Spatio-temporal variability of the connection between spatial characteristics of the transportation networks and PM10 air pollution: a European scale analysis

Seyedehmehrmanzar Sohrab[1], Nándor Csikos[2], Péter Szilassi[1]
[1]*Department of Geoinformatics, Physical and Environmental Geography, University of Szeged, Hungary*
[2]*Department of Soil Mapping and Environmental Informatics, Institute for Soil Sciences, Centre for Agricultural Research, Hungary*
**mehrmanzar_sohrab@geo.u-szeged.hu*

The rapid development of urbanization has generated various air pollution problems in Europe. There is a high proportion of transportation-related emissions in total air pollution. The urbanization process is accompanied by the construction of many roads and land use changes. They are constantly changing in the process of urbanization and have an essential impact on air quality and land use structures. Among pollutants, particulate matter (PM) is the one associated most consistently with a variety of adverse health outcomes even at very low concentrations.

In this study, the spatial and temporal variability of the connection between monthly average PM10 concentration and transportation networks was analyzed across European countries. We used General Additive Model (GAM) to investigate the relationship between the density and distance to the different types of transport networks and monthly PM10 concentration in 1216 air quality (AQ) European stations (1039 urban and 177 suburban stations) and in two different buffer zones (1000m and 3000m) from AQ station points.

The results show that there is an inverse relationship between the monthly average PM10 concentration and distance to roads and in contrast, it has a positive correlation with distance to railways. In addition, the monthly average PM10 concentration is positively associated with the density of railways, primary, residential, and link roads in urban landscapes. while PM10 showed a negative significant correlation with motorways and secondary road density in these areas. Also, we found a strong additive influence of motorways and primary roads in suburban landscapes. Our GAM model estimates a dramatic increase in PM10 concentration during the heating period. The outcomes of the study may help landscape planners, environmentalists, and decision-makers in framing better policies and management.