

Impact of Moorland Fires on Sheffield Air Quality on 9th October 2023

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What happened?

Moorland fires on Stanage Edge, Strines Moor and other nearby areas on Monday 9th October 2023 led to large quantities of smoke drifting into Sheffield¹. These fires were planned, controlled burns to maintain the moorland for various purposes, including game bird shooting.



BBC and Sheffield and Rotherham Wildlife Trust

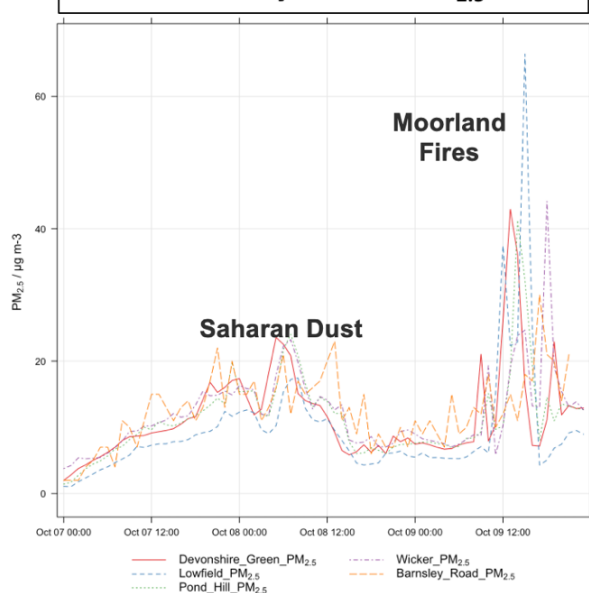
Impact on Air Quality (AQ)

Biomass burning releases particulate matter (PM) into the air which can have a significant impact on AQ. From an AQ perspective, PM_{2.5} (PM less than 2.5 µm in size) presents the greatest risk to health. Sheffield has a network of AQ sensors around the city which measure pollutants, including PM_{2.5}. This network consists of higher quality instruments maintained by DEFRA² and Sheffield City Council (SCC)³ and a network of low-cost sensors^{4,5}, including those which are part of Clean Air Sheffield.

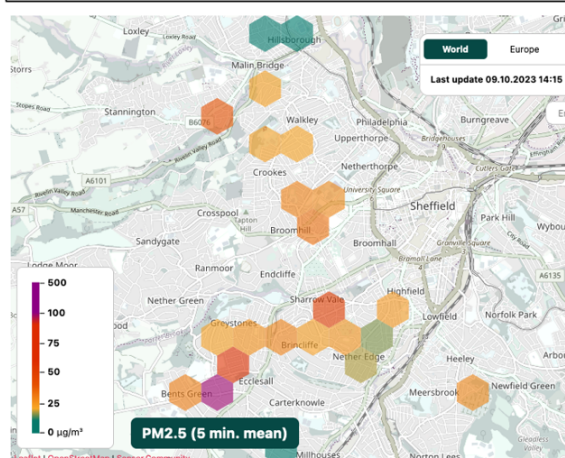
On 9th October, the DEFRA and SCC sensors reveal a significant spike in PM_{2.5} from midday to 5-6 pm (4 of 5 sensors >40 µg m⁻³). This increase dwarfs the weekend peak from long range transport of Saharan dust, which is unavoidable. The maximum value recorded at Devonshire Green was the highest for 8 months while the single largest reading (66 µg m⁻³) was observed at Lowfield Primary School. Young children are particularly vulnerable to poor AQ⁶ and were exposed to high levels for several hours. Other sensors across the western side of Sheffield also recorded very high PM_{2.5}, exceeding 50 µg m⁻³ in many regions.

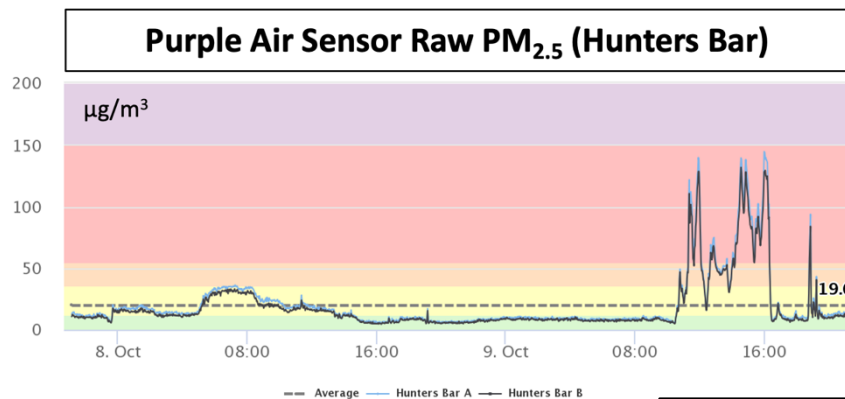
The assessment of PM_{2.5} exposure is based on a 24-hour average (current WHO⁷ limit of 15 µg m⁻³), making quantification of the health impact of this short-term episode challenging. Nevertheless, the size of the increase indicates a longer burning fire would have resulted in Sheffield's PM_{2.5} concentration easily exceeding the WHO limit that day.

DEFRA and City Council PM_{2.5} Data

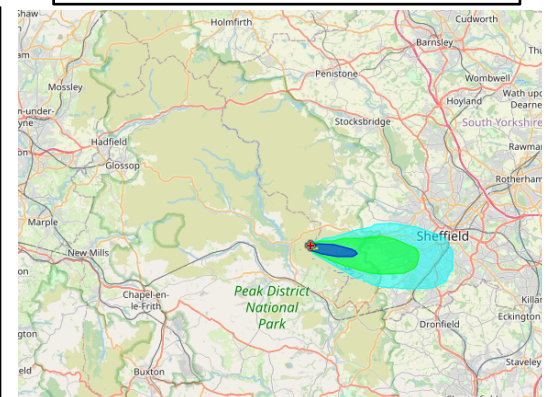


Clean Air Sheffield Network (Sensor.Community)





**Pollution dispersion after
1 hour (14:00 BST)**



Impact of Weather

Weather plays a central role in pollution dispersion and the concentrations experienced by population centres. To illustrate this, we use a computer model⁸ which shows the prevailing winds on 9th October blew directly to the east, pushing the pollution straight over Sheffield.

Had the winds been blowing to the north, south or west, the pollution would have had much further to travel before reaching population centres. This would lead to greater dispersion, lower PM_{2.5} concentrations and a smaller impact on AQ and public health.

Conclusions and Recommendations

Under certain weather conditions, burning even modest areas of moorland can dramatically worsen Sheffield's air quality, putting the most vulnerable members of our community at risk. This summary highlights the critical importance of considering forecasted winds before any controlled burn is permitted, even if these burnings are believed to be important for biodiversity and ecological safeguarding of the moorlands. Moorland fires should only be allowed to occur when the forecasted winds will not carry the smoke to Sheffield, or to any other population centre.

More generally, this episode highlights the vulnerability of Sheffield's air quality to unplanned wildfires, which could potentially burn more widely and for a much longer period in future. Left unchecked, in a warming world with more frequent heatwaves, wildfire frequency and severity are likely to grow. To address this growing threat, proactive land management strategies should be implemented to reduce wildfires' ability to form and spread. These efforts are crucial to protect the air quality, health and well-being of our community and should be a priority in our environmental planning and policy decisions.

References

- ¹ **BBC News** <https://www.bbc.co.uk/news/uk-england-south-yorkshire-67058489>
- ² **DEFRA air quality sites** <https://uk-air.defra.gov.uk/interactive-map>
- ³ **Sheffield City Council air quality sites** <https://rb.gy/mlrgk>
- ⁴ **Low cost sensor map 1** <https://maps.sensor.community/#12/53.3776/-1.4429>
- ⁵ **Low cost sensor map 2** <http://aqicn.org/station/@348523/>
- ⁶ **European Environment Agency** <https://rb.gy/cn3xu>
- ⁷ **WHO Global Air Quality Guidelines** <https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1>
- ⁸ **HYSPLIT Trajectory Model** <https://www.arl.noaa.gov/hysplit/>