

Dependence of Air Pollutants on Meteorological Parameters in Urban Environments: A Comparative Study of Battaramulla and Kandy

P.M. Batuwita^{1*}, A.I.S.S. Wijerathna¹, J.J.M.A.D. Jayasundara², G. Naveendrakumar¹

¹*Department of Bio Science, Faculty of Applied Science, University of Vavuniya, Vavuniya, Sri Lanka*

²*Central Environmental Authority, Colombo, Sri Lanka*

**piyumibatuwita@gmail.com*

Urban air quality significantly impacts public health and environmental sustainability amid rapid urbanization. This study delves into the intricate links between air pollutants and meteorological conditions in Battaramulla and Kandy, Sri Lanka, during 2020. Utilizing hourly data from two ambient air quality monitoring stations, it unravels the complex dynamics shaping urban air quality. Examining correlations between multiple air pollutants, including ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter (PM) with meteorological variables (ambient temperature, relative humidity, solar radiation, precipitation, and wind speed) using Pearson correlation analysis in R software, the research offers valuable insights into these interrelations. In Battaramulla, air pollutants generally showed weak negative associations with temperature and rainfall and moderately negative links to wind speed. O₃ displayed a strong positive relationship with temperature and a weak positive correlation with wind speed. CO, NO₂, and PM_{2.5} showed weak positive correlations with relative humidity, SO₂, PM₁₀, and O₃ exhibited weak negative correlations. Solar radiation had weak negative correlations for CO, NO₂, and both PM types and a weak positive correlation for SO₂. Surprisingly, O₃ showed a moderately positive relationship with solar radiation. In Kandy, a similar pattern emerged, with pollutants generally showing weak positive associations with temperature and solar radiation. O₃ displayed a moderately strong positive relationship with these factors but a moderately strong negative association with humidity. Furthermore O₃, SO₂, and both PM types exhibited weak negative correlations with rainfall. Additionally, O₃, NO₂, SO₂, and PM₁₀ displayed weak positive correlations with wind speed, while CO and PM_{2.5} displayed weak negative relationships. Overall, this study unravels the intricate correlations between air pollutants and meteorological parameters in Battaramulla and Kandy, underscoring the complex nature of urban air quality dynamics and providing valuable insights for crafting location-specific strategies to address air quality concerns.

Keywords: Air Pollutants, Correlation Analysis, Location-specific Strategies, Meteorological Parameters, Urban Air Quality
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