Multi-scale relationships between urban green infrastructure landscape patterns and atmospheric PM2.5 concentrations

26 October 2021, by Zhang Nannan

Chinese Academy of Sciences (CAS) took the urban agglomeration in central Liaoning, a region of rapid urbanization, as an example, and analyzed the relationships between UGI landscape patterns and PM$_{2.5}$ concentrations at urban agglomeration and neighborhood scales.

The researchers interpreted spatial patterns of UGI from 2000 to 2019 using Google Earth Engine, the changes of UGI landscape patterns over the past 20 years were quantitatively analyzed by landscape pattern index and Morphological Spatial Pattern Analysis. Then, various regression models were utilized to reveal the statistical relationship between UGI landscape patterns and PM$_{2.5}$ concentrations.

They found that at the scale of urban agglomeration, the annual variations in PM$_{2.5}$ concentration were mainly attributed to economic development, urbanization and other socio-economic factors, and meteorological factors such as wind speed and relative humidity had greater effects on PM$_{2.5}$ concentration than UGI landscape pattern factors.

At the neighborhood scale, the relationship between UGI landscape pattern and PM$_{2.5}$ pollution changed with neighborhood spaces and seasons, showing scale and seasonal effects.

In addition, the researchers found that the impacts of UGI landscape patterns on PM$_{2.5}$ were greater at the neighborhood scale than those at the urban agglomeration scale.

The results of this study deepen the understanding of the relationship between UGI landscape patterns and PM$_{2.5}$ concentrations, which will provide a scientific guidance for future urban planning and the prevention and control of PM$_{2.5}$ pollution.

Urban green infrastructure (UGI) refers to the natural and semi-natural open spaces with ecosystem functions in and around the cities. Improving urban green infrastructure is considered as an important technical means for the effective control of atmospheric PM$_{2.5}$ (particles aerodynamic diameter of lower than or equal to 2.5 ?m) pollution.

High-speed urbanization and industrialization, however, have brought a large number of pollution sources, causing PM$_{2.5}$ pollution to be increasingly serious, and they have encroached on a large range of urban green spaces, resulting in drastic changes in landscape patterns and functions (e.g., dust retention performance) of UGI. Therefore, it is very important to further understand the relationship between UGI landscape pattern change and PM$_{2.5}$ pollution in the context of urbanization.

Associate Prof. LI Chunlin and other researchers from the Institute of Applied Ecology (IAE) of the Avenue of Sciences (CAS) took the urban agglomeration in central Liaoning, a region of rapid urbanization, as an example, and analyzed the relationships between UGI landscape patterns and PM$_{2.5}$ concentrations at urban agglomeration and neighborhood scales.

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This study, funded by the National Natural Science Foundation of China and the Youth Promotion Association of CAS, has been published in *Journal of Cleaner Production*, titled "Multiscale analysis of the effects of urban green infrastructure landscape patterns on PM$_{2.5}$ concentrations in an area of rapid urbanization."

**More information:** Kongming Li et al, Multiscale analysis of the effects of urban green infrastructure landscape patterns on PM2.5 concentrations in an area of rapid urbanization, *Journal of Cleaner Production* (2021). DOI: 10.1016/j.jclepro.2021.129324

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