

## **Description for the general public**

By the migration of pollutants is meant the transport of contaminants together with the changes they may undergo during transport. The combination of physical, chemical and biological processes is most often associated with the movement of pollutants in the unsaturated and saturated zone of the soil-water environment.

Increasingly, particularly in areas directly exposed to the pollution from the surface, unfavorable changes in the quality of groundwater and surface water are observed. Bearing in mind the environmental consequences of such a situation, it is necessary to undertake complex and often costly preventive and monitoring actions. These actions should be complemented by activities aimed at identifying the main processes responsible for the migration of pollutants in the environment, including the soil-water environment.

Therefore, a main objective of the study is the identification of contaminant migration processes in the soil-water environment using laboratory tests and numerical modeling techniques.

As part of the implementation of this project, field, laboratory and computer simulations will be performed using hydrogeological modeling software. During field studies, soil samples will be collected, and then their physicochemical properties will be determined in laboratory conditions. An attempt will also be made to determine the impact of individual soil features on the migration of pollutants. The chemical characteristics of the tested materials and the contaminant solutions used in the tests will also be presented.

Essential for the modeling the contaminant transport in the environment is determination of the migration parameters. For that reason, laboratory tests will be carry out in dynamic: column experiments and static conditions: batch tests. These studies will be conducted on natural, granulometrically differentiated soils, using the various contaminant solutions that perform in experiments the roles of markers (conservative or reactive). The results of the dynamic studies will be presented in relation to the pore volume of flow, as a so-called "breakthrough curves". Based on the results of the dynamic studies, the parameters of the advective-dispersion equation of contaminant transport will be determined using the non-linear estimation procedure based on the measured values. "Batch" tests will be conducted to determine the sorption capacity of the studied soils by estimating the parameters of the sorption models describing the phenomena of contaminant sorption from the liquid to the solid phase. As a result of these studies, the parameters of the migration of pollutants, including parameters of advection, diffusion, dispersion and sorption, will be obtained.

Then, the numerical modeling studies, which are increasingly being used in environmental sciences as a tool for predicting the extent and spread of pollutants, will be carry out. As a consequence of the hydrogeological modeling, the scenarios of migration of contaminants in the soil-water environment will be presented, taking into account the conditions of the soil-water environment, the type and concentration of pollutants and other factors that can significantly affect the extent and intensity of the migration.

The use of computer techniques, in particular the numerical models, combined with the results of laboratory studies, will provide a comprehensive overview on the processes and extent of the migration of contaminants in the soil-water environment.