University of Nairobi

Eastern Africa GEOHealth Hub — Global Environmental & Occupational Health

CASELAP | THE CENTRE FOR ADVANCED STUDIES IN ENVIRONMENTAL LAW AND POLICY

POLICY BRIEF

Suspended dust particles showing the air pollution in Nairobi, Keny. Photo Credit: GEOHealth Kenya

Air Quality in Nairobi City: Reality Check!

Executive Summary

Long term exposure to very fine particles ($PM_{2.5}$) can cause adverse health impacts related to the lung and heart.

Our study aimed at establishing factors influencing fine dust particle concentrations in Nairobi City and their impacts on lung health of school going children from long-term exposure. Here we report on the levels of the fine dust particles in 8 primary schools in Nairobi between August 2019 and September 2020. The particles were measured using air quality monitors (BAM 1022 and Nephelometers). We show that the daily pollutant levels intermittently exceeded the WHO recommended standards and varied in distribution across the City. Human factors such as vehicular traffic, burning of solid wastes, and Industrial emissions appear to be major contributors of the pollutant, which declined in concentration during COVID-19 pandemic driven by partial lockdown of the city. Policy decisions targeting such emissions would reduce the exposure levels and mitigate health impacts of fine particle pollutants on children.

Introduction

Quality of air is an important determinant of public health for a city. In Nairobi City, this has been of particular concern due to vehicular, industrial, and solid waste burning emissions. Our study aimed at establishing long term exposure of school going children to the fine particulate matter ($PM_{2.5}$) using high precision fine particles monitors.

Approach

A time-series study design was used where daily (24-hour) average $PM_{2.5}$ concentrations were recorded between 21 August 2019 and 30 September 2020 using the BAM-1022. A 12-month mean concentration was further obtained from 10 Nephelometers erected in primary schools spread in 8 city planning zones (Dagoretti, Embakasi (2), Kamukunji, Kasarani, Langata (2), Makadara, Starehe and Westlands). Daily and long-term average concentrations were expressed as weight of the fine particles per cubic metre of air. The Inverse Distance Weighting interpolation technique was used to determine the pollutant spatial distribution in the city. These were compared with WHO guidelines of safe levels of ambient pollutant concentrations that are 25 μg/m^3 (daily) and 10μg/m^3 (long-term).

Key Findings

1. Daily pollutant levels were intermittently above WHO recommended standards of 25μg/ m^3 but generally in safe levels (Figure 1).
2. Pollutant levels dropped between March and May 2020 during the partial lockdown necessitated by COVID 19 pandemic but rose to pre-lockdown levels by the first week of June 2020.
3. The 10-month average of pollutant concentrations was above WHO recommended standards of 10μg/m^3 in 7 planning zones, but were at safe levels in large parts of the Langata planning zone (Figure 2).
4. Pollutant levels varied according location (Figures 2 & 3).
5. There was a close correlation between pollutant levels and controllable human activities (traffic, garbage burning)


BAM 1022 at the University of Nairobi, Nairobi, Kenya. Photo Credit: GEOHealth Kenya

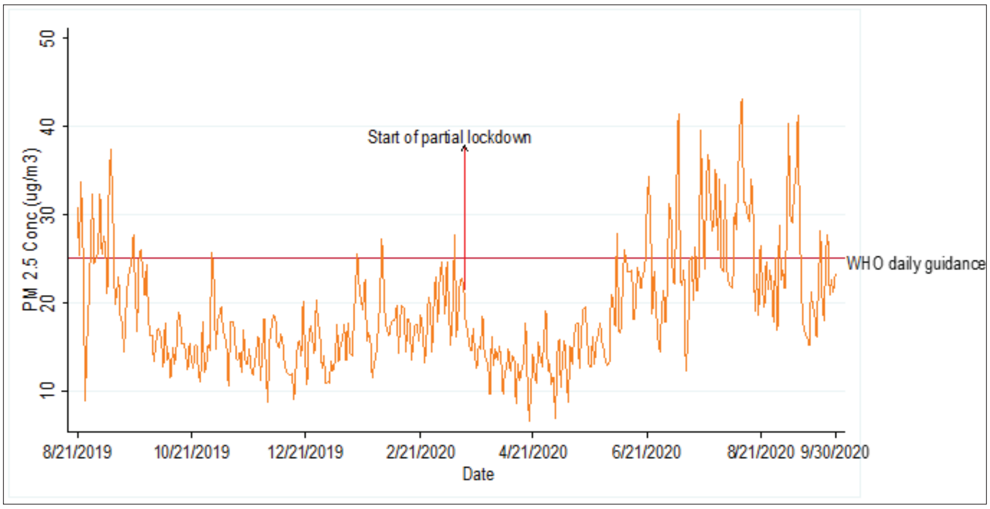

Figure 1: A time-series line graph showing the daily average of ambient air particulate matter ($PM_{2.5}$) concentrations (µg/m^3) in Nairobi City, as measured by the BAM 1022 monitor between 21 August 2019 and 30 June 2020. Note the drop-in pollutant levels following the partial lockdown in mid-March.

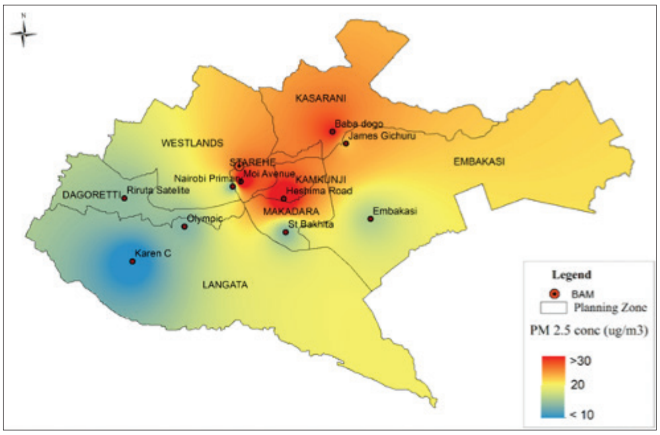

Figure 2: Map of the eight planning zones of Nairobi City showing the average of ambient air particulate matter ($PM_{2.5}$) concentrations (µg/m^3) as measured by the monitors erected in 10 schools between 21 August 2019 and 30 June 2020.

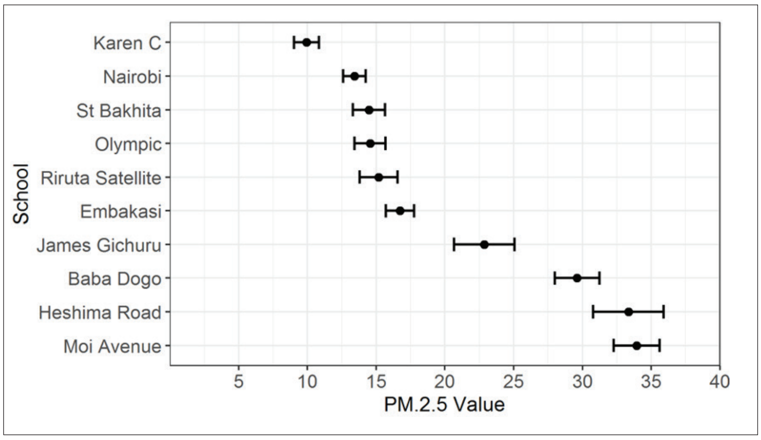

Figure 3: Mean particulate matter concentrations (µg/m^3) in 10 schools between 21 August 2019 and 30 June 2020.

Recommendations

- Develop strategies for enhancing traffic flow throughout the city, e.g. removal of hand carts from major roads to reduce snarl-ups
- Improve on solid waste collection and disposal, e.g. discourage waste burning
- Incentivize firms to invest in green energy technologies including use of carbon filters in their chimneys
- Incentivize reduction in the use of private cars into the city, e.g. fast tracking the Bus Rapid Transit (BTR), light trains, etc.
- Incentivize non-motorized mobility types, e.g. provision of walkways and cycle lanes throughout the city

Key References

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CASELAP - University of Nairobi | Parklands Campu | P.O.Box 30197 Nairobi, Kenya
Email: geohealthuon@gmail.com | www.geohealthhub.org

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