

Project entitled „Occurrence of organotin compounds in bottom sediment of the Odra river estuary-environment conditions affecting presence of the compounds, mobility, their degradation products and environmental persistence” is aimed at finding the environmental effect of organotin compounds on the ecosystem of mouth of Odra River. The results of investigations will reveal not only the mechanisms of accumulation of the compounds and their release from sediments, but also describe the dependence between their concentration and other physico-chemical parameters of water and bottom sediments.

Tributyltin (TBT) is a highly toxic compound that has been utilized in production of antifouling claddings for ship hulls and other steel frameworks. Currently, industry phases out the use of TBT due to the ban imposed by European Union in 2003. However, organotin compounds are still present in vicinity of harbour areas due to strong adsorption on particles in the bottom sediments. Their half-life in anoxic conditions of such environment is between 10 and 20 years. Tributyltin has negative effect on fertility and immunological system of living organisms. A special case is imposex – the irreversible masculinization of female molluscs. Moreover, organotin compounds are strongly accumulated in food chain of marine predators.

The Szczecin Lagoon is an area of high ecological value. It is a shallow coastal lagoon with brackish water resulting from hindered exchange of sea water by narrow straits and high fresh water flow. It is inhabited by numerous species of fish and molluscs that are a food source for migrating and wintering birds. Due to very high biodiversity of this ecosystem, the estuarine area of Odra River is under different forms of legal protection. There are nature reserves: Natura 2000 and Wolin National Park with very valuable and unique ecosystems. However, the Szczecin Lagoon and nearby reservoirs are the heart of economy of the Pomerania region. Two main seaports connected with a 60-kilometer shipping lane are located in Szczecin and Świnoujście and also a number of smaller harbours, both on Polish and German part of the lagoon. Additionally, the contaminants carried by river's waters have also a strong deleterious effect on the environment as the Odra River drains around 1/3 of the area of Poland. The main part of the lagoon's pollutants is present in suspended solids and bottom sediments.

The number investigations on tin compounds pollution of Polish environment is very small in comparison to other countries. The results of the research undertaken in frame of the project will fill the gap in knowledge on the tin compounds pollution. The knowledge on tin geochemistry will be advanced by new findings which are unique for Polish environmental conditions. The newly developed analytical methods based on unique equipment-gas chromatography with atomic emission detector-will allow to gain the new knowledge on circulation mechanism of tin and its compound in water environment. The results of petrographic, geochemical and ecotoxicological analyses, their mutual correlation will be used in assessment of the risk of environment pollution caused by the tin compounds. The huge amount of adsorbed organotin compounds may be released to water during resuspension of the sediment caused, for example, by deepening of the basin. Their elevated concentrations have been already observed during preliminary investigations that were conducted recently.

During the course of the project the samples of water and bottom sediments will be collected from around 150 locations in the mouth of Odra River. The same locations will be sampled twice with one-year interval between the sampling in order to observe the short-term changes in water characteristics. The results of the project will be used in preparation of pollution map of the investigated reservoir. The map will depict the hot spots with the highest accumulation of tributyltin and the highest risk of secondary pollution of water compounds caused by the tin compounds desorption from sediments. The relation between content of organotin compounds and other anthropogenic substances may reveal the sources of environment pollution. The ratio of tributyltin to products of its biodegradation – dibutyltin and monobutyltin – may be used in determination the age of sediments collected from the lagoon. The knowledge about concentration of other contaminants will shed light on environmental toxicity of tin compounds; whether it prevails by toxicity of other pollutants or it induces by interaction with other substances present in sediments and/or water. Thus the results will indicate the real toxicological effect of organotin compounds occurred in water and sediments on the ecology of the region. Circulation and transformations of organotin compounds in the environment are still not fully understood. In Poland the content of these substances in sediments is not monitored, even during water engineering works. Especially, various processes of the compound migration that lead to different spatial distribution of contaminants in Odra river estuary are not fully elaborated. In the course of this project we will estimate the level of anthropogenic pressure on the quality of water and sediments of Szczecin Lagoon and nearby reservoirs, mainly considering the content of tributyltin and other tin compounds. The project gives also important scientific contribution to knowledge on tin circulation in environment and its transformation mechanisms. The knowledge gained during the project is important for taking appropriate measures to mitigate the risk of tin compounds pollution of the environment.