

# State of the dioxin contamination in bottom sediments from the southern Baltic Sea area

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**Introduction:** The term “dioxin” is commonly used to refer to a family of toxic chemicals that all share a similar chemical structure and a common mechanism of toxic action. This family includes 75 of the polychlorinated dibenzo-p-dioxins (PCDDs), 135 of the polychlorinated dibenzofurans (PCDFs). The term cover also the so -called dl-polychlorinated biphenyls (PCBs) [1]. Dioxins can be commonly detected in air, soil, sediments and food. They are transported primarily through the air and are deposited on the surfaces of soil, water bodies, and the leaves of plants. The principal route by which dioxins are introduced to most rivers, streams and lakes is soil erosion and storm water runoff from urban areas. Dioxins are not commercial chemical products but are trace level unintentional by-products of most forms of combustion and several industrial chemical processes. The basic properties of dioxins - stability and lipophilicity cause strong sorption of these substances in the soil or dust. Their poor biodegradability results the accumulation in sediments and bioaccumulation in organisms [2, 3]. The accumulation in sediments promotes large octanol-water partition coefficients (approximately 4-8). Sediments are known to be an important and final sink for non-polar organic contaminants, including dioxins and dl-PCBs. And it is important to study their presence in sediments, particularly since contaminated sediments can be consumed by marine organisms, such as fish, burrowing invertebrates and filtering organisms. The Baltic Sea is highly contaminated with PCDD/PCDFs and dl-PCBs. While to a large extent the pollution of the Baltic area is attributed to the effluents of the pulp and paper industry which used chlorine as a bleaching until the early 1990s, it is also due to the fact that Baltic Sea is an inland sea with low water exchange [4, 5].

**Methods:** In the Baltic Sea Region in 2010-2014 was realized project ECODUMP (Application of ecosystem principles for the location and management of offshore dumping sites in SE Baltic region) conducted by Maritime Institute in Gdansk (Poland) and Klaipeda University (Lithuania) in the framework of South Baltic Cross-border, Co-operation Program.

Among others the ECODUMP project has been studied contents of dioxin in surface (0-20 cm or 0-30 cm) sediment samples collected from:

- the Gdynia Port and former shipyard area
- Gdynia dumping site
- Gdansk dumping site area
- DCT (deep container terminal) dumping site
- The Gulf of Gdansk
- Klaipeda dumping site
- Baltic Sea area close to the Klaipeda Port

**Results:** The highest concentrations of analysed PCDD/PCDFs were indicated in sediments from former shipyard area in Gdynia Port.

The highest concentrations of dioxins on Gdynia Dumping Site were found in sediments located in shallower part of dumping site, on both sides of the ridge. The ratio of the PCDD/Fs and dl-PCBs in sediments from Gdynia Dumping Site is similar to the pattern found in the sediments from the Gdynia Port. In sediments from the Gulf of Gdansk the highest concentration of dioxins was found on DCT dumping site and in one sediment sample collected along Vistula river profile. A very small percentage of furans relative to PCDD may indicate a low deposition from the atmosphere as a source of these pollutants. Percentage contribution of PCDD congeners in sediments both from Gdynia Port and Gulf of Gdansk shows the biggest amount of OCDD. The most toxic congeners are TCDD and PeCDD. Percentage contribution of individual furans congeners indicates that the distribution is more or less uniform. And that means an increase in the content of toxic congener PeCDF. Among analysed dl-PCBs congeners PCB 105 and PCB 118 were found in highest concentrations.

**References:** [1] Ogura et al. (2001) *Chemosphere* 45:173-183; [2] Moon & Ok (2006) *Chemosphere* 62:1142-1152; [3] Fiedler (1996) *Chemosphere* 32:55-64; [4] Karl et al. (2010) *Chemosphere* 78:106-112; [5] HELCOM (2004) [www.helcom.fi](http://www.helcom.fi).