2017 he also began the roll out of Low Emission Bus Zones (LEBZs).[62] Low Emission Bus Zones are bus corridors that are used only by buses with top-of-the range engines and exhaust systems that meet or exceed the highest Euro VI emissions

[58] Mayor of London, Pathways to Net Zero Carbon by 2030, 18 January 2021
[59] Element Energy, Analysis of a Net Zero 2030 Target for Greater London, 18 January 2021
[60] Element Energy, Analysis of a Net Zero 2030 Target for Greater London, 18 January 2021
[61] Element Energy, Analysis of a Net Zero 2030 Target for Greater London, 18 January 2021
[62] Mayor of London. Mayor launches five new Low Emission Bus Zones. 15 November 2018.

standards[63] (these standards already applied to those buses operating in the ULEZ). All twelve zones were completed in 2019, one year ahead of schedule. All Low Emission Bus Zones are in areas where buses account for at least 40 per cent of NOx emissions.

In January 2021, TfL announced that all buses on its network were compliant with ULEZ standards,[64] a total of 9,000 vehicles. The proportion of transport NOx emissions coming from TfL's buses has reduced from 15 per cent to four per cent. £85 million has been spent by TfL to retrofit around 4,000 buses, with each bus now emitting up to 95 per cent fewer NOx emissions and 80 per cent less PM than before. There are plans to introduce 2,000 all-electric buses to be in operation by 2025.

Air pollution will continue to be a high profile issue in the capital until it is brought within safe levels. On Friday 14 January 2022, the Department for Environment, Food and Rural Affair's UK Air website released a severe warning for London, cautioning against outside exercise[65] 'people with lung or heart problems should avoid strenuous physical activity while healthy people should reduce physical exertion, particularly outdoors'. This was the result of unusually still air around the capital, meaning that the high levels of pollution from transport and other sources were concentrated above the city and not as dispersed as they normally would be. It was the first such incident since March 2018, just the latest example of why London's polluted air is a necessary priority for both the Mayor and the Environment Committee.

In 2019, the Mayor was asked about the next steps after low emissions bus zones and his response was "It is worth bringing in the Commissioner to explain the timelines for the next phase, but of the 12 Low-Emission Bus Zones, seven have begun. We are already seeing evidence of the difference they are making to the quality of air in relation to the nitrogen dioxide (NO2) and nitrogen oxide (NOx) and the particulate matters that used to come from the diesel buses and also other vehicles. We have seen huge improvements in Putney High Street in your patch"[66].

[63] Mayor of London. Low Emission Bus Zones: Evaluation Report. September 2019
[64] TfL. TfL Press Release - London's buses now meet ULEZ emissions standards across the entire city. 14 January 2021
[65] Evening Standard, Londoners warned to limit outdoor exercise amid pollution alert for capital on Friday, January 2022
[66] Mayor of London. https://www.london.gov.us/questions/2019/2090-3. April 2019.

CASE STUDY: Putney Low Emission Bus Zone

In August 2016 the Mayor of London announced London's first Low Emission Bus Zone programme, targeting at some of the most polluted roads in the city.[1] The zones include some of the busiest roads in and out of the area adjacent to the original ULEZ, including Putney High Street, Haringey Green Lanes, Edgware Road and Cam Road in Newham.

The first to be completed was at Putney in March 2017 and monitoring is focussed on the busy Putney High Street main facade. The zone starts at Putney rail station and leads all the way down the high street to Putney Bridge Road.[2] At the time of implementation the street exceeded hourly legal levels of NOx 1,248 times per year, the standard limit for hours exceeding these levels was 18 per year.

According to a 2018 evaluation report, in its first year, Putney High Street saw a 99 per cent reduction in the hours where emissions exceeded legal limits.[3] This includes a saving of 17 tonnes of NOx emissions, or a reduction of 85 per cent.

Putney high street

[1] Mayor of London. Low Emission Bus Zones: Evaluation Report. September 2019
[2] Mayor of London. Mayor Launches first Low Emissions Bus Zone.
[3] Mayor of London. Low Emission Bus Zones: Evaluation Report. September 2019

Road filtering schemes

Following the first Covid-19 lockdown which included 'stay at home' orders[67] from the government, many local authorities trialled changes to local roads which might encourage more walking and cycling whilst reduced pollution. In this section we examine two widespread schemes for doing so and what evidence there is for a positive impact on local air pollution.

School streets

The Mayor has supported the rollout of more than 500 'School Streets' through TfL in conjunction with local boroughs.68 The initiative restricts vehicle access during school drop-off and pick-up times, the busiest times of a school day where children will congregate outside of the school and be more exposed to emissions from vehicles. Consequently, they enable a reduced level of traffic and pollution in the immediate vicinity of schools during these times.69 As figure 5 illustrates pollution primarily in the form of PM2.5 (the most harmful) is commonplace in the areas around education settings.

Air quality monitoring of 30 monitors in three London boroughs has demonstrated a clear reduction in air pollution near some schools.[70]

Recent research found that School Streets reduce nitrogen dioxide by up to 23 per cent during morning drop off. In London walking is now the main way 58 per cent of children aged 5-11 get to school. [71]

Schools Streets are considered to have been a success across London boroughs, with many seeing a reduction in traffic within the School Street zones, an increase in the number of pupils walking, cycling or scooting to school and a reduction in the number of pupils traveling to school by car. TfL has set a new target to get 60 per cent of primary children in London walking to school by 2026. A further 80 Schools Streets have been planned across London boroughs in the 2022-23 financial year. [72]

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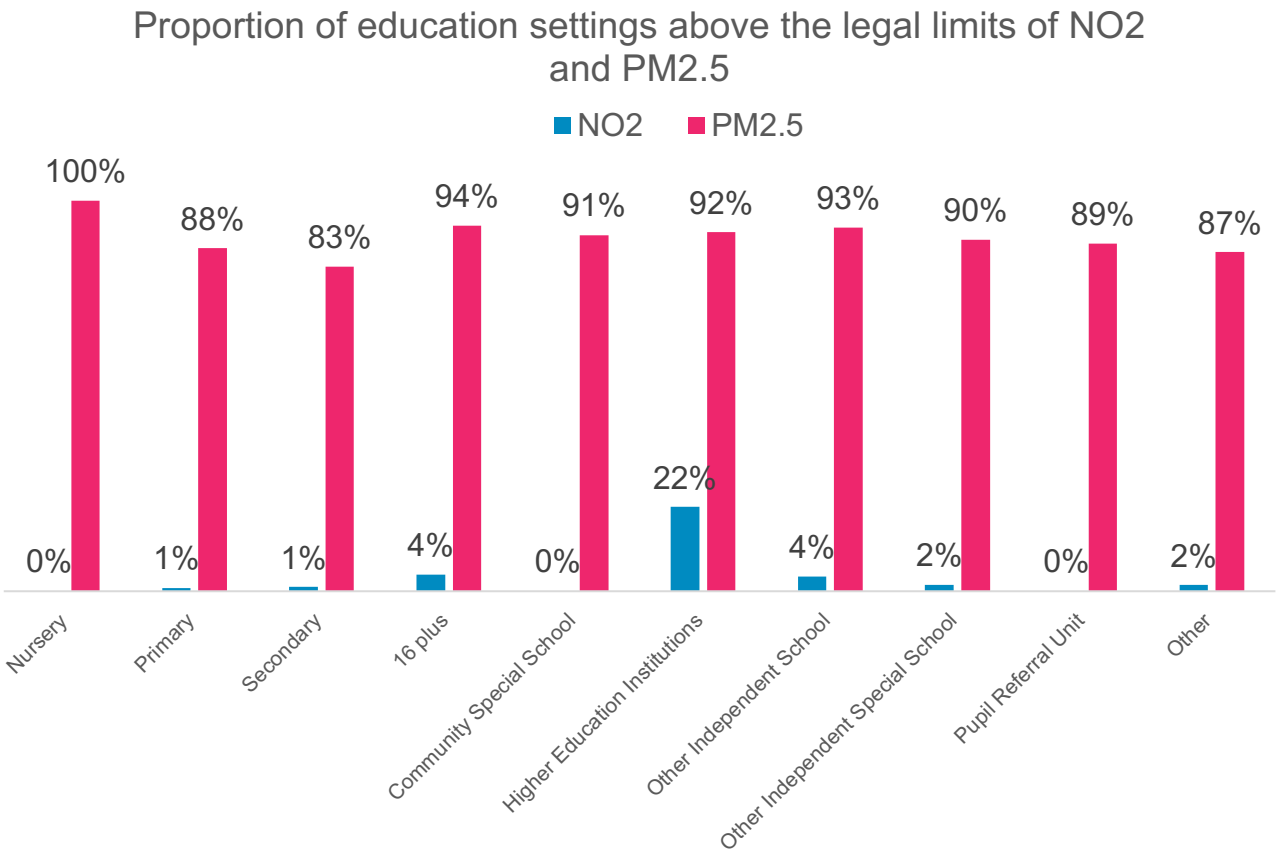
[67] UK Government. Staying at home and away from others (social distancing). 23 March 2020
[68] Mayor of London press release, https://www.london.gov.uk/press-releases/mayoral/mayor-hails-success-of-schools-streets-programme, March 2022
[69] Air Quality Monitoring on behalf of the GLA. Air Quality Monitoring Study: London School Streets. March 2021
[70] Mayor of London. New studies show School Streets improve air quality. 9 March 2021
[71] Mayor of London press release, https://www.london.gov.uk/press-releases/mayoral/mayor-hails-success-of-schools-streets-programme, March 2022
[72] Mayor of London press release, https://www.london.gov.uk/press-releases/mayoral/mayor-hails-success-of-schools-streets-programme, March 2022

Figure 5. Education settings where pollution is above legal limits



Source: London Atmospheric Emissions Inventory (LAEI) 2019

School Streets have strong support from parents, from a sample of 35 schools 77 per cent of parents and carers expressed support for the School Streets changes being kept long term.[73] As evidence from the medical community and the case of Ella Kissi-Debrah illustrated, children's lungs are so vulnerable to our everyday pollution. The school streets initiative is the first step on the path to ensuring their health for the long term.

[73] Mayor of London press release, https://www.london.gov.uk/press-releases/mayoral/mayor-hails-success-of-schools-streets-programme, March 2022

Local traffic and streetspace schemes

During the early stages of the pandemic, national Government asked local authorities to introduce measures to provide more space for walking and cycling on their streets. This included measures such as new cycle lanes, wider pavements and Low Traffic Neighbourhoods (LTNs).

We heard a range of views about the impacts and merits of these measures. A study published last year by Rachel Aldred, professor of transport at the University of Westminster, examined all LTNs introduced in the capital between March and September 2020.[74] It found that across London, people in deprived areas were much more likely to live in a new LTN than people in less deprived areas. People without cars were more likely to live in an LTN overall and LTN residents were demographically similar to neighbours in immediately adjacent areas. It was concluded that LTN implementation has been broadly equitable at the city level and micro level, but not always at the district level.

Researchers estimated that 3.7 per cent of all Londoners live inside a new LTN, and 8.8 per cent live within 500 metres of a new modal filter. In January 2022, it was announced that further investigation by the team at the University of Westminster into London's LTNs has received £1.5 million in funding.

There have been a lot of questions about the pollution impact of these schemes, but the data can be slow to update, and can appear inconclusive. The South London Partnership has already bought over 100 additional Breathe London nodes to measure air quality around schools in Kingston, Sutton, Croydon, Richmond and Merton75. Access to more local data makes it possible to understand progress at individual sites in reducing air pollution.

Scrappage schemes have helped to replace older and more polluting vehicles and switch to cleaner models. This scheme has replaced or retrofitted 10,000 vehicles since 2019 to tackle air pollution in the capital[76].

To support Londoners transitioning to compliant vehicles before the rollout of ULEZ, the Mayor provided an accompanying £23 million in funding for a scrappage scheme in February 2019[77] aimed at supporting the smallest businesses and charities. The Mayor's full programme of scrappage scheme investment up to November 2021 has totalled £61 million, aimed at taking the most polluting vehicles off London's roads. So far, 13,500 vehicles have

[74] University of Westminster. Equity in new active travel infrastructure: a spatial analysis of London's new Low Traffic Neighbourhoods. March 2 2021
[75] Breathe London,
Bloomberg Philanthropies and GLA launch the Breathe London community programme to award AQ sensors to London Communities in efforts to tackle air pollution/ access AQ data, October 2021
[76] Mayor of London. Mayor announces an additional £5 million for scrappage scheme | London City Hall, July 2021.

[77] Transport for London. GLA - Mayor opens £23m van 'scrap for cash' fund. 22 February 2019

been scrapped as part of these initiatives. The Assembly has also passed a motion calling on the Government to allow London to have access to the national Clean Air Fund as cities like Bath and Birmingham have benefited from[78]. The scrappage schemes also included access to discounts on schemes like car and van sharing[79].

Recommendation 4

The Mayor should consider how to support Londoners concerned about air pollution in local areas, including those in Air Quality Management Areas (AQMAs), and Air Quality Action Plan (AQAP) with access to new, live pollution monitoring, especially particulate matter and nitrogen oxides such as that supported by the Breathe London Network.

Recommendation 5

Policies that enable more active travel and sustainable transport, particularly walking and cycling, should continue to be supported across London. An evaluation should be published of the impact of scrappage schemes to date in shifting Londoners' behaviour, including their use of walking and cycling.

ULEZ expansion

The London ULEZ has been in operation since 2019. It initially covered the same area as the Congestion Charge Zone but in October 2021 it was expanded to include the area within (but not including) the North and South Circular roads.[80] It now covers an area populated by more than 4 million people and is the largest of its kind in Europe. Vehicles entering the zone are required to be compliant with a set of standards.

Euro 3 for motorcycles, mopeds, motorised tricycles and quadricycles (L category)
Euro 4 (NOx) for petrol cars, vans, minibuses and other specialist vehicles
Euro 6 (NOx and PM) for diesel cars, vans and minibuses and other specialist vehicles

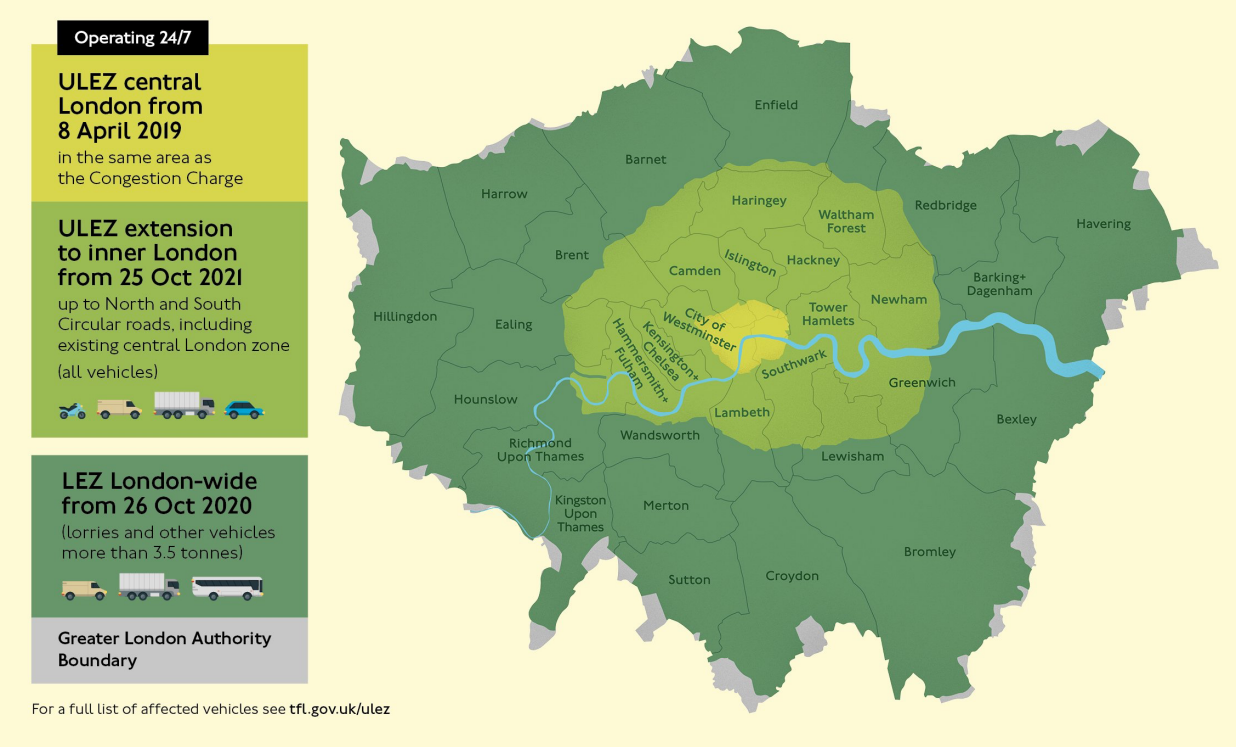
Larger vehicles (above 3.5 tonnes) have to comply to a separate Low Emission Zone charge.[81] If vehicles enter the ULEZ zone and do not meet these standards, they are required to pay a daily charge. For instance, £12.50 for cars.

[78] Mayor of London. https://www.london.gov.uk/motions/ultra-low-emission-zone-and-good-work-standard. November 2021.
[79] Transport for London. https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/organisations-supporting-ulez-scrappage-schemes. March 2022
[80] GLA. The Mayor's Ultra Low Emission Zone for London
[81] TfL. ULEZ standards

So far, ULEZ compliance has been high. According to a report released on 10 December 2021 by the Mayor, so far 92 per cent of vehicles driving into the zone have been compliant,[82] up from 87 per cent in the two weeks before the scheme was launched[83]. Compliance with the ULEZ standards is also high in the rest of London outside the ULEZ zone, reaching 82 per cent, an increase of two percentage points since the expanded scheme began in October. This compares to compliance levels of 39 per cent in February 2017 when the ULEZ was announced.[84]

This is also illustrated by the reduction in polluting vehicles entering the zone. Since implementation, on average there are around 47,000 fewer older, more polluting vehicles seen each day in the zone compared to the two weeks before the scheme was introduced, a reduction of 37 per cent. There are also 11,000 fewer vehicles driving at all, each day. As a result of these changes, it is estimated that there will be a five per cent reduction in CO2 emissions from cars and vans in the newly expanded zone in its first year. This is on top of the six per cent reduction in CO2 emissions in the central London ULEZ area since 2019.[85]

Figure 6. Map of Central and Ultra Low Emission Zones



Source: Transport for London, https://tfl.gov.uk/modes/driving/ultra-low-emission-zone

[82] GLA press release. 92 per cent of vehicles comply with expanded ULEZ one month on December 2021
[83] Mayor of London Expanded Ultra Low Emission Zone - First Month Report, 10 December 2021
[84] Mayor of London. 92 per cent of vehicles comply with expanded ULEZ one month on.10 December 2021
[85] Mayor of London. 92 per cent of vehicles comply with expanded ULEZ one month on.10 December 2021

On average, around 77,000 non-compliant, unique vehicles were detected in the zone every day, including weekends, in the scheme's first month of operation. Of these, 59 per cent paid the charge, with vans and minibuses having the lowest compliance rates.[86]

When it comes to traffic reduction, although this is not the main aim of the ULEZ compared to the pre-launch baseline, vehicle kilometres travelled in the ULEZ zone have reduced by nearly one per cent since the ULEZ expansion. Along boundary roads, preliminary data has indicated that average daily traffic flows were about 1.5 per cent lower than prior to the scheme.

Following the success of the expansion in October 2021, the Mayor announced in March 2022 that he intends to extend the zone to encompass the whole of London by the end of 2023.[87] However, in his speech announcing the plans, he made it clear that his long-term ambition is the replacement of ULEZ and other charges with a road-user charging scheme. This would mean TfL charging users depending on length of journey, how polluting vehicles are, the level of congestion in the area and access to public transport. However, the plans are still some way off from being deliverable.

The Mayor also has direct control, via TfL over many of London's main roads. However, some are delegated to local authorities.[88] Carrying more than 30 per cent of London's Traffic on just five per cent of London's overall road length, these roads are known as 'red routes'. Once the ULEZ has expanded to cover the whole city, all of these red routes will fall within the Mayor's remit to control the types of vehicles using them to bring down emissions.

TfL is building a tunnel under the Thames linking Silvertown to the Greenwich Peninsula in east London. The tunnel - which is planned to be opened in 2025. TfL's case for the tunnel is that it will reduce air pollution, and as part of the process to gain development consent, it agreed to conduct extra monitoring of roads that will be affected by it[89]. TfL state that the tunnel will help to reduce congestion at the Blackwall Tunnel, and they also plan to public transport links in the area, including introducing more cross river bus journeys.

Within the Mayor's updated pathway for net zero, the chosen 'accelerated green' pathway has already been examined for its impact on the Mayor's policies and actions. It is stated that two areas of policy to support modal shift within the Mayor's Transport Strategy that were due to be completed by 2041 will now need the majority of the measures in place by 2030[90].

[86] Mayor of London, Expanded Ultra Low Emission Zone - First Month Report, 10 December 2021
[87] Mayor of London. Mayor announces plans to expand Ultra Low Emission Zone London-wide. 4 March 2022
[88] TFL. Red Routes.
[89] Mayor's Question Time, Monitoring of air pollution from the Silvertown road tunnel, June 2021
[90] Mayor of London, London Net Zero 2030 – an updated Pathway, January 2022

Recommendation 6

Monitoring of pollution from London's red route network of roads, which are in the Mayor's control, should be strengthened, incorporating new monitoring of air quality emissions due for the Silvertown Road Tunnel project. A regular report should be produced on the changes in pollution on main roads, to provide an objective measure of progress.

Recommendation 7

The Mayor's updated 2030 net-zero pathway states that measures relating to modal shift originally due by 2041 will now need to be largely met by 2030. In light of this, a clear picture of how this changes existing targets and their contribution to pollution should be provided by the Mayor to aid tracking progress.

Recommendation 8

The forthcoming consultation on further measures including a wider ULEZ and road user charging to reduce London's air pollution, congestion and carbon emissions should include a summary of expected impacts so that Londoners can understand the likely benefits and changes in their area, including details of alternatives that were considered.

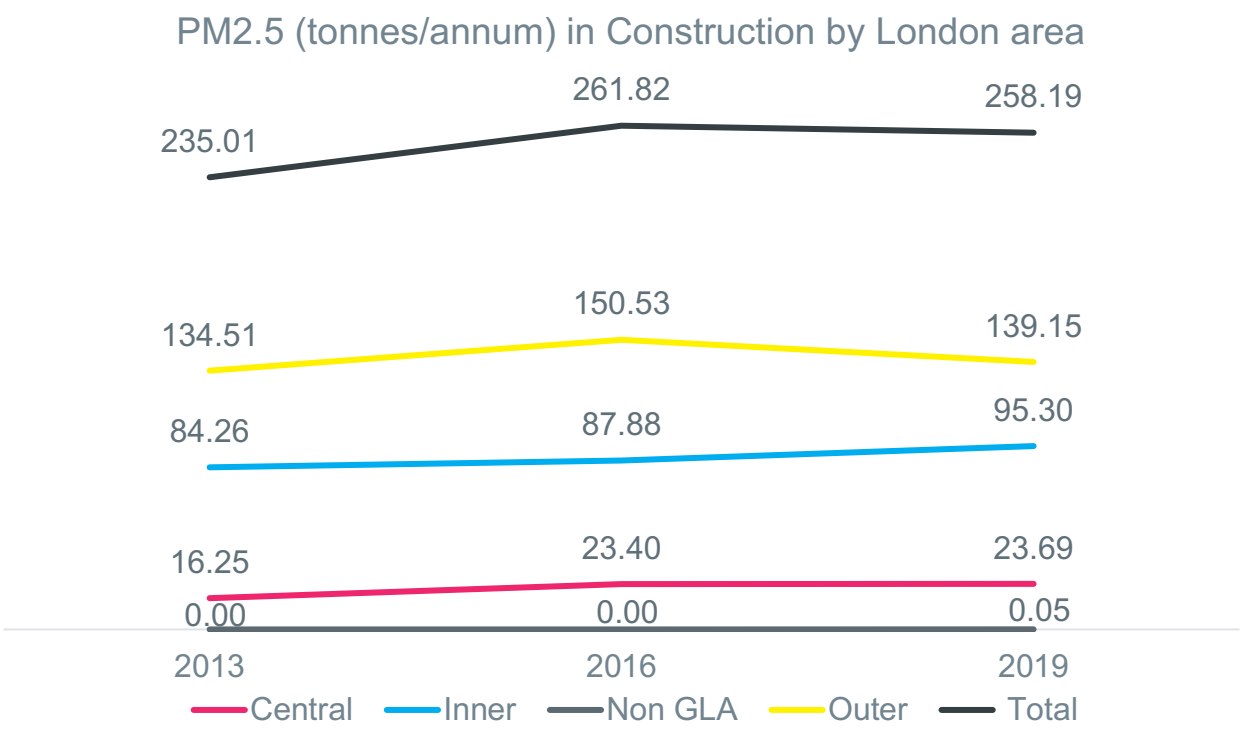
Air pollution from construction sites

Construction sites across the city are populated with a range of machinery which can be polluting. NRMM can be electric, plugged into the mains power of a construction site. However, some on-site machinery will be powered using polluting fuels such as diesel, emitting harmful particulate matter.

For instance, some machinery on the rail network such as bulldozers, generators or lifting machinery can use red diesel,[91] which contributes to the spread of particulate matter. NRMM, is tightly regulated, following a similar 'Euro' style set of standards to road vehicles such as HGVs. Though the Mayor's powers to regulate construction sites are limited. The Government recently changed its tax status to disincentivise its usage from April 2022.

[91] UK Government, Reform of red diesel and other rebated fuels entitlement, November 2021

Figure 7. Emissions – PM2.5 from the construction sector in London



Source: London Atmospheric Emissions Inventory (LAEI) 2019

The Mayor, recognising this, has put in place a Low Emission Zone which, similarly to the ULEZ regulations, requiring NRMM in the zone to meet a certain 'stage'.[92] The zone covers the Central Activities Zone and Opportunity Areas, including Canary Wharf. Levels of pollution from construction sites are higher in outer London (figure 7).

Exemptions are available and were extended for a period of 6 months from September 2020 to allow construction companies more time to comply with standards, following the pandemic. There is also a set of supplementary planning guidance for construction sites for reducing dust and PM from construction and demolition. [93]

In the London Environment Strategy, the Mayor committed to lead by example through the GLA group. His intention is that emissions from NRMM construction and maintenance activities will, where appropriate, meet or improve upon the standards set out by the NRMM Low Emission Zone. However, the Mayor has limited powers of his own to regulate air pollution from construction machinery any further than what is stipulated in national regulations. The Mayor has therefore suggested that more

[92] London Assembly, Non-Road Mobile Machinery (NRMM)
[93] London Assembly, Control of Dust and Emissions

powers could be devolved to his office in order to potentially regulate machinery in the same way the ULEZ is applied to road vehicles.

Recommendation 9

The Mayor should continue to call on the government for further powers to regulate NRMM via a user-charging scheme akin to the ULEZ, with penalties for non-compliant plant and machinery, including monitoring at construction sites.

Recommendation 10

The Mayor should lobby government for requirements on developers of construction sites to conduct detailed air quality monitoring, which is accurate enough to assess compliance with both legal and safe levels of air pollution (NOX, PM10, PM2.5) as determined by WHO standards set out in September 2021.

Deliveries and freight

The logistics network is vital to the health of London's economy, connecting us with the rest of the world whilst bringing in food and other goods. During the pandemic there has been an increase in the proportion of online sales, particularly at the height of national lockdowns when high street shops were shut and most people were required to work from home,[94] which will have a potential impact on pollution levels. In 2018, London's freight accounted for ten per cent of PM2.5 emissions and a fifth of its traffic.[95]

Though online sales have steadily increased over the last decade, the overall proportion of sales that were online sales has increased by 7 per cent since the start of the pandemic in 2020. In March 2021, the registration of light commercial vehicles (LCVs) saw a massive increase compared to 2020. Diesel vans saw an 82 per cent increase in March 2021 compared to 2020, and for petrol vans there was a twofold increase. Over the same period a cultural shift has occurred, with the increased use of mobile food-ordering applications and the popularity of services such as Amazon Prime, which is currently estimated to have more than 15 million members receiving regular deliveries.[96]

Many of the products being delivered to homes in the capital will originate abroad. The UK is a net importer of goods,[97] which means London, along with the rest of the UK, is also a net importer of emissions. According to a report by the World Wildlife Fund (WWF) in 2020, 46 per cent of the UK's

[94] Online. Internet sales as a percentage of total retail sales. January 18 2022
[95] Mayor of London, London Environment Strategy, May 2018
[96] Retail Week. Data: Amazon Prime membership hits 15 million in UK. 7 March 2019
[97] ONS. UK Trade. October 2021

carbon footprint is attributed to the manufacturing country, even though their production relies on demand here.[98]

According to the WWF report, the UK's domestic greenhouse gas emissions reduced 41 per cent between 1990 and 2016, whereas its overall carbon footprint decreased by 15 per cent. The disparity is explained by the proportion of the country's emissions which are produced abroad. The biggest six sectors and their contribution to the UK carbon footprint are: heating homes (9.7 per cent), car fuel (8.6 per cent), electricity (eight per cent), construction (6.7 per cent), agriculture (6.6 per cent) and air travel (5.9 per cent). Non-domestic emissions were spread globally, but the EU at 9.9 per cent was the biggest single region or country in terms of contributing to the UK's carbon footprint.

A report released in November 2021 by the Centre for London[99] examined in detail the impact of freight and deliveries on the environment in the capital. It found that freight accounted for 15 per cent of total vehicle miles travelled in London, and a quarter of transport-related carbon emissions. The report supported the Mayor's interest in road-user charging as well as proposing the consolidation of all commercial deliveries into designated areas, such as certain high streets, in order to reduce congestion and pollution. It also suggested better use of London's waterways, following from the rollout of delivery company DHL's Thames River delivery boats.[100]

The number of parcels delivered in London is expected to double by 2030, the shift accelerating as a result of continued changes to purchasing behaviour that have been exacerbated by the pandemic. This could have an impact on London's air quality. If this is to be the case, there must be a strategy to make sure the increasing burden of deliveries is as efficient, but as clean, as possible.

Recommendation 11

The Mayor should commission a study to assess how shifts in transport use and the increase in online sales may have changed air pollution since the beginning of the Covid-19 pandemic, due to factors such as an increase in household deliveries and home-working.

Recommendation 12

The Mayor and London boroughs should consider a best practice scheme to champion those businesses who are acting to support clean air in London, and who are embracing zero or low emission practices.

[98] WWF, UK's Carbon Footprint, April 200.
[99] Centre for London. Worth the Weight. November 2021
[100] Centre for London. Worth the Weight. November 2021

Appendix

A1. Response to the commitments made at the 27 January 2022 meeting of the Committee by Elliot Treharne, Head of Air Quality - Greater London Authority

1. Confirm any work undertaken regarding pollution derived from tyre and brake wear across the GLA Group

Overall, the most effective way to reduce non-exhaust emissions is to reduce the number of kilometres travelled by cars on our roads, which is a core part of the Mayor's Transport Strategy and future plans.

However, some essential trips will continue to be made by car. The Mayor's Environment Strategy commits to work with the industry and other partners to seek solutions to reduce emissions from tyre and brake wear. Last year TfL announced a new trial with the Royal Mail using specially designed tyres designed to reduce tyre emissions from Royal Mail's fleet of electric vans. The first results from the trial will be available this year.

The European Commission is also looking at brake and tyre wear in the context of new Euro 7 emission standards. City Hall officers and TfL colleagues are supporting the work to develop these standards. The Commission will also include them as part of its impact assessment of a soon-to-be-proposed Euro 7 Regulation.

2. Explore the publication of a comprehensive list of School Street Schemes currently in place in London

The GLA and TfL share the Committee's desire to publish a comprehensive list of School Streets and are looking at the detail of how this would be collated and kept up to date given the varied status of school streets across the London boroughs, with many still in place only on a trial basis. Subject to working through these issues, we hope to be able to publish a list later this year.

3. Provide an update on guidance available to boroughs regarding the implementation of School Street Schemes, means of consultation and best practice

TfL has published guidance to support Boroughs with the delivery of School Streets across London, which can be found on the TfL website here: https://content.tfl.gov.uk/appx-eight-lsp-school-streets-guidance.pdf. The guidance is intended for use by borough transport officers, public health teams, schools, school community groups and elected members.

4. Confirm the number of London boroughs that have taken part in enforcement workshops under the Mayor's Air Quality Fund

As part of the pan-London engine idling project, Idling Action, 131 school workshops and 53 idling action events have been undertaken. These have been complemented by a comprehensive marketing campaign including radio adverts and billboards.

In addition, Idling Action has held three idling enforcement workshops for borough officers across the course of the project. The aim of the workshops was to support boroughs with adopting or improving their idling enforcement practices by sharing best practice and providing a forum for discussion around idling enforcement. Each workshop saw presentations from boroughs on their idling enforcement regime covering the different legal routes for enforcement and a discussion session for boroughs to share experiences and issues.

All boroughs who are partners of the project were invited to attend the workshops. The first workshop was attended by 22 boroughs, the second by 18 boroughs and the third by 24 boroughs. Notes and slides form the sessions were circulated to officers in all partner boroughs following the workshops.

5. Provide an update on whether additional data to the full LAEI update can be provided on an annual basis

Due to the lag in obtaining and processing input data from various sources it would not be possible to provide a full update to the London Atmospheric Emissions Inventory (LAEI) on an annual basis. However, we recognise the importance of providing regular insights about air pollution trends. As a result, interim 'snapshot' LAEI updates using the latest monitoring data will be provided annually.

6. Provide information on any consideration of antisocial burning and nuisance burning by the London boroughs wood burning working group

GLA officers have discussed the issue of antisocial burning and nuisance burning with boroughs officers. One of the main challenges boroughs face is that when a nuisance is reported by the time they are able to investigate the burning activity may have ceased. There is a clearly a role for improved awareness raising with the public and the wood burning working group will be picking this up in due course.

Furthermore, at the last wood burning working group meeting in January 2022 there was a discussion around amendments to the Environment Act that will come into force in May 2022. These amendments to the Environmental Protection Act 1990 allow local authorities to take more substantive action against those who repeatedly emit smoke and endanger human health from chimneys. It does this by extending the system of statutory nuisance to private dwellings in Smoke Control Areas (SCAs).

Borough officers have invited a Defra official to join the working group at the next meeting to talk through the changes as there is a lack of clarity for boroughs in terms of enforcement, documentation and standards.

7. Confirm whether data on pollution from incinerators monitored by the EA reflects health indicators in local areas

The data collected on pollution relates solely to the operation of the site and does not include health indicators in the local area.

8. Confirm whether vehicle movements are taken into consideration as part of the planning process related to any incineration facility

Yes, vehicle movements are taken into account during the planning process for any incinerator, both in terms of their impact on air pollution and wider traffic and congestion issues.

Where steps need to be taken to ensure that vehicle movements or their impacts need to be limited this can be done through planning conditions or requirements.

9. Provide information regarding standards in place for London boroughs in respect of vehicle movements to/from incineration facilities.

As I mentioned to the committee the Low Emission Zone (LEZ) requirements require most large and heavy vehicles to meet the Euro VI emission standard or pay a charge. There is no exemption from the LEZ for vehicles serving waste sites and Euro VI is currently the tightest available emission standard.

At the end of October 2021 compliance with the LEZ stood at 95.7 per cent, even higher than compliance with the ULEZ.

Additional standards are reflected when new waste contracts are let, which require broad conformity with the London Environment Strategy – including the need to comply with the LEZ (rather than pay the charge) and to support the phase out of fossil fuel waste transport and boost uptake of low or zero emission alternatives.

A2. Mayor's initiatives to date

London Environment Strategy and clear air

The London Environment Strategy, (published in 2018) highlights the issue of clean air in the capital and outlines a series of proposals for improving it.

It specifies two sets of pollutants which can be harmful - nitrogen dioxide and the set of particulates which can be harmful regardless of their concentration in the air. These include PM10 and PM 2.5, but also black carbon which can be traced to the use of diesel fuel.[101]

The strategy made several proposals in relation to clean air, including:[102]

- Provide better public information on air pollution

[101] International Council on Clean Transportation, Black carbon
[102] Mayor of London, London Environment Strategy, May 2018

- Reduce young people's exposure to unsafe air
- Improve the understanding of air pollution to improve policy responses
- Achieve legal compliance within UK and EU limits as soon as possible
- Reduce emissions from London's transport network
- Reduce emissions from non-road transport sources
- The Mayor will work with other cities (here and internationally), global city and industry networks to share best practice
- Establish new targets for PM and other pollutants where needed

The strategy also highlights the role of local authorities in the capital when it comes to reducing emissions. It specifically references emissions-based parking charges, encouragement for walking and cycling and support for electric vehicle infrastructure[103] (we will examine transport related policies and proposals in the second meeting and accompanying briefing). Alongside the strategy, the Mayor published an implementation plan,[104] setting out a series of actions emphasising risk management and growing resilience in relation to adapting to climate change.

London Environment Strategy: Second Progress Report

The Mayor published his second progress report in September 2021. This document summarises key actions taken by the Mayor against the policies and proposals in the strategy over his first Mayoral term, covering the period from May 2016 to May 2021, with particular focus on achievements since the 'one year on' report publication, in October 2019.[105]

The report noted that the Mayor has improved monitoring of air pollution, auditing results at 50 London schools[106] and 20 nurseries along with funding for schools to encourage walking and cycling. The report set out a number of recommended measures to help schools reduce air pollution:

- 'no engine idling' schemes, to reduce emissions from parent's drop off and collection of their children.
- reducing emissions from boilers, kitchens and other sources.
- School Streets – where the road is closed to traffic at drop off and collection times.
- adding green infrastructure like 'barrier bushes' along busy roads and in playgrounds to help filter fumes.
- encouraging students to walk, cycle and scoot along less polluted routes.
- six schools were selected to trial an indoor air filtration system, to determine if this could have a positive effect on reducing indoor air quality.

[103] Mayor of London, London Environment Strategy, May 2018
[104] Mayor of London, London Environment Strategy, May 2018
[105] GLA, London Environment Strategy: Second Progress Report September 2021
[106] GLA, London Environment Strategy: Second Progress Report September 2021

A follow up report conducted by the National Institute for Health Research.[107] It looked at baseline behaviour data, concluding that awareness of air pollution, its global affects and health impacts amongst parents and children was high. Whilst most parents were in favour of legislation which would reduce pollution they were described as 'ambivalent' when it came to changing their own behaviours in order reduce emissions.

In February 2021 the Mayor launched The London Schools Pollution Helpdesk for schools seeking advice in setting up their own audit.[108] The Mayor has also followed up on his pledges to improve information for Londoners on air pollution, launching the Breathe London website, which contains statistics on air pollution in the capital.[109]

The Mayor has funded an anti-engine idling campaign funded through the Mayor's Air Quality Fund.[110] The campaign seeks to draw attention to the harmful emissions released by drivers when parked if they leave the engine on. The LES identified that engine idling is an issue for both domestic and commercial use, with efforts to discourage engine idling focusing on parked buses, coaches and taxis, as well as particular problem areas around schools, transport interchanges and major tourist attractions. Idling is also a waste, costing households and businesses unnecessary fuel.

A3. Committee work to date

Last year the committee published *Cleaning the air: pollution in London*, a report specifically looking at air pollution in the capital. It welcomed the progress made by the Mayor at the end of the last term and identified areas of improvement, particularly around schools and PM 2.5[111] This followed a meeting of the committee in November 2020, split into two panels which looked at the state of air pollution in the capital and the Mayor's response to date.[112]

The report made 10 recommendations with a focus on learning from best practice, current Mayoral initiatives, tackling air pollution around schools and nurseries and improving the communication around the dangers of toxic air:

Recommendation 1
The Mayor should prioritise reductions in PM2.5 levels by:
a) Identifying London-specific measures to reduce PM2.5 levels in the capital.
b) Set strategic targets for reductions in NO2 and PM2.5 levels, particularly emissions from traffic and domestic and commercial premises.

[107] National Institute for Health Research, Assessing the impact of the Mayor's schools air quality audit recommendations in reducing pupils' exposure to poor air quality feasibility and base line data collection, October 2019
[108] GLA, London Environment Strategy: Second Progress Report September 2021
[109] Breathe London
[110] Idling Action London
[111] London Assembly Environment Committee. Clearing the air: pollution in London. February 2021
[112] London Assembly Environment Committee, Transcript of Agenda Item 7 - Health impacts on Londoners, emerging research and the role of Covid-19. November 2020

Recommendation 2
The Mayor should develop a one-year, targeted campaign, starting in May 2021, to communicate the health risks associated with exposure to air pollution for younger and older people, harnessing the growing public interest in the topic since Covid-19. As part of the campaign, the Mayor should:
a) Involve wider partners, including those from the public, private and third sectors.
b) Establish a baseline for Londoners' awareness of the issues, which will enable an assessment of the impact of the campaign with a view to extending the campaign if it is successful.

Recommendation 3
The Mayor should lead the way in exploring the relationship between air pollution on Covid-19. Specifically, the Mayor should take account of and fund further scientific research examining the links between air pollution and Covid-19 in the next six months. The research should explore the effects of exposure to air pollution on Covid-19 mortality and severe illness.

Recommendation 4
The Mayor should resource the London Schools Pollution Helpdesk properly and consider expanding its remit to support London care homes and hospitals as the Covid-19 recovery gets underway.

Recommendation 5
The Mayor should conduct a review of the Schools and Nurseries Air Quality Audit Programme by October 2021. The review's aim should be to increase the uptake across the capital, with a target for 100 additional enrolled schools or nurseries on the Programme by December 2021.

Recommendation 6
The Committee recognises that the date may be impacted in the event of a further resurgence in Covid-19.
The Mayor should confirm when he expects the air quality at all schools to be brought within the legal NO2 limit. This includes the 14 schools in London in areas at or exceeding the legal NO2 limit. If this is not within a year, he should outline an action plan to do so.

Recommendation 7
The voices of pupils, teachers, parents and local residents should be heard as part of the School Street Evaluation Project. As part of this, the Mayor and TfL should fully engage with schools and London boroughs.

Recommendation 8

The Mayor should collate best practice in tackling and monitoring air pollution in the context of Covid-19 and share it by December 2021. National and international best practice should help policy makers, at all levels of government, identify further action and learn from measures taken by other cities over 2020 and 2021.

Recommendation 9
When recovery gets underway, the Mayor should extend the Air Quality Audit Programme to London care homes and hospitals, working in partnership with London Boroughs to identify and work with the sites on the ground. Six months into this programme, the Mayor should review his engagement and return to the Committee.

Recommendation 10
The Mayor should review the impact of London's Red Route network on air pollution at schools by December 2021.

The committee raised concerns in the report that the Mayors Audit programme for schools and nurseries (see section 2) has not had the desired impact, and that too few schools had been audited since its launch. It asked the Mayor to extend his clean air audit to include other locations in which vulnerable people gather, for instance health settings such as care homes and hospitals.[113]

A4. WHO updated Air Quality Guidelines September 2021

The WHO Global air quality guidelines offer global guidance on thresholds and limits for key air pollutants that pose health risks.[114]

The Guidelines apply worldwide to both outdoor and indoor environments and are based on expert evaluation of current scientific evidence for:

- particulate matter (PM)
- ozone (O3)
- nitrogen dioxide (NO2)
- sulfur dioxide (SO2).

The Guidelines also include qualitative good practice recommendations for black carbon/elemental carbon, ultrafine particles (<=1um) and particles derived from sand and dust storms.

Particulate matter (PM)

Definition and principal sources

[113] London Assembly Environment Committee. Clearing the air: pollution in London. February 2021
[114] World Health Organisation, https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health, September 2021

PM is a common proxy indicator for air pollution. It affects more people than any other pollutant. The major components of PM are sulfate, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. While particles with a diameter of 10 microns or less, (≤ PM10) can penetrate and lodge deep inside the lungs, the even more health-damaging particles are those with a diameter of 2.5 microns or less, (≤ PM2.5). PM2.5 can penetrate the lung barrier and enter the blood system. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer.

Air quality measurements are typically reported in terms of daily or annual mean concentrations of PM10 particles per cubic meter of air volume (m3). Routine air quality measurements typically describe such PM concentrations in terms of micrograms per cubic meter (µg/m3). When sufficiently sensitive measurement tools are available, concentrations of fine particles (PM2.5 or smaller), are also reported.

Health effects
There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM10 and PM2.5) and increased mortality or morbidity, both daily and over time. Conversely, when concentrations of small and fine particulates are reduced, related mortality will also go down – presuming other factors remain the same. This allows policy-makers to project the population health improvements that could be expected if particulate air pollution is reduced.

Small particulate pollution has health impacts even at very low concentrations – indeed no threshold has been identified below which no damage to health is observed. Therefore, the WHO Global guideline limits aimed to achieve the lowest concentrations of PM possible.

Guideline values

Fine particulate matter (PM2.5)

5 µg/m3 annual mean

15 µg/m3 24-hour mean

Coarse particulate matter (PM10)

15 µg/m3 annual mean

45 µg/m3 24-hour mean

In addition to guideline values, the WHO Global air quality guidelines provide interim targets for concentrations of PM10 and PM2.5 aimed at promoting a gradual shift from high to lower concentrations.

If these interim targets were to be achieved, significant reductions in risks for acute and chronic health effects from air pollution can be expected. Achieving the guideline values, however, should be the ultimate objective.

The effects of PM on health occur at levels of exposure currently being experienced by many people both in urban and rural areas and in developed and developing countries – although exposures in many fast-developing cities today are often far higher than in developed cities of comparable size.

In low- and middle- income countries, exposure to pollutants in and around homes from the household combustion of polluting fuels on open fires or traditional stoves for cooking, heating and lighting further increases the risk for air pollution-related diseases, including acute lower respiratory infections, cardiovascular disease, chronic obstructive pulmonary disease and lung cancer.

There are serious risks to health not only from exposure to PM, but also from exposure to ozone (O3), nitrogen dioxide (NO2) and sulfur dioxide (SO2). As with PM, concentrations are often highest largely in the urban areas of low- and middle-income countries. Ozone is a major factor in asthma morbidity and mortality, while nitrogen dioxide and sulfur dioxide also can play a role in asthma, bronchial symptoms, lung inflammation and reduced lung function.

Ozone (O3)

Definition and principal sources
Ozone at ground level – not to be confused with the ozone layer in the upper atmosphere – is one of the major constituents of photochemical smog. It is formed by the reaction with sunlight (photochemical reaction) of pollutants such as nitrogen oxides (NOx) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry. As a result, the highest levels of ozone pollution occur during periods of sunny weather.

Health effects
Excessive ozone in the air can have a marked effect on human health. It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases.

Guideline values
O3
100 µg/m3, 8-hour daily maximum*
60 µg/m3 8-hour mean, peak season**
* 99th percentile, (i.e. 3-4 exceedance days per year)

** Peak season is defined as an average of daily maximum 8-hour mean O3 concentration in the six consecutive months with the highest six-month running average O3 concentration

Nitrogen dioxide (NO2)

The current WHO guideline value of 10 µg/m3 (annual mean) was set to protect the public from the health effects of gaseous nitrogen dioxide.

Definition and principal sources
NO2 is the main source of nitrate aerosols, which form an important fraction of PM2.5 and, in the presence of ultraviolet light, of ozone. The major sources of anthropogenic emissions of NO2 are combustion processes (heating, power generation, and engines in vehicles and ships).

Health effects
Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO2. Reduced lung function growth is also linked to NO2 at concentrations currently measured (or observed) in cities of Europe and North America.

Guideline values
10 µg/m3 annual mean

25 µg/m3 24-hour mean

Sulfur dioxide (SO2)

Studies indicate that a proportion of people with asthma experience changes in pulmonary function and respiratory symptoms after periods of exposure to SO2. Health effects are now known to be associated with much lower levels of SO2 than previously believed. A greater degree of protection is needed. Although the causality of the effects of low concentrations of SO2 is still uncertain, reducing SO2 concentrations is likely to decrease exposure to co-pollutants.

Definition and principal sources
SO2 is a colourless gas with a sharp odour. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur. The main anthropogenic source of SO2 is the burning of sulfur-containing fossil fuels for domestic heating, power generation and motor vehicles.

Health effects
SO2 can affect the respiratory system and the functions of the lungs, and causes irritation of the eyes. Inflammation of the respiratory tract causes coughing, mucus secretion, aggravation of asthma and chronic bronchitis and makes people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with

higher SO2 levels. When SO2 combines with water, it forms sulfuric acid; this is the main component of acid rain which is a cause of deforestation.

Guideline values
40 µg/m3 24-hour mean

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Email 与我们联系。

Hindi

यदि आपको इस दस्तावेज का सारांश अपनी भाषा में
चाहिए तो उपर दिये हुए नंबर पर फोन करें या उपर दिये
गये डाक पते या ई मेल पते पर हम से संपर्क करें।

Vietnamese

Nếu ông (bà) muốn nội dung văn bản này được dịch sang
tiếng Việt, xin vui lòng liên hệ với chúng tôi bằng điện
thoại, thư hoặc thư điện tử theo địa chỉ ở trên.

Bengali

আপনি যদি এই দলিলের একটা সারাংশ নিজের ভাষায় পেতে চান,
তাহলে দয়া করে ফো করবেন অথবা উল্লেখিত ডাক ঠিকানায় বা
ই-মেইল ঠিকানায় আমাদের সাথে যোগাযোগ করবেন।

Greek

***Εάν επιθυμείτε περίληψη αυτού του κειμένου στην γλώσσα
σας, παρακαλώ καλέστε τον αριθμό ή επικοινωνήστε μαζί
μας στην ανωτέρω ταχυδρομική ή την ηλεκτρονική διεύθυνση.***

Urdu

اگر آپ کو اس دستاویز کا خلاصہ اپنی زبان میں
درکار ہو تو، براہ کرم نمبر پر فون کریں
یا مذکورہ بالا ڈاک کے پتے یا ای میل
پتے پر ہم سے رابطہ کریں۔

Turkish

Bu belgenin kendi dilinize çevrilmiş bir özetini
okumak isterseniz, lütfen yukarıdaki telefon
numarasını arayın, veya posta ya da e-posta
adresi aracılığıyla bizimle temasa geçin.

Arabic

الحصول على ملخص لهذا المستند بلغتك،
فرجاء الاتصال برقم الهاتف أو الاتصال على
العنوان البريدي العادي أو عنوان البريد
الإلكتروني أعلاه.

Punjabi

ਜੇ ਤੁਸੀਂ ਇਸ ਦਸਤਾਵੇਜ਼ ਦਾ ਸੰਖੇਪ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਲੈਣਾ
ਚਾਹੋ, ਤਾਂ ਕਿਰਪਾ ਕਰਕੇ ਇਸ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ
ਉਪਰ ਦਿੱਤੇ ਡਾਕ ਜਾਂ ਈਮੇਲ ਪਤੇ 'ਤੇ ਸਾਨੂੰ ਸੰਪਰਕ ਕਰੋ।

Gujarati

જો તમારે આ દસ્તાવેજનો સાર તમારી ભાષામાં
જોઈતો હોય તો ઉપર આપેલ નંબર પર ફોન કરો
અથવા ઉપર આપેલ ટપાલ અથવા ઈ-મેઈલ સરનામા
પર અમારો સંપર્ક કરો.

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