

Urban Air Quality in Southeast Asia: Examining HCHO, SO₂, O₃, and NO₂ Trends and Variations.

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Abstract

This study examines the air quality trends and variations across seven Southeast Asian cities—Dhaka, Bangkok, Manila, Kunming, Jakarta, Taipei, and Kuala Lumpur—from 2005 to 2023, using NASA satellite data for four key pollutants: Nitrogen Dioxide (NO₂), Ozone (O₃), Formaldehyde (HCHO), and Sulfur Dioxide (SO₂). Correlation analysis revealed a generally weak negative correlation between NO₂ and O₃ in most cities, indicating potential ozone consumption by NO₂ in atmospheric reactions. The relationship between NO₂ and HCHO appeared weak and inconsistent, suggesting disparate emission sources for these pollutants. A weak positive correlation between O₃ and HCHO in most cities suggests shared emission sources or atmospheric processes impacting both pollutants. Observations in Dhaka revealed a significant increase in NO₂ levels, surpassing a 2% annual rise, alongside yearly increases in O₃, peaking during winter. Taipei showcased effective HCHO emission control, maintaining levels near 2006 values, with decreasing NO₂ and minimal O₃ increases. Manila experienced significant NO₂ fluctuations, not consistently aligning with December/January peaks. Bangkok demonstrated stable or slightly declining NO₂ levels, contrasting with rising O₃ concentrations. Kuala Lumpur and Jakarta exhibited decreasing NO₂ trends alongside increasing O₃ levels in Kuala Lumpur and a slight rise in Jakarta's O₃. These findings offer critical insights into air quality dynamics in Southeast Asian cities. They emphasize the need for tailored air quality management strategies considering the intricate relationships between pollutants and their emission sources.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

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MANGO: Monsoon Asia and Oceania Networking Group