Information for research project

Call:
Competition for financial support of basic research projects – 2021
Main scientific area:
Earth Science
Contract No:
H54/2
Initial date and duration of the project:
15.11.2021 г., 36 (thirty six) months
Project title:
Development of a methodology for air quality and human health risk assessment in urban areas
Research organization:
Sofia University "St. Kliment Ohridski"
Partner organizations:
Principle investigator:
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Abstract of the research project

The main objectives of this study are to understand and quantify the intricate interplay between the processes underlying the lifecycles of air pollution, including the urban infrastructure, which is not accounted for in the current air quality studies in Bulgaria. There are no investigations in the country on the relationship between pollution estimated by local dispersion models and health risk at present.

Sofia valley and air pollution are selected for a pilot study due to the following reasons:

• Sofia municipality is the biggest urban area in the country and despite the efforts made during the last decades, the capital city habitants are still exposed to high levels of particulate matter PM_{10} (with diameter < 10μm);

• Sofia city as a study object is a challenging complex urban system, because of its geographical setting and due to the fast expansion of the city and the recent tendencies in city urban development. Unfavourable in terms of air quality are the rising density and share of impervious surfaces, urban street canyons formation, and "green wedges" interruption, which have important role for the ventilation of the city, as well as the construction of transport infrastructure, encouraging travel by private cars.

Two newly purchased (within the scopes of the project) stationary instruments for particulate matter concentration (PM) measurements will provide more reliable background concentration data, and will ensure a unique set of data for pollution gradient studies in areas with significant surface heterogeneity (boulevard with intensive traffic and city park area). Data analyses can provide possible recommendations for urban planning.

The inventory of emissions from transport and domestic heating is the most uncertain part of air quality modelling, which can be improved using a combination of data and algorithms, which is expected to improve significantly simulation results. A comprehensive scenario design will be used to model already planned or alternative situations in the future for the entire city of Sofia and for specific parts.

A cross-sectional epidemiological study (health survey) in a sample, representative of the population of Sofia, is expected to confirm the impact of the steep gradients in air pollution levels along busy traffic arteries on a number of non-communicable diseases of high prevalence in the general population. This study may also suggest alternative scenarios and models of urban development and disease prevention. Questionnaire data will be linked to the modelled air pollutant levels. As a following step, we will conduct health impact assessment based on the derived exposure-response relationships.

The framework methodology in support of the management and planning of a healthy urban environment and lifestyle will be developed for the city of Sofia as a pilot study, but will be applicable to any other urban area.