Air Pollution Event Report

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Camden, London June 2023

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Background

This document is an analysis of pollution patterns during June 2023 over a sensor network in Camden, London. For this report a representative sample of 80 nodes (1/3 of the whole network) was analysed based on hourly average of the following pollutants: PM_{2.5}, O₃ and NO₂. The pollutant concentrations were also compared to previous months and the findings are presented in this report.

Analysis

For the comparison purposes the data of Camden AirNodes covers the period between April 2023 and June 2023. Nevertheless, the focus of this report is on June.

NO₂: Seasonal Variation with Persistent WHO Guideline Exceedence

The analysis of NO₂ data, gathered from the Camden devices, indicates marginal variation in average monthly concentrations, demonstrating a consistent daily pattern of pollutant formation (Table 1, Fig. 2). NO₂ levels observed in Camden in the beginning of June were low, however starting from 8th of June the NO₂ concentration rose and remained elevated for the rest of June. This trend coincides with rising temperatures and elevated ozone concentration, which can have an effect on NO₂ creation. The average NO₂ concentration in June increased compared to May. Moreover, Camden on average still exceeds the World Health Organization's guidelines for a 24-hour NO₂ average (25 ug/m³), continuing a pattern observed in previous months (Fig. 1). The NO₂ concentrations are especially elevated on bigger roads such as Haverstock Hill, Pond Street, North End Way and Euston Road (Fig. 7).

Table 1: Monthly averages of observed pollutants				
Month/Pollutant	NO ₂ in ug/m³	O ₃ in ug/m ³	PM _{2.5} in ug/m³	
April	42	40.9	8.6	
May	34.3	42.7	5.7	
June	36.2	57.4	6.9	
3 months average	37.5 ± 4.0	47.0 ± 9.1	7.0 ± 1.5	



Fig. 1: NO₂ 4h average in April-June period.

The black horizontal line represents an average of AirNodes for that time period. The black dashed line represents temperature observed in the AirNode.



Fig. 2: NO₂ hourly average in June.

The black horizontal line represents an average of AirNodes for March. The black dashed line represents temperature observed in the AirNode.

O₃: Seasonal Variability and Summer Correlation

The variability in Ozone (O3) concentration is more pronounced in June in comparison to NO_2 . The average concentration of O_3 exhibited a rising trend over the past three months, spanning April to June, with a significant increase in June (Table 1, Fig. 3), a phenomenon likely attributed to extended sunshine durations and increase in average temperature.

Moreover, certain periods in June, especially the period between 10th and 18th of June, experienced an elevated O_3 concentration, which correlates well with increased temperatures, sunny days and occasional storms that occurred in that period (Fig. 4). The association between the concentration of ozone and the prevalence of sunny summer weather is significantly emphasized during the month of June.



Fig. 3: O₃ 4h average in April - June.

The black horizontal line represents an average of AirNodes for that period. The black dashed line represents temperature observed in the AirNode.



Fig. 4: O_3 hourly average in June.

The black horizontal line represents an average of AirNodes for March. The black dashed line represents temperature observed in the AirNode.

PM_{2.5}: Spikes in June and Localised Pollution

The PM₂₅ dataset reveals a rise in concentrations, significantly exceeding the average, specifically observed over a few days of June (11th - 12th and 18th-19th). The PM₂₅ concentration was notably higher than in May, however less pronounced than in April (Table 1, Fig. 5).

Additionally, localized spikes in pollution, unaligned with the broader trends, have been observed. Nodes situated in some regions of Camden, specifically at **High Holborn, Fitzjohn's Ave, North End Way experienced more frequent incidences of elevated PM pollution** as noticed in previous months.

Increased Air Quality Index in June

AQI levels in June saw an increase in month over month readings.



Fig. 5: PM_{2.5} 4h average in April-June.

The black horizontal line represents an average of AirNodes for that time period.



Fig. 6: PM₂₅ hourly average in June.

The black horizontal line represents an average of AirNodes for that time period. The black dashed line represents temperature observed in the AirNode.

Summary

The analysis of the data provides insights into patterns of pollution formation and their correlations with certain weather conditions.

 NO_2 data demonstrates consistency in its formation pattern with minor monthly fluctuations. The NO_2 concentration on average increased in June compared to May and occasionally surpassed the World Health Organization's guidelines for NO_2 . NO_2 is especially elevated on busier roads with heavy traffic such us: Haverstock Hill, Pond Street, North End Way, Euston Road

Ozone concentrations have increased significantly in the month of June, likely due to longer periods of sunshine and elevated temperatures. The association between the concentration of ozone and the prevalence of sunny summer weather is significantly emphasized during the month of June.

 $PM_{2.5}$ concentration was notably higher than in May, however less pronounced than in April and is still lower than those seen in the winter months, indicating a possible seasonal effect on PM_{25} emissions.

A notable escalation in all monitored pollutants was observed during the period between 10th and 13th June, which was followed by a high pollution alert by the Mayor of London on 13th. This was due to the effects of a plume of pollution that traveled in from the continent alongside a build-up of local emissions, exacerbated by sunny weather with high temperatures. Imperial College London forecasters advised the Mayor on the likelihood of high ozone levels, influenced by the hot, sunny weather and south-easterly winds blowing existing pollutants towards London.



Fig. 7: NO₂ on 12th June as seen on airscape.ai



Fig. 8: Historical weather data from June 2023 (meteoblue.com)

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