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Study material

MODELING OF AEROSOL PARTICLE CAPTURE BY GREEN  
INFRASTRUCTURE IN SETTLEMENTS IN CONDITIONS OF  
CLIMATE CHANGE

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## Objectives

The aim of the theoretical part is to understand the physical, chemical and biological aspects of aerosol particle capture by green infrastructure in settlements, to understand the theoretical aspects of modeling and measuring the deposition flux of aerosol particles and aerosol particle capture, understanding the impact of climate change on aerosol emissions and their impact on green infrastructure. . The aim of the applied part is to acquire the knowledge needed for measuring and modeling the deposition flux of aerosol particles in green infrastructure, calculating the capture of aerosol particles by green infrastructure in settlements, evaluation of urban green infrastructure in reducing aerosol particles and adaptation to climate change, assessing the impact of aerosol particles on health green infrastructure, proposing measures for the maintenance and creation of urban greenery in areas with different sources of aerosol particulate emissions and proposing technical measures (green roofs and walls suitable for aerosol particulate trapping).

## Study topics

1. Basic information about green infrastructure and its role in reducing air pollution.
2. Emissions of aerosol particles into the atmosphere. Characteristics of aerosol particles. Influence of precursor emissions on the concentration of aerosol particles in the atmosphere.
3. Physical, chemical and biological factors influencing the concentration of aerosol particles in the air.
4. Transport of aerosol particles through the atmosphere, dips and outlets of aerosol particles.
5. Atmospheric deposition of aerosol particles. Physical, meteorological and chemical processes leading to the deposition flow of aerosol particles.
6. Atmospheric deposition of aerosol particles on a local and regional scale. Atmospheric deposition of aerosol particles in the Czech Republic and in the world.
7. Micrometeorological methods for measuring the deposition flux of aerosol particles. Gradient method. Eddy covariation method.
8. Modeling of deposition flow and capture of aerosol particles. Resistance models. Aerosol particle transfer models. Calculation of aerosol particle capture.
9. Analysis of urban greenery, its impact on the environment and the values of society.
10. Proposal of measures for maintenance and creation of urban greenery in areas with different sources of aerosol particle emissions and different population densities, including proposal of addition of green infrastructure and technical measures (green roofs and walls, suitable materials for building construction and aerosol particle capture).

11. Planning and care of urban greenery with regard to air pollution by aerosol particles and adaptation to heat and water shortages.

12. Qualitative modeling of scenarios of the effects of changes in the structure and distribution of urban greenery with regard to the sources of aerosol particle emissions, especially from transport and local heating plants.

13. Influence of reduction of precursor emissions on aerosol particle concentrations in the years 2030 to 2100. Projection of reduction of aerosol particle precursors (NO<sub>x</sub>, NH<sub>3</sub> and VOC) in the Czech Republic.

## **Study literature**

### **Mandatory literature**

BRIMBLECOMBE, P., HARA, H., HOULE, D., NOVAK, M. (Eds.), Acid Rain – Deposition to Recovery, Springer, Dordrecht, The Netherlands, 2007, 419 s.

HAIR, L. City Green: Inovative Green Infrastructure Solutions for Downtowns and Infill Locations. EPA 230R16001, EPA, 2016. City of Camden Green Infrastructure Design Handbook. EPA 830-R-13-008, EPA, 2013.

ZAPLETAL, M. KOTLÍK, B. Modelování depozičních toků částic a kvantifikace záhytu částic různými povrchy v urbanizované oblasti. Meteorologické Zprávy, 2012, roč. 65, č. 1, s. 23-29.

ZAPLETAL, M., ŠKARKOVÁ, P., KADLUBIEC, R. (2015): Jak vybrat nejlepší lokality pro výsadbu stromů s ohledem na zvýšení záhytu prachových částic a ozonu v městské oblasti. In: Růžičková, P. (eds.): Program a sborník conference Ovzduší 2015, Brno, 20. – 22. 4. Masarykova univerzita v Brně, Brno, 2015, s. 32-36.

### **Expanding literature**

ECONOMIDES, CH. Green Infrastructure: Sustainable Solutions in 11 Cities across the United States. Columbia University, 2014.

ZAPLETAL, M. Hodnocení městské zeleně při snižování koncentrace polutantů v ovzduší a vlivu tepelného ostrova ve městě. In: Sborník k odborné konferenci Zelená města- města budoucnosti, Veřejné prostranství a městský mobiliář, září 2017, Městské kulturní středisko Havířov, Havířov, 2017, s. 11-14.

### **Recommended literature**

ZAPLETAL, M. Historický vývoj atmosférické depozice síry a dusíku v České republice. Slezská univerzita v Opavě, Opava, 2014, 136 s.