Organic matter is one of the most important compounds which are present in the composition of bottom sediments. Taking into account the increasing level of human impact, the sorption capacity of organic matter is essential in preventing the migration of various pollutants in the environment, and it also influences the detoxification of pollutants. However, test methods concerning the content and composition of organic matter, and its effect on bioavailability and toxicity of pollutants still appear to be insufficient and neglected. Moreover, determination of only the content and composition of organic matter as well as the content of individual pollutants in sediments using chemical methods does not always reflect the ecological risk connected with their presence in the aquatic environment. The reason is that from the economical point of view it is not possible to study all substances that occur in sediments. What is more, such a wide analysis does not answer the issue of possible interactions taking place between individual pollutants. That is why biological methods based on bioassays and bioindicators are a good supplement to chemical analyses in testing bottom sediments. Application of bioassays and bioindicators enables a comprehensive assessment of risks connected with the presence of pollutants in sediments and with the role of organic matter in their bioaccumulation and toxicity, i.e. assessment of toxicity, bioavailability, mobility, and cooperation of various chemical substances. The goal of the proposed project is to verify the following hypothesis: *The amount and quality of organic matter determine bioavailability and toxicity of chemical compounds in bottom sediments and thereby affect their qualitative parameters.* The primary scientific goal of the project is, therefore, a comprehensive analysis of the effect of organic matter on bioavailability and toxicity of chemical compounds in bottom sediments. This analysis will be carried out using TRIO: 1) chemical methods which will allow to determine the content and fractional composition of organic matter and chemical, physical, and biochemical properties of bottom sediments; 2) a battery of bioassays that will make it possible to determine the toxicity of sediments and interactions between the substances; 3) bioindicators that will make it possible to determine the ecological potential of sediments and the bioaccumulation of the studied compounds. In order to realization of the project goals, bottom sediments from the dam reservoirs (which represent different forms of river basin management: agricultural and urbanized) will be sampled. The bottom sediments will be subjected to analysis of content, distribution, and occurring forms of organic matter. It is planned to analyze 7 primary forms of organic matter (carbon), including total form, soluble form, and forms associated with humic acids, with hemicelluloses, and black carbon. Heavy metals, dioxins, PAHs, pesticides and their residues were selected for the research. Basic physical, chemical and biochemical properties of the sediment samples will be tested as well. The next part of the project is an analysis of the degree of bioavailability and bioaccumulation of metals and dioxins, PAHs and pesticides for benthic organisms. The degree of bioavailability will be assessed by in situ tests. It means that both benthic organisms and the sediments will be analyzed for the presence of heavy metals, dioxins, PAHs, and pesticides. This will enable to assess what amount of the studied pollutants has been accumulated by a given organism. Moreover, laboratory experiments will be conducted: representative benthic organisms will be introduced to the bottom sediment, and then they will be subjected to the effect of individual pollutants for 10 days. The content of individual compounds in the organisms will be determined. The determined concentrations in the organisms as well as in the bottom sediments will allow to calculate the bioaccumulation factor of the studied pollutants. The next part of the project will be the use of a series of bioassays: Phytotoxkit, Ostracodtoxkit, Microtox, Spirodela Duckweed Toxkit, Daphtoxkit. In addition to the bioassays, it is planned to conduct analyses of the ecological state of the reservoir and of the biological potential of the sediments. The analyses will use bioindicators – meiobenthos assemblages. Biological potential of the sediments will be evaluated based on the response to stress associated with unfavorable environmental and survival conditions of ostracod Candona rectangulata. The evaluation will make it possible to quickly arrange the studied reservoirs in terms of their similarity and ecological state and to determine the purity/degradation degree of the reservoirs. The result of the research will be to investigate the effect of organic matter and its different forms on content, bioavailability and toxicity of chemicals in sediments. The effect of the above-mentioned tests will serve to create maps concerning spatial distribution and content of organic matter and its forms in the sediments, distribution of pollutants in the reservoirs, and the ecological and ecotoxicological state of a given reservoir. The advanced statistical analyses will serve to determine the relationships among the studied parameters and to create a model of pollutant transfer from sediments to aquatic organisms. The project proposes a comprehensive analysis of the effect of organic matter on bioavailability and toxicity of pollutants in bottom sediments, which will allow to assess the quality parameters of bottom sediments and their effect on the state of water purity. At the same time, it needs to be emphasized that the subject of quality of bottom sediments and their significance in the evaluation of the state of the aquatic environment is becoming more and more important, because the direct relation between the quality of bottom sediments and the ecological potential and the state of water pollution is indisputable.