

EGU2020-21547

<https://doi.org/10.5194/egusphere-egu2020-21547>

EGU General Assembly 2020

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Air pollution studies in “street canyons” in Minsk and urban planning for minimization of its exposure

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Reducing the risks associated with the effects of polluted air on public health is one of the main tasks of sustainable urban development. This problem can be solved in two different ways: by emission reduction and by minimization of human exposure to elevated concentrations of pollutants. In the context of the second approach, it is important to plan the urban area in order to minimize places with a large number of people and poor dispersion conditions.

For this purpose investigation and identification of street canyons in Minsk city was performed. With population ca 2 mln inhabitants Minsk is one of the most populated European cities. Due to many historical destructions of the city nowadays it has mainly planned structure of streets and buildings according to General plans of urban development designed in the second part of the XX century. According to the plans Minsk has relatively wide main transport lines surrounded by mid-level buildings and has good conditions for air circulation and air pollutions spatial dispersion. Nevertheless, there is some location in the city with conditions close to urban street canyons and is characterised with high pedestrian and traffic intensity. Besides in modern construction so density planning not so rare. That's in addition to limited air pollution concentration researches makes important measurements and assessments in such conditions in Minsk.

For sampling, urban canyons NO_x concentration in the air were carried out in 2012-2019 in Minsk. Air was sampled on both sides of “street canyons” taking into account weather conditions. During sampling, traffic accounting was carried out. The concentration of NO_x was determined by the fluorimetric method.

Obtained results have shown that the actual formation of “street canyons” occurs even with a low height of buildings along to the streets with heavy traffic. It has been shown that a statistically significant increase of NO_x content by 20–50% on the windward side compared to the leeward with buildings height comparable to the width of streets. Besides statistical reliable correlation between emissions levels (assessed based on traffic data) and measured concentrations are observed.

Identified patterns of air concentration in combination with GIS allow identifying areas with potential increased risk of exposure. This knowledge will help to plan urban territory in a sustainable way.

