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BSc Environmental Engineering

Examining PM10 and PM2.5 concentration in Gödöllő

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Abstract

Air pollution, specifically caused by particulate matter (Cichowicz & Dobrzański), like PM_{10} and $PM_{2.5,}$ is a concern that greatly impacts the health of the public and the environment. The World Health Organization (Organization) attributes millions of deaths each year to air pollution, both indoors and outdoors. The research aims to investigate the origins of particulate matter in the city of Gödöllő, Hungary and comparatively examine the varying levels of PM_{10} and $PM_{2.5}$ in sub-urban and urban settings along with factors that affect these levels. To understand the dynamics of particulate matter in Gödöllő, data was collected from two locations where sensors were installed: Sensor A, which was located outside of the city center near the highway, and Sensor B situated in the city center. The Honeywell HPMA115S sensor was utilized to monitor levels of PM_{10} and $PM_{2.5}$ from February 17th to May 1st 2023 spanning over the transition end winter to spring season. Other environmental variables, like temperature, humidity, and pressure were also recorded to investigate how they relate to PM levels. The results suggest that PM_{10} and $PM_{2.5}$ levels tend to be elevated in the areas closer to the highways and where wood-based heating systems are installed have PM_{10} and PM2.5 concentration averages of 24.6 μg/m³ and 19.2 μg/m³ respectively. The sensor is not near the highway and where center heating system like sensor B has a PM_{10} and $PM_{2.5}$ concentration average of 13.1 μg/m³ and 10.4 μg/m³ respectively. In addition, $PM_{2.5}$ concentrations of sensor A exceeded WHO standards 75% of the data collected in Gödöllő. Statistical analysis such as Pearson correlation analysis, revealed a correlation between temperature and particulate matter levels suggesting that higher temperatures are linked to lower concentrations of particulate matter possibly due to enhanced dispersion in the atmosphere and low usage of heating systems. On the other hand, pressure and humidity displayed positive associations with PM levels. The study's findings have important implications for public health policies and environmental regulations in Hungary. The study highlights the importance of implementing policies to enhance air quality with a focus on controlling emissions from vehicles and switching to modern heating systems. These findings enhance our knowledge of where particulate matter originates in Gödöllő and lay the groundwork, for creating measures to combat air pollution and its related health hazards.