

PM_{2.5} AIR POLLUTION FROM BURNING WASTE IN THE SHEFFIELD HEELEY & MEERSBROOK ALLOTMENTS

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ISABEL NAVARRO LAW AND MARIA VAL MARTIN

SCHOOL OF BIOSCIENCES, UNIVERSITY OF SHEFFIELD



THE ISSUE. Heeley and Meersbrook allotments are to the south of Sheffield City Centre. The site has more than 400 plots, being the largest single allotment site in Europe, and burning between October and April is common practice to dispose of waste. These burnings produce smoke, which includes large amounts of harmful air pollutants, including PM_{2.5}. This air pollution has damaging health effects and people with existing health problems are especially vulnerable, e.g., asthmatics, children, and the elderly. PM_{2.5} released from fires is ten times more harmful than from any other source. Air pollution is responsible for 36,000 premature deaths in the UK

every year and about 500 deaths in Sheffield alone. The World Health Organisation (WHO)'s has set PM_{2.5} limits of 5 µg/m³ per year and a daily limit of 15 µg/m³. The Sheffield City Council imposes a fire ban from May to September and local groups are advocating for a full year fire ban.

WHAT WE DID. We analysed PM_{2.5} data recorded by nine low-cost sensors (sensor.community SDS011) in and around the allotments, in combination with meteorological data from a nearby weather station. We also distributed a questionnaire to residents and allotment holders to understand public perception of fire, PM_{2.5} pollution and the introduction of a full year fire ban.

WHAT WE LEARNT

- There are significantly higher PM_{2.5} levels between October and April when the fire ban is not in place, although this period coincides with wintertime when PM_{2.5} pollution is systemically at its worst. This made difficult to quantify the overall impact of burning waste on the local PM_{2.5} levels.
- Daytime PM_{2.5} during the 'fire season' is still below the WHO's recommended safe annual limit (5 µg/m³), although daily PM_{2.5} values are above the daily limit (15 µg/m³) on many occasions. We note that PM_{2.5} data collected near the allotments are limited to be able to do a conclusive analysis.
- Small scale waste fires can make PM_{2.5} levels reach more than 300 µg/m³ locally for a few hours and even peak at 1,000 µg/m³ (the highest level the sensors can record). These concentrations are comparable to levels found in very highly polluted mega cities.
- Highest PM_{2.5} values outside the allotments are associated with periods with wind blowing from the allotments, suggesting that allotment fires may impact PM_{2.5} in the residential areas.
- Allotment holders in general do not support a full year ban; only senior allotment holders (> 50-years old) and well-established allotment holders (> 5 years) would support it.
- Residents in general do not support or care about a full year ban, although residents living less than a mile from the allotments are more inclined to support it.
- Residents and allotment holders with a pre-existing respiratory disease or with children do not support a full year ban, indicating that the public does not associate allotment fires with air pollution and human health issues, which highlights the complexity of the subject.

WHAT WE RECOMMEND

- Longer and continuous PM_{2.5} measurements and a precise record of burning waste (day, time, and duration) will help quantify the overall contribution of allotment fires in local PM_{2.5} levels.
- Local Authorities should discourage burning and provide alternatives to allotment holders to avoid extremely high PM_{2.5} pollution levels during short periods in residential areas.
- Sheffield City Council must improve education on air pollution and the impact of allotment fires in human health as a priority, before gaining the support of the community for implementing additional fire bans.