

Spatio-temporal Variation of PM_{2.5} Concentrations and its Possible Health Impacts in a Mega City, Delhi in India

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Abstract: The present study was designed to analyze the spatial and temporal variations of particulate matter (PM_{2.5}) concentrations in a mega city, Delhi. The spatial analysis was conducted using geostatistical approaches. The daily PM_{2.5} concentrations monitored by Central Pollution Control Board (CPCB), New Delhi during April 2015 to March 2016 in different locations distributed in the region of study was used for the analysis. The descriptive statistics indicate that the spatial mean of monthly average PM_{2.5} concentrations ranged from 105.37 $\mu\text{g m}^{-3}$ to 234.51 $\mu\text{g m}^{-3}$. The maximum and minimum spatial variance observed in the months of March and April respectively. The study also analysed the PM_{2.5} air quality index (PM-AQI) for assessing the health impacts in the study areas. The AQI value was determined according to the US EPA method. The result suggests that most of the area had the moderate to very unhealthy category of PM-AQI and that leads to severe breathing discomfort for people residing in the area. It was observed that the air quality level was worst during winter months (October to December). Furthermore, the study also demonstrates an approach for identifying the hot spots that are having the higher level of PM_{2.5} concentration. The hot spot maps were produced for each month based on the AQI values to understand the shifting of the locations of hotspots. Since the hotspots analysis was conducted with limited data, the presented hotspots are indicative and dependent on the external factors like meteorology and source emission during the specific period and cannot be considered as a robust health impact study.

Keywords: Particulate Matter (PM_{2.5}); Geostatistics; Ordinary kriging; AQI mapping; Health effect.

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