Improving London’s Air Quality

London’s Air Pollution and Emissions Story

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Air quality in history
Why is air quality so important?

Public Health
• In 2015 the GLA published its assessment of the combined health impacts of particulate matter ($\text{PM}_{2.5}$) and nitrogen dioxide ($\text{NO}_2$). This estimated that the equivalent of 9,500 deaths were caused by long-term exposure to air pollution.
• A baby born in London in 2010 who was exposed to 2010’s air quality for its entire life would lose 2.2 years (if male) and 2 years (if female) of life expectancy.

Fairness
• The health impacts associated with air pollution fall disproportionately on our most vulnerable communities, affecting the poorest and those from minority ethnic groups more acutely. Tackling air pollution is about social justice and there is an urgent need to do more to tackle public health inequalities.

Legal compliance
• Like most major European cities, London does not meet the legal requirements for some pollutants (mainly Nitrogen Dioxide ($\text{NO}_2$) but issues remain with Particulate Matter).
Recent trends in London’s air quality

NO₂ 2010

NO₂ trend 2000-2015

NO₂ 2013

PM₁₀ trend 2004-2015

NO₂ 2015
Major NOx emissions sources

Road Transport 52%
- Non-Road Mobile Machinery 8%
- Industry 7%
- Gas - Non-Domestic 8%
- Other 1%
- Gas - Domestic 13%
- River 1%
- Rail 3%
- Aviation 8%

NOx emission sources in 2013 (Londonwide)
- Diesel Car 24%
- Petrol Car 12%
- HGV 21%
- TFL Bus 20%
- Van and Minibus 12%
- Motorcycle <1%
- Non-TFL Bus and Coach 6%
- Taxi 4%
NO$_2$ – A EUROPE WIDE CHALLENGE
Approach

- **Sort out our own house first:** Buses and taxis are the individually most polluting vehicles

- **Harness technology:** zero emission capable vehicles, geofencing

- **Biggest bang for buck:** heavy diesel vehicles

- **Carrots before sticks:** Incentives and support before disincentives such as charging

- **Local targeted action:** proportionate and uses available funding more effectively
ULTRA LOW EMISSION ZONE

Euro 4 petrol (<13-14yrs old in 2020) ...or £12.50 a day
Euro 6 diesel (<4-5yrs old in 2020) ...or £12.50 a day
Euro VI (<6yrs old in 2020) ...or £100 a day

Euro 3 (<13yrs old in 2020) ...or £12.50 a day

Exempt but new licensing requirements

PRIVATE HIRE
BUSES

24/7
Euro 4 petrol is an equivalent NO\textsubscript{x} standard to Euro 6 diesel.

Euro 4:
- NO\textsubscript{x} emissions: 0.08 g/km

Euro 5:
- NO\textsubscript{x} emissions: 0.06 g/km

Euro 6:
- NO\textsubscript{x} emissions: 0.08 g/km

Euro 3:
- NO\textsubscript{x} emissions: 0.15 g/km

Euro 6 diesel:
- NO\textsubscript{x} emissions: 0.08 g/km

Euro 5 diesel:
- NO\textsubscript{x} emissions: 0.18 g/km

Euro 4 diesel:
- NO\textsubscript{x} emissions: 0.25 g/km

Euro 3 diesel:
- NO\textsubscript{x} emissions: 0.50 g/km
**ULTRA LOW EMISSION ZONE**

- Bringing forward the ULEZ in central London by 2019;

- Extending the ULEZ beyond central London in, or around, 2020:
  - For motorcycles, cars and vans, to the North and South Circular roads
  - For lorries, buses and coaches, London-wide

- TfL have started work on a diesel scrappage scheme as part of a wider national scheme to be delivered by Government and lobbying for a reformed Vehicle Excise Duty.
ULTRA LOW EMISSION ZONE

Legend:
- Central CCZ and ULEZ
- Proposed Inner ULEZ
- Outer area of LEZ
- Borough
- River Thames
Zero emission capable vehicles (buses and taxis)

TfL is spending more than £300m transforming London’s bus fleet by phasing out of pure diesel buses and a commitment to purchase only hybrid or zero-emission double decker buses from 2018.

We will no longer licence new diesel taxis from 2018 and supporting the trade to upgrade to much cleaner, ‘zero emission capable’ vehicles;
NOx Abatement Retrofit

- 2,100 SCR systems now fitted to 3 types of Euro III bus

- 95 out of 220 buses that use Putney High Street were retrofitted with SCR

- This made Putney the ideal location for monitoring the effectiveness of SCR programme.

- Expanding the ULEZ retrofit programme up to 3,000 buses, including some Euro IV buses outside the central zone
NOx Reduction operating on Putney High Street
Remote Sensing on Putney Hill

On average we see a **61%** reduction in emissions of NO₂
**45%** reduction in emissions of NOₓ

These reductions are substantial compared with the average performance of the bus fleet in London including OEM SCR systems

- **Emissions distribution**
  - SCRT buses sometimes behave like base buses
  - Other times there is ~90% reduction in NOₓ

- **Test track results**
  - Importance of SCR inlet temperature
    - >200°C gives 90% reduction in NOₓ
  - Expect greater reduction in NOₓ where engine runs hotter
The Mayor wants to deliver the greenest taxi fleet in the world by:

– No more new diesel taxis and only ‘zero emission capable’ from 2018;
– Providing a £3,000 grant towards the first 9,000 ZEC taxis;
– Delivering a rapid charging network from 2017;
– Introducing a scrappage scheme for the oldest taxis from 2017;
– Exploring options to convert to a cleaner fuel;
– Rewarding drivers who pioneer green technology.
• Covers NRMM on construction sites between 37 and 560 kW

• In the two yellow zones NRMM must meet stage IIIB

• In the rest of London NRMM on major construction sites must meet stage IIIA

• This will be uprated to stage IIIB and Stage IV in 2020
NRMM emissions Stages

EPA and EU nonroad emissions regulations: 37 – 560 kW (50 – 750 hp)
How is it Enforced?

- We use the planning process to require new developments to use the online register for their plant.
- This is monitored and enforced through spot checks.
- The register also helps provide a more reliable dataset for NRMM use in London.
Exemptions and retro-fitting

• Exemptions can be applied for through the website for equipment used in emergencies or where compliant equipment isn’t available.

• Wherever possible non-compliant equipment should be retro-fitted with approved emissions controls.

• Generators and road moving cranes are exempt from the stage IIIB requirements until 2018 due to the lack of available equipment or appropriate retro-fit.

• For specialist equipment or where it is not viable for the company to retro-fit or replace a 1 year exemption can be granted for either or both of the zones.

• Exemptions of 30 days can be granted in emergencies of where retro-fit is in the process of being fitted.
What does the future hold in London?

• Stage V emissions standards:
  – These will be introduced for new engines from 2019 onwards
  – Ultimately we would like to see any diesel powered machinery in London meeting these standards

• Support for less polluting machines:
  – Hybrid generators are a rapidly maturing technology
  – Hybrid excavators are also available but not yet common in Europe
  – Hydrogen as a fuel is also rapidly maturing, particularly in generators. This is quiet as well as non-polluting

• Better tools for audit and enforcement are being developed
REDUCING THE IMPACT OF NEW BUILDINGS: AQ NEUTRAL

- A minimum standard for all new major developments

- “Benchmarks” are used to ensure that the buildings are no worse than existing buildings of the same type

- Technology neutral – however you heat the building you have to meet the same standard

- The benchmarks are currently not challenging. We intend to tighten them in the future but the methodology will remain the same

<table>
<thead>
<tr>
<th>Land Use Class</th>
<th>NOx (g/m²)</th>
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<tbody>
<tr>
<td>Class A1</td>
<td>22.6</td>
</tr>
<tr>
<td>Class A3 - A5</td>
<td>75.2</td>
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<tr>
<td>Class A2 and Class B1</td>
<td>30.8</td>
</tr>
<tr>
<td>Class B2 - B7</td>
<td>36.6</td>
</tr>
<tr>
<td>Class B8</td>
<td>23.6</td>
</tr>
<tr>
<td>Class C1</td>
<td>70.9</td>
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<tr>
<td>Class C2istik</td>
<td>68.5</td>
</tr>
<tr>
<td>Class C3istik</td>
<td>26.2</td>
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<tr>
<td>D1 (a)</td>
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<tr>
<td>D1 (b)</td>
<td>75.0</td>
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<tr>
<td>Class D1 (c -h)</td>
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<td>Class D2 (a-d)</td>
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<td>Class D2 (e)</td>
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Using low emission heat sources
An “Air Quality Positive” development should do more than just hit minimum standards.

Developments on the master planning scale provide significant opportunities to do more to reduce not only their own emission but improve surrounding areas as well by:

- Ensuring that new public spaces are separated from sources of pollution, reducing exposure
- Designing out new emissions sources
- Making sure new cycling and walking infrastructure serves existing as well as new residents
- Providing access to new district heat networks so that old boilers can be replaced. Ideally these would use low or zero emission heat sources
- Supporting infrastructure such as freight consolidation centers and transport hubs that can help reduce the need for more vehicles on the road.

We want to encourage holistic thinking, not just new hoops to jump through.

By doing all of this new developments can contribute to making London’s air cleaner.
MAYOR OF LONDON

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www.london.gov.uk/environment-newsletter