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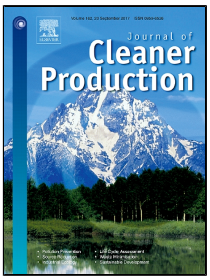

The effect of natural and anthropogenic factors on haze pollution in Chinese cities: A spatial econometrics approach

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The effect of natural and anthropogenic factors on haze pollution in Chinese cities: A spatial econometrics approach

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Abstract: The haze pollution accompanies rapid urbanization and industrial development is the central environmental problem for academia, the government, and the public in China today. Recent studies have investigated the different aspects of haze, but no holistic research has yet been conducted that includes both natural and anthropogenic factors and spatial effects. This study used the Air Quality Index (AQI) as the measure of haze pollution and 14 natural and anthropogenic factors as explanatory variables. We applied exploratory spatial data analysis and the spatial Durbin model (SDM) to analyze the spatial distribution and variation pattern of the AQI and to quantitatively estimate the contributions and spatial spillovers of different natural and anthropogenic factors on the air quality of 289 prefecture-level cities in 2014. The results show that approximately 1.255 billion people in 280 Chinese cities were exposed to an unhealthy atmospheric environment. A significant positive spatial autocorrelation of AQI values was identified, with the influence of urban air pollution extending, on average, between 600 and 800 km. The AQI of a city increased by more than 0.45% for every 1% increase in the average AQI of neighboring cities. The most heavily polluted regions are mainly located in urban agglomeration areas–the areas with the highest population densities. Urbanization, urban population aggregation and industrialization had a significant positive impact on the AQI. The spillover effect of car density is also significant. Except for temperature, all the natural factors that we studied have a negative effect on the AQI, with vegetation cover having a significant spatial spillover effect around cities. Only the ratio of green space to urban built-up areas has a significant local effect, while wind speed has a more significant effect locally than on neighboring areas. The amount of urban land, per capita gross domestic product, elevation, and relative humidity have no significant effect. The final remarks of this paper suggest three strategies to prevent haze and to develop more sustainable cities.

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