Air Quality Fact Sheet:
Pollutant Trends in the UK and London

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Experts in air quality management & assessment

Prepared by: Dr Kate Wilkins

Reviewed by: Dr Ben Marner

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1 Trends in Nitrogen Dioxide

1.1 London's Low Emission Zone (LEZ) came into force in 2008 to help reduce traffic pollution in London, and the standards became more stringent in March 2021. The Ultra-Low Emission Zone (ULEZ), originally covering the congestion charge zone, came into force in April 2019, and was expanded outward to the North and South Circular Roads in October 2021. The ULEZ was expanded again to cover all of outer London at the end of August 2023.

1.2 The effect of the Covid-19 pandemic on traffic volumes across the UK was clear, and roadside concentrations of nitrogen dioxide (NO_2) were affected as a result[1]. However, the overriding trends in roadside NO_2 concentrations in London and the rest of the UK reveal the longer-term impacts of emissions reduction measures such as the increased use of lower emissions vehicles, particularly in London, where policies targeting road traffic emissions such as the ULEZ/LEZ and the electrification of vehicle fleets have been implemented. Concentrations at most locations in the UK are thus continuing to fall irrespective of recent activity and societal changes brought about by the pandemic.

1.3 Figure 1 shows annual mean weather-adjusted NO_2 concentrations, separated by concentrations in London and the rest of the UK (excluding London) between 2016 and 2023. They are the average of measurements from relevant UK roadside, kerbside and urban traffic automatic monitors with sufficient data capture. Both regions show a steady reduction in concentrations close to roads from 2016 to 2023, and while the average concentration in London at the start of the period was much higher than outside the capital, concentrations have fallen more steeply. Average concentrations in 2023 are the lowest of all the years shown, lower even than during 2020 at the height of the Covid-19 pandemic. It should be noted that not all of the most recent measurements are ratified and so should be treated with caution[2].

1.4 Figure 2 shows the reduction in average annual mean weather-adjusted NO_2 concentrations between 2016 and 2023 across Northern Ireland, Scotland, Wales, England (excluding London) and

[1] Gellatly, R. and Marner, B. (2020) *Nitrogen Oxides Trends in the UK 2013 to 2019*; Gellatly, R., and Marner, B. (2020) *The Effect of COVID-19 Social and Travel Restrictions on UK Air Quality*; Gellatly, R., Marner, B., Liska, T. and Laxen, D. (2020) *The Effect of COVID-19 Social and Travel Restrictions on UK Air Quality – 06 April Update*; Liska, T., Gellatly, G., Laxen, D., and Marner, B. (2020) *The Effect of COVID-19 Social and Travel Restrictions on UK Air Quality – November Update*; Pearce, H., Marner, B., and Moorcroft S. (2022) *Trends in UK NOx and NO_2 Concentrations through the COVID-19 Pandemic: January 2022;* Pearce, H., Marner, B., and Moorcroft S. (2022) *Trends in UK NOx and NO_2 Concentrations through the COVID-19 Pandemic: May 2022 Update*. All reports available at: https://www.aqconsultants.co.uk/resources.

[2] Provisional data have been included in order to provide the most recent data and a current snapshot of air quality conditions. The process of ratifying the data, i.e. undergoing the process of detailed quality assurance and control, can take between six months to a year and varies across monitoring stations in London.

London from "road"[3], "urban"[4] and "rural"[5] sites. This shows that the largest reduction in concentrations was in London during that time.

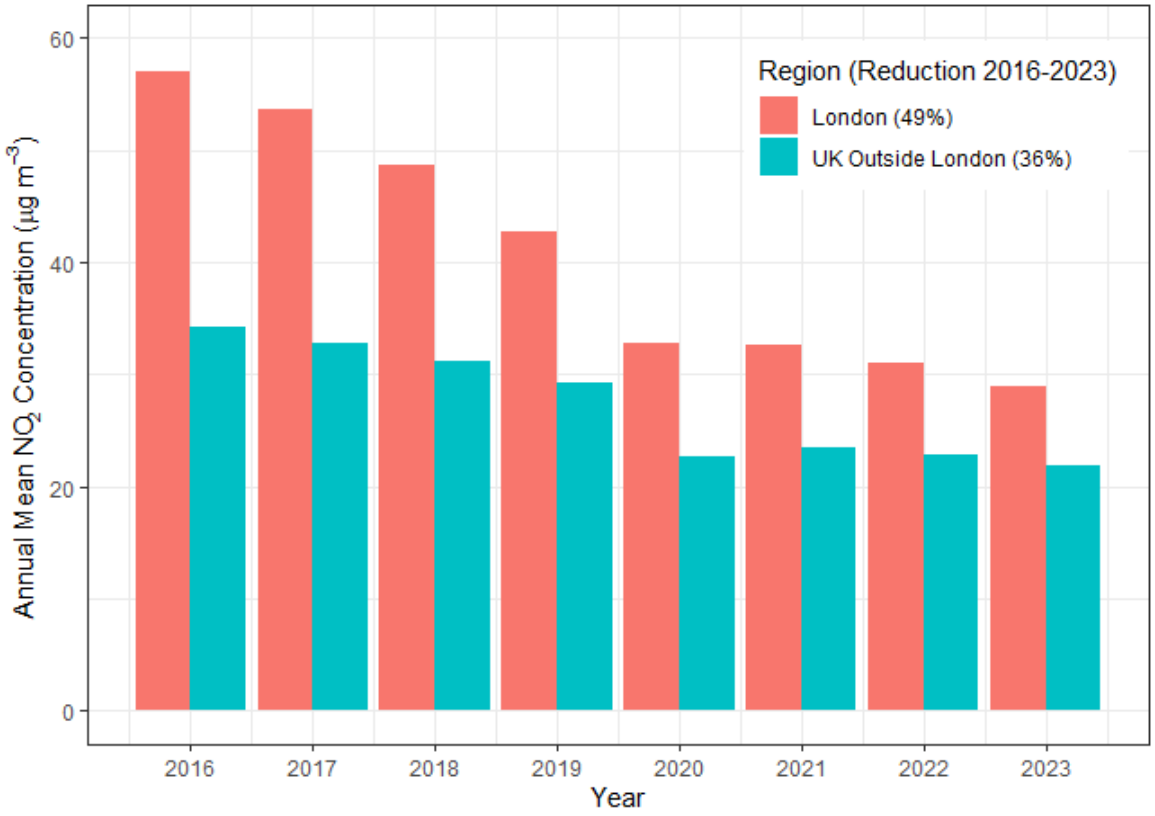

Figure 1: **Annual mean 'deweathered' NO_2 concentrations at roadside, kerbside and urban traffic automatic monitoring sites with sufficient data capture across the UK outside of London (based on 73 monitoring sites) and sites within London (based on 26 monitoring sites).**

[3] Roadside, kerbside and urban traffic sites.

[4] Urban background, suburban background, urban, suburban and urban centre sites.

[5] Rural and rural background sites.

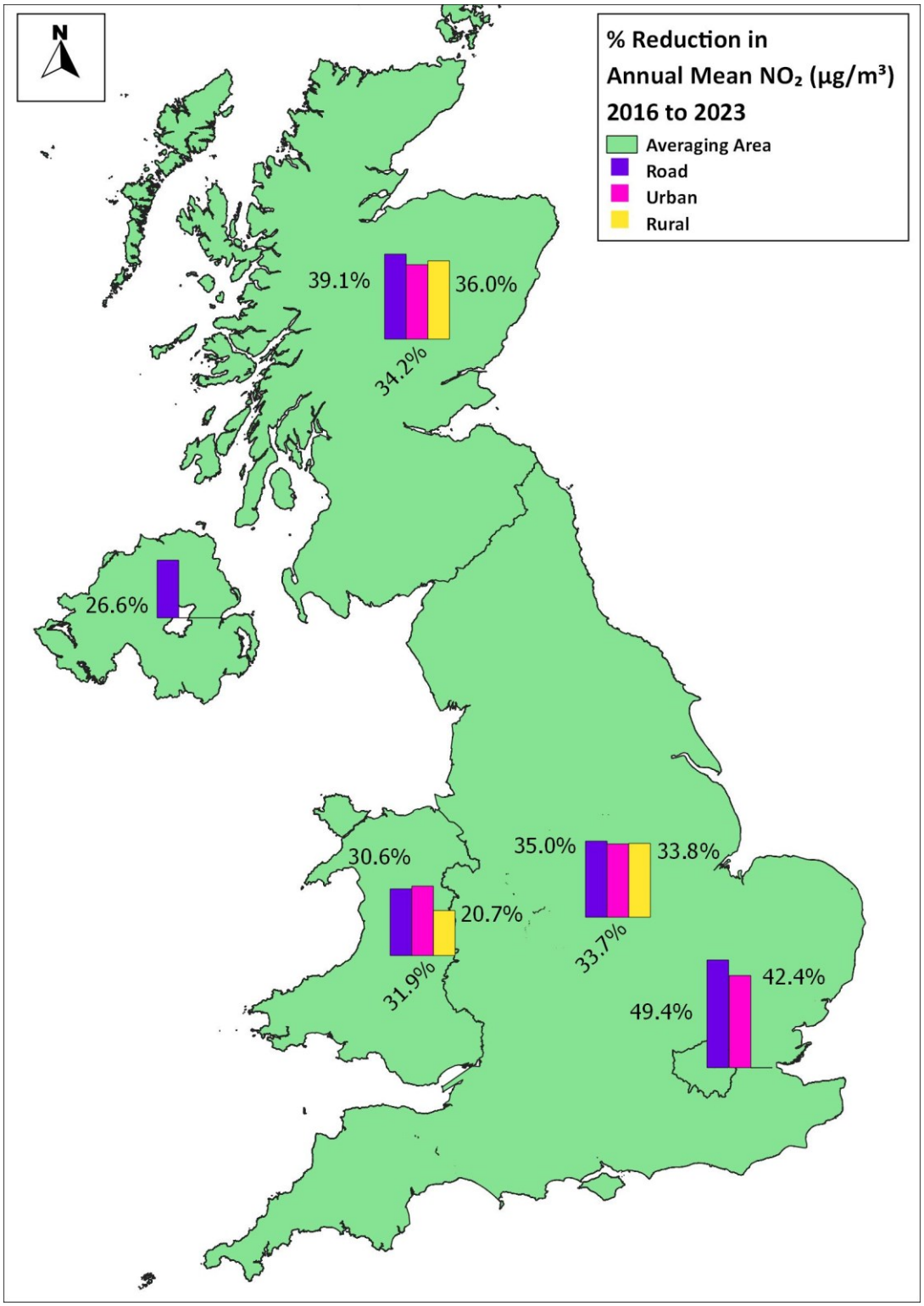

Figure 2: **Reduction in average annual mean 'deweathered' NO_2 concentrations between 2016 and 2023 at road, urban and rural automatic monitoring sites in London, England outside London, Scotland, Wales and Northern Ireland. There are no suitable rural sites in London, or urban and rural sites in Northern Ireland, for use in this analysis.**

2 Methodology and Additional Information

2.1 This report provides an analysis of NO_2 concentrations to remove the predictable effects of weather using statistical models (using the R OpenAir package[6,7]), following the method of previous analyses undertaken by AQC[1]. The model build was run from 1 January 2014 to 28 January 2024, but only processed results from the beginning of 2016 up to the end of December 2023 are shown in this report. The most recent data are unratified and thus more uncertain[2]. The analysis considers measurements from 202 real-time monitoring sites across the UK, but only includes sites with at least 90% data capture over the whole monitoring period, and more than 75% data capture every year between 2016 and 2023 inclusive in the Automatic Urban and Rural Network (AURN), Scottish Air Quality Network (SAQN), Welsh Air Quality Network (WAQN), Air Quality England (AQE) network and King's College London (KCL) network. The effect of seasonality has not been removed.

2.2 The reduction in average annual mean NO_2 concentrations between 2016 and 2023 has been calculated using the same dataset as described above. The reductions are shown as a percentage of the 2016 values. For London, they are based on 26 London road[3] sites and 23 urban[4] sites. For England outside London, they are based on 36 road sites, 27 urban sites and 7 rural[5] sites. For Scotland, they are based on 28 road sites, 4 urban sites and 1 rural site. For Wales, they are based on 8 road sites, 1 urban site and 1 rural site. For Northern Ireland, the reduction is based on 1 road site. No suitable rural sites were available in London, or urban or rural sites in Northern Ireland, with sufficient data capture for inclusion in this analysis.

2.3 The annual average data shown in Figure 1 can be taken to indicate the average concentrations close to roads; it should be noted that this is an average of several locations, and there may be locations where concentrations are much higher or lower than those calculated here.

6 Carslaw D.C. & Ropkins K. (2012), openair — An R package for air quality data analysis, Environmental Modelling & Software, 27–28(0), 52–61. ISSN 1364-8152, doi:10.1016/j.envsoft.2011.09.008.

7 Carslaw, D. (2023) *deweather: Remove the influence of weather on air quality data. R package version 0.7.2*, http://davidcarslaw.github.io/deweather/.