Abstract Index #: 148

PLANNING FOR CLEAN AIR IN CHINA'S MEGACITIES: LINKING URBAN STRUCTURE AND AIR POLLUTION IN BEIJING

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Individual Paper

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While Beijing is not alone when it comes to smoke-filled skies, this city of more than 20 million people has come to symbolize the environmental cost of China's break-neck economic growth. Fine particulate matter (PM2.5) pollution has been a heated topic for discussion that also leads to health concerns greatly. Health studies have shown a significant association between exposure to fine particulates and adverse human health effects, such as respiratory problems and cardiovascular diseases. The sources of PM2.5 could be from burning of coal and biofuel, dust from roads, exhausted gases from vehicles and industrialization. Air quality varies in urban spaces non-linearly and depends on multiple factors, such as meteorology, traffic volume, and land uses. It is of significant importance to investigate the contributions of population density, land use, transportation system and urban activities to the concentrations of PM2.5. The proposed research will also be one of the earliest assessments, as known, of examining the spatial variation of the PM2.5 concentrations and exploring the impacts from urban structure and activities in the Chinese context since the public release of real time PM2.5 data in major Chinese cities in 2013.

Most of currently reported models for linking the PM2.5 concentrations to land use and urban pattern, such as the most commonly used Land Use Regression (LUR) Model in environmental research, are global methods without considering local variations, which might introduce significant biases into prediction results. In this paper, a geographically weighted regression (GWR) model will be developed to examine the impacts of urban structure and activities on PM2.5 concentrations, in the Beijing metropolitan area. It aims to make contributions to development and new advances in bridging the LUR and GWR modeling, including expanding the scope of the predictor variables, new GIS approaches, and spatio-temporal considerations.

This research applies the GWR model to assess the exposure to fine particles in Beijing, and to understand the impacts from vegetation coverage, population density, land use pattern, transport network as well as human activities, e.g., catering services. It makes use of the data collected from around 100 air quality monitoring stations in the Beijing metropolitan area between January and December 2014. Combined with the road networks, demographics, distribution of catering services and land use map, the GWR model is built to analyze the contributions of those factors to the concentrations of PM2.5. By doing this, we will help policy makers identify the priority areas and design better plan for pollution controls. Of course, this research could also serve as the important inputs to the health effects study of long-term exposure to outdoor air pollution.

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