161. Assessment of Particulate Matter (PM) Levels in Urban Centers in Kenya: A Case Study of Meru Town, Kisumu, and Nairobi

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Abstract

Particulate Matter (PM) is a significant contributor to air pollution, posing serious public health risks. Urban centers in Kenya, particularly Meru Town, Kisumu, and Nairobi, face heightened risks due to industrial and motor vehicle emissions, compounded by rapid urbanization and weak environmental regulations. This study aims to assess PM levels in these urban centers to evaluate their suitability for human habitation. To achieve this, Internet of Things (IoT)-enabled Optical Particle Counters (OPCs) were deployed at various strategic locations in the three towns to collect PM data. The data, spanning from 2020 to 2023, was transmitted to a central server for analysis using Python and archived on the sensors.AFRICA Sensor Africa portal. The PM levels were compared against the World Health Organization's (WHO) recommended thresholds to determine pollution severity.The study revealed elevated PM levels in all three towns, exceeding WHO's guidelines. Specifically, Nairobi recorded PM2.5 levels of 25 $\mu g/m^3$ and PM10 levels of 25 $\mu g/m^3$. Meru had PM2.5 levels of 30 $\mu g/m^3$ and PM10 levels of 22 $\mu g/m^3$, while Kisumu recorded PM1.0 levels of 25 $\mu g/m^3$ and PM2.5 levels of 25 $\mu g/m^3$. For context, WHO recommends an annual mean of 5 $\mu g/m^3$ for PM2.5 and 15 $\mu g/m^3$ for PM10, and a 24-hour mean of 15 $\mu g/m^3$ for PM2.5 and 45 $\mu g/m^3$ for PM10. The high PM levels across these urban centers can be attributed to industrial emissions, vehicular exhaust, and rapid urban growth, with each city exhibiting unique pollution sources. Nairobi's pollution is primarily driven by vehicular emissions, Meru's by a combination of industrial activities and urbanization, and Kisumu's by both industrial emissions and biomass burning.These findings underscore an urgent need for policymakers to commission comprehensive PM monitoring studies across all urban centers in Kenya. Moreover, stringent regulatory measures must be formulated and enforced to mitigate escalating PM levels, ensuring safer living conditions for urban residents.

Keywords: *Particulate Matter, PM 1.0, PM 2.5, PM 10, WHO, PM annual threshold, PM daily threshold, Optical Particle Counters*