Air Pollution Event Report

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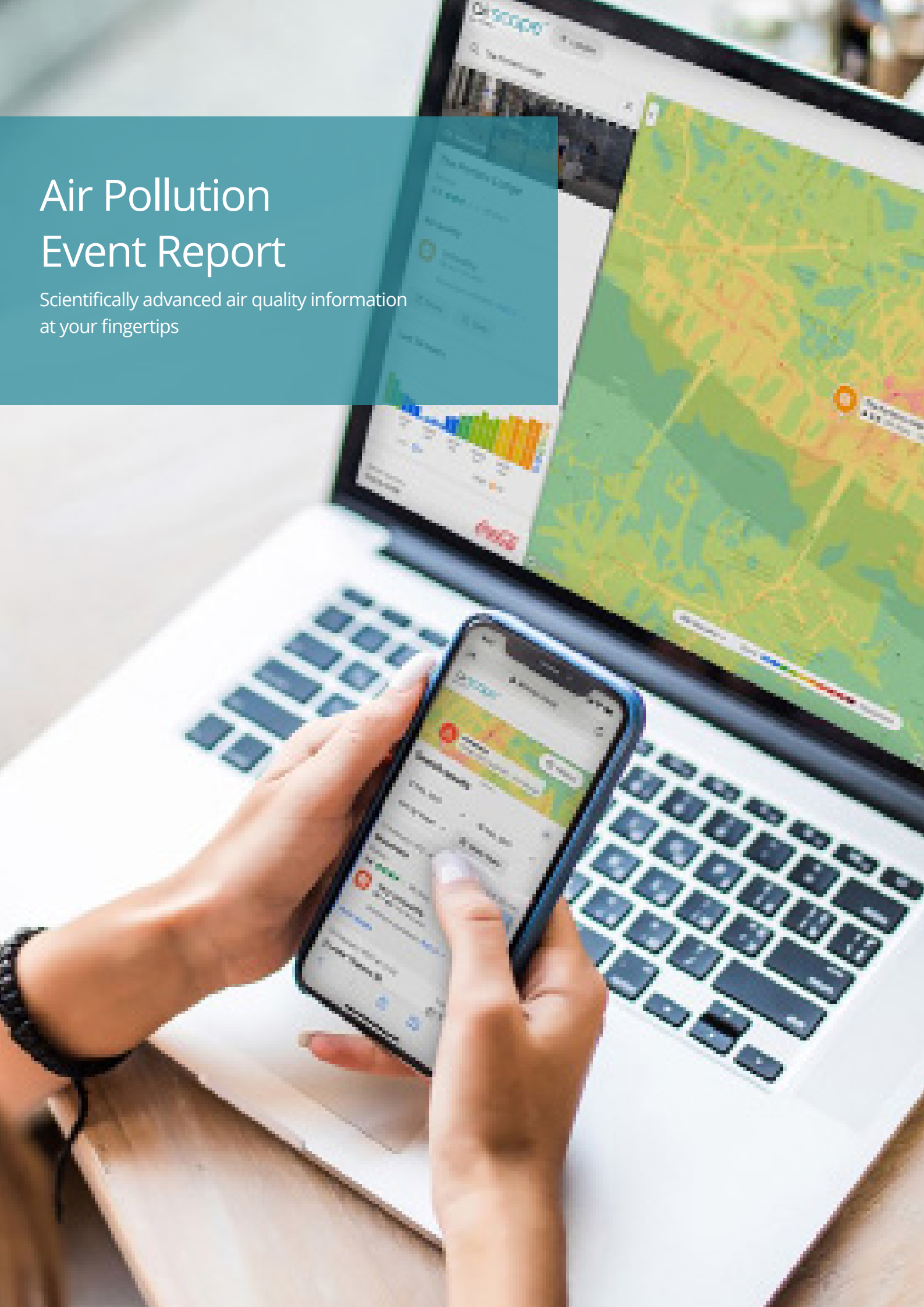

Camden, London February 2023

Title	Camden pollution events report (February 2023)
Report no	TR008
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Description	Report on recent pollution events in Camden, London
Authors	Szymon Kwiatkowski
Reviewers	Matthew S. Johnson
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Background

This document is an analysis of pollution patterns during February 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: $PM_{2.5}$, O_3 and NO_2. 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 December 2022 and February 2023. Nevertheless, the focus of this report is on February.

Based on the analysis of the **NO_2** data from the representative Camden devices, it can be seen that there are no big differences between the months, and that the average monthly concentrations vary little (Table 1, Fig. 1) suggesting stable daily patterns for the pollutant formation. However, February saw a slight increase in concentration of all major pollutants compared to January. Moreover a tendency for NO_2 to increase with decreasing temperatures and slower wind speed can be observed in February (Fig. 2), which was also a case in previous months. We can also clearly distinguish two periods of elevated NO_2 concentrations, that is: 6th-10th and 13th-16th of February. **On average NO_2 concentration in February was clearly higher than WHO guidelines for 24-hour NO_2 average (25 ug/m³)**.

Table 1: Monthly averages of observed pollutants

Month/Pollutant	NO_2 in ug/m³	O_3 in ug/m³	$PM_{2.5}$ in ug/m³
December	36.6	25.7	11.6
January	40.5	29.9	8.6
February	41.3	30.5	10.3
3 months average	39.5 ± 2.5	28.7 ± 2.6	10.2 ± 1.5

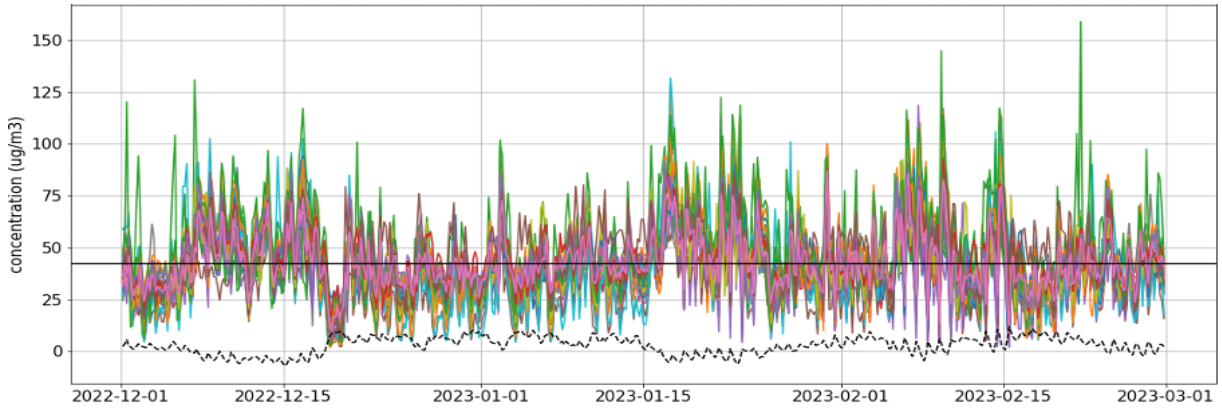

Fig. 1: NO_2 hourly average in December-February period.
The black horizontal line represents an average of AirNodes for that time period.

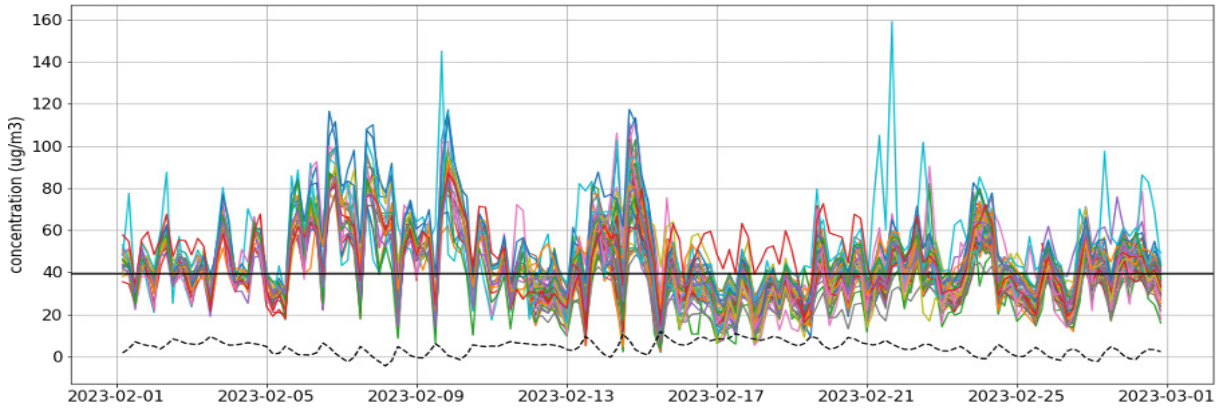

Fig. 2: NO_2 hourly average in February.
The black horizontal line represents an average of AirNodes for December.

The **Ozone** concentration saw a much higher variability in February compared to NO_2. The average concentration of O_3 in the last three months (from December to February) remains at similar levels (Table 1) and is slightly increasing month over month probably due to increasing sunshine duration.

Periods of low wind speed from the east (Fig. 9) contributed the most to the low ozone concentration in February (6th-8th and 13th-16th of February) (Fig. 3). However, even stronger winds from the north that should reduce the ozone concentration in the city didn't help in the last days of February. This is probably due to strong solar radiation in that period. Generally, the correlation between wind speed and its direction with ozone is very noticeable.

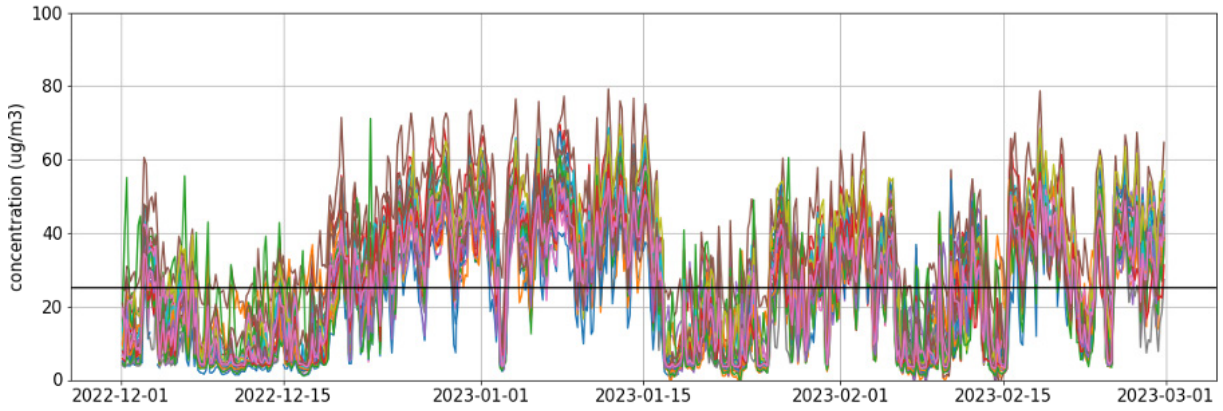

Fig. 3: O_3 4h average in December - February.
The black horizontal line represents an average of AirNodes for December.

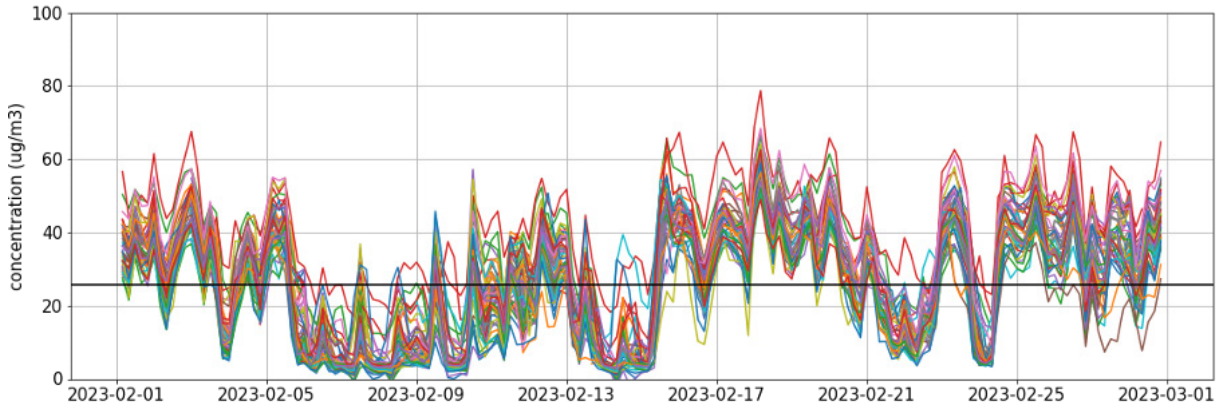

Fig. 4: O_3 hourly average in February.
The black horizontal line represents an average of AirNodes for December.

The **$PM_{2.5}$** data shows some increased concentration strongly above the average for at least 10 days in February (Fig. 5, Fig. 6, Table 1). The periods between 6th and 9th as well as 13th to 16th are especially bad (Fig. 7). The average concentration in the 13th -16th period (31.6 ug/m3) increased three times compared to the average February concentration (10.3 ug/m3). The pollution of similar scale caused the London authorities to raise a high pollution alert in January. This however, didn't happen in February even though the AQI levels reached unhealthy thresholds again (Fig. 8). Furthermore, air quality was very poor on 14th of February. We could argue that from a health perspective staying home on Valentine's day was probably a better decision this year than going on a romantic walk (Figure. 7). The PM pollution seems to be correlated to lower temperatures in that period and small wind speeds (Fig. 9). In general a conclusion can be drawn from the existing data that higher wind speed, precipitation and warm weather have significant positive impact on lowering PM concentration.

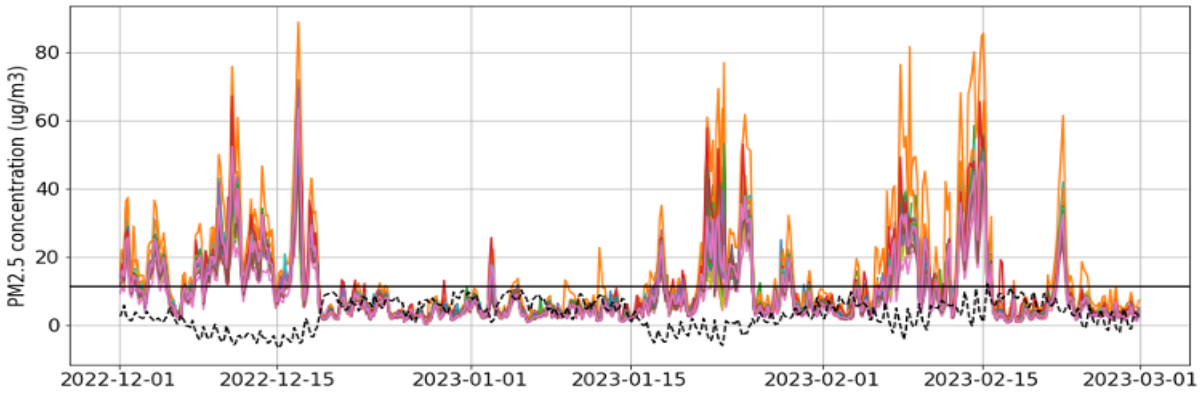

Fig. 5: $PM_{2.5}$ 4h average in December - February.
The black horizontal line represents an average of AirNodes for that time period. The black dashed line represents temperature observed in the AirNode.

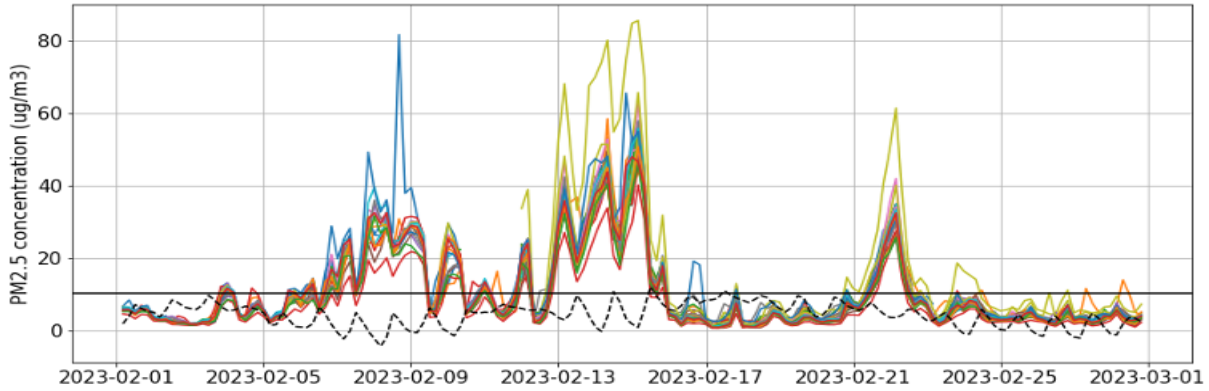

Fig. 6: $PM_{2.5}$ hourly average in February.
The black horizontal line represents an average of AirNodes for that time period. The black dashed line represents temperature observed in the AirNode.

Summary

Based on the data gathered by the Camden Network in London, February was another eventful month regarding air pollution.

- NO_2 data exhibited stable daily patterns, with of slight increase in all pollutants compared to January. The concentration of NO_2 was higher than WHO guidelines throughout January.
- Ozone is slightly increasing each moth due to increased sunshine duration.
- We saw increased $PM_{2.5}$ concentration strongly above the average for at least 10 days in February. The highest PM concentration, three times higher than average for the month, were between 6-9th February and 13-16th.
- Pollution levels of a similar scale that prompted a high pollution alert by London authorities on 24th January was seen again in February - but without another alert. Live data from airscape.ai showed in real time the increased pollution over the Camden borough and could have a real impact on those more vulnerable to air pollution (Fig. 7 and 8). Figure 7 shows that Valentines Day was not the best time for a romantic walk.

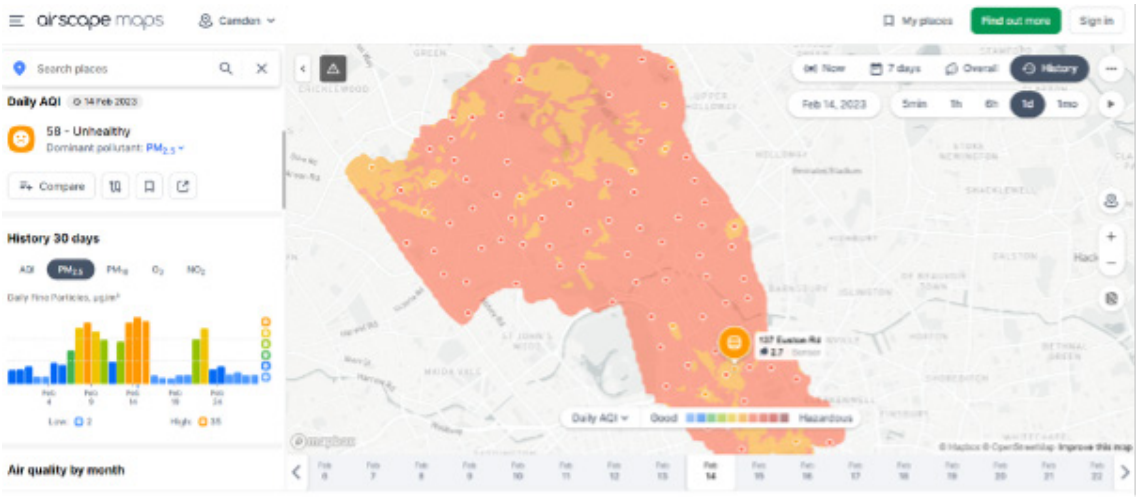

Fig. 7: $PM_{2.5}$ of one of the AirNodes on 14th February, Valentines Day @ airscape.ai

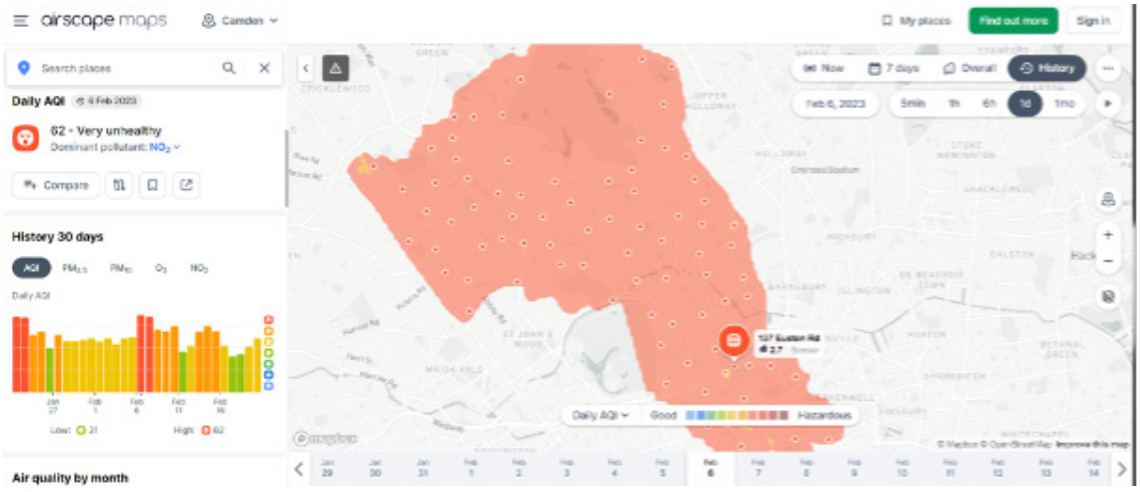

Fig. 8: AQI over Camden on 6th February @ airscape.ai

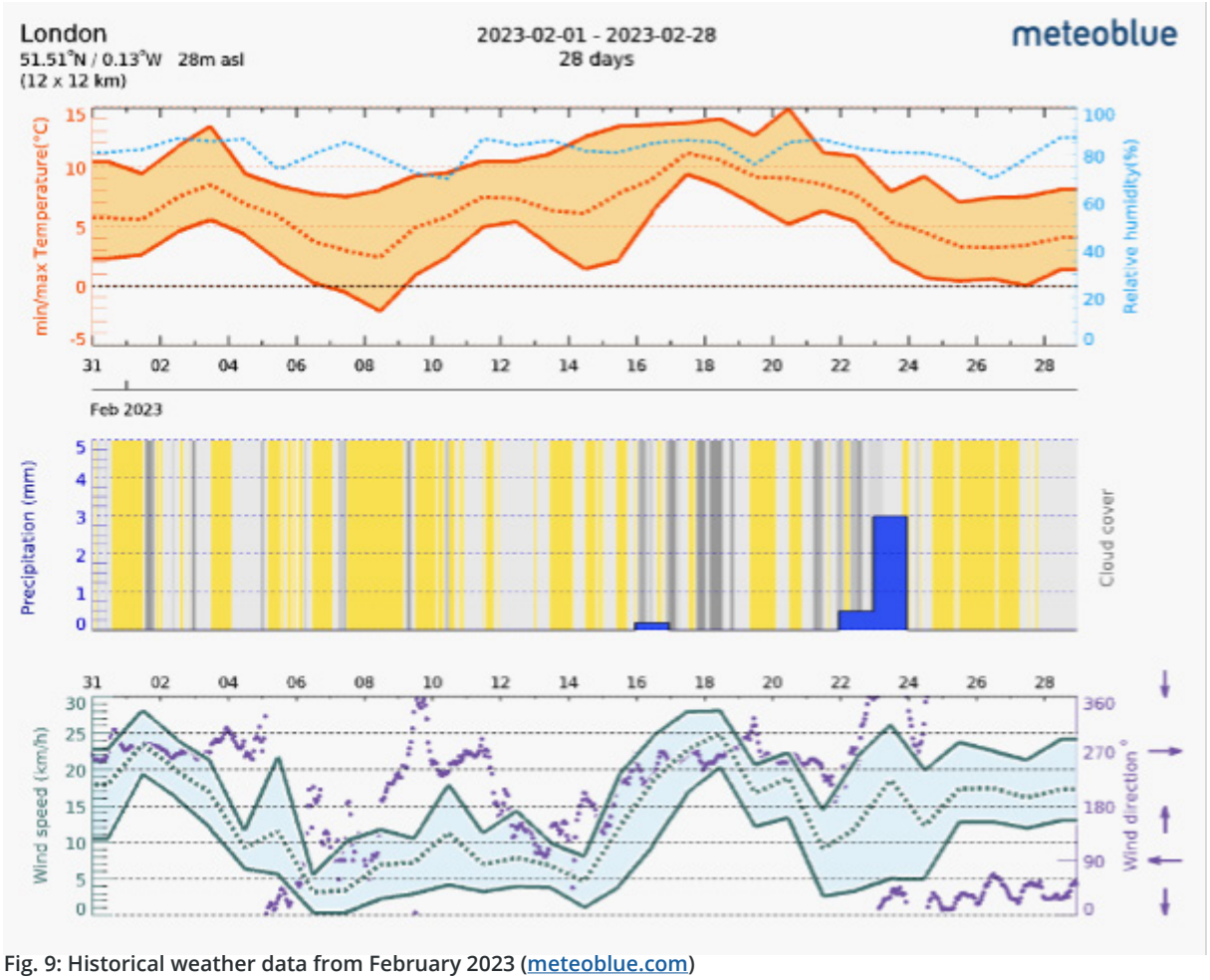

Fig. 9: Historical weather data from February 2023 (meteoblue.com)

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