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GIS-BASED ANALYSIS OF PM10 AND PM2.5 POLLUTION IN TÜRKİYE (2019–2022): A FOUR-YEAR SPATIAL AND TEMPORAL PERSPECTIVE

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Abstract

This study provides a four-year assessment of PM10 and PM2.5 in Türkiye by analyzing spatial and temporal variability across the pre-pandemic (2019), pandemic (2020–2021), and post-pandemic (2022) periods. Ground-based measurements from 120 PM10 and 42 PM2.5 stations were selected using a ≥80% data completeness criterion. Annual means were examined using descriptive statistics, IDW interpolation (power = 2), change-detection, and leave-one-out cross-validation. Air quality levels were classified using a six-tier system adapted from WHO, EU, and national standards. analysis. Spatial PM distributions showed regional disparities across Türkiye. Annual mean PM10 remained relatively stable at ~43–45 µg/m³ from 2019 to 2022, while PM2.5 declined from 21.3 µg/m³ to 18.2 µg/m³ (–14%). PM decreases occurred in Eastern Anatolia during the pandemic, while increases appeared in metropolitan and industrial regions such as İstanbul, Ankara, and İzmir. Correlation analysis of daily PM values indicated weak temporal consistency across years. The results reveal distinct spatial and temporal differences in particulate pollution across all periods. By integrating multi-year ground observations with GIS-based analysis, this study provides a comprehensive national perspective on PM10 and PM2.5 trends and a reference for future assessments.

Key words: air quality, COVID-19, GIS, particulate matter, spatio-temporal analysis

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