Polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/F), called „*dioxins*" are environmental „*microcontaminants*". Despite their presence at trace levels in the environment, since 90's of the last century, PCDD/F have been a subject of interest due to their harmful effects on organisms and human. The harmful effects of dioxins are mainly based on disruption of endocrine functions of steroid hormones, which qualifies them to the group of "*endocrine disruptors*". PCDD/F are emitted to the environment as unintentional, by-products in many technological processes, mainly as a result of uncontrolled emissions from the municipal sector (*i.a.* low emission). Thus, the estimation and reduction of their emissions remains extremely challenging.

Emission of PCDD/F and their precursors in the industrialized temperate zone has a significant impact on the pollution of the remote, polar regions, recently considered as „*ecological background*". PCDD/F adsorbed on the aerosols particles are transported to remote regions where depending on the direction, their persistence and migration is different. Confronting the subject of polar regions, it should be noted that the temperature plays a key role in global distribution of PCDD/F. It hences the evaporation of PCDD/F in the equatorial areas and deposition in the polar regions (Meijer *et al*. 2003). The „*grasshopper effect*" explains an abrupt transfer of persistent organic pollutants toward the Poles, however, it does not explain completely the transport on east-west axis. There are many mechanisms influencing the global distribution of these substances and most of them have not been recognized yet. Lack of scientific data or discrepancies in interpretation preclude a precise source identification of PCDD/F in polar regions, including both northern and southern pole of different air masses and oceanic circulation.

Recognition of the transboundary transport of PCDD/F is fundamental in global emission management. Thus, the main objective of the project is identification of the anthropogenic and natural sources of polychlorinated dibenzo-*p*-dioxins and furans (PCDD/F) in bottom sediments of the Arctic and Antarctic using an Enzyme Linked Immunoassay (ELISA), combined with chemical trace analysis, followed by multivariate receptor modeling techniques. The results of the project will allow evaluation of the effectiveness of transboundary transfer of pollutants *via* atmosphere- "*the grasshopper effect*", and the phenomenon of "*the cold trap*". Implementation of the project is also aimed at clarification and precise description of the particular sources of PCDD/F, mostly defined as "*atmospheric deposition*". The project will also involve the role of the precursors of PCDD/F- pentachlorophenol (PCP) and triclosan (TCS) in the formation of PCDD/F in the bottom sediments, since such approach is often overlooked. Comparative analysis of state of contamination of both poles PCDD/F with simultaneous identification of their sources, enable comparison of emissions of these substances in both hemispheres with different characteristics.

Immunoenzymatic methods will be used for the preliminary environmental screening. The results of bioassay will enable to identify samples with quantified concentration of PCDD/F, which will be further analyzed by high resolution gas chromatography (HRGC). Source identification in polar sediments will be carried by applying advanced cheminformatic tools followed by multivariate receptor modelling techniques- positive matrix factorization (PMF). PMF estimates statistically sources based on PCDD/F „*fingerprint"*. Particular *„fingerprints"* consists of individual compounds varying in the amount and the place of chlorine molecule substitution. Receptor modelling techniques have been successfully applied for PCDD/F source apportioning in the Baltic Sea sediments (Witt 2015, Sundqvist 2009), north-eastern Tokyo Bay (Uhimiya *et al.* 2007) and the Taihu Lake in China (Zhang *et al*. 2012).

Interpretation of PCDD/F congener profiles is multi-factor-dependent and it is not recognized fully, which may preclude a proper emission management. Multi-parameter properties of these substances and the processes to which they are subject in individual elements of the environment, limits the possibility of explicit inference. There are many mechanisms of the global movement of these substances and not all have been so far explained. It is therefore necessary to extend the database of concentrations of PCDD/F and multi-dimensional, holistic approach, using the most modern mathematical tools to the global inventory of PCDD/F emission and its fate in the natural environment.