Mapping of bottom sediment contamination in Klaipeda port area, Lithuania

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Introduction: Contaminated sediments in port areas do not only pose risks for aquatic live, but because many ports are located in relatively shallow waterways, the need for regular dredging causes additional problems to manage and safely dispose off large volumes of dredged materials [1]. Klaipeda State Seaport is the only port in Lithuania and northernmost ice–free port on the Eastern coast of the Baltic Sea. It is the most important and biggest Lithuanian transport hub, connecting sea, land and railway routes from East to West. Klaipėda port occupies the area of Klaipėda Strait – a sophisticated hydrosystem with pulsating fluxes of energy, sediment migration and exchange of biomass between the fresh water of Curonian Lagoon (in the south) and the salty Baltic Sea (in the north) [2]. The strait is characterized by high spatial heterogeneity of the area due to the impacts of natural processes (barrier zone between the Curonian lagoon and Baltic sea) and permanent changes due to the economic activities (deepening works, port activities). Most of the contaminants are reaching the port area from outer sources – Nemunas river outflow and Klaipeda city sewage water discharges. Other part originates from the ship repair and cargo enterprises, operating in the port area. Although contamination level of bottom sediments in the area is episodically investigated in frame of National monitoring programme since 1995 the amount of data is not enough in order to characterize present state of pollution.

Methods: Detailed mapping of Klaipeda port bottom sediment contamination was done by Klaipeda university Coastal research and Planning Institute (KU CORPI) during several expeditions in 2010-2012 period in order to determine the degree and the spatial extent of contamination by hazardous substances in this highly anthropogenic area. Sediment samples from a total of 177 stations in Klaipeda port were analysed for grain size distribution and chemical composition (total concentrations of Cd, Cr, Cu, Pb, Ni, Zn, Hg, As, mineral oil, PAHs, PCBs and TBT). Bottom sediments were then classified in accordance with national requirements.

Results: According to the results of analysis sediments were divided into 4 contamination classes, Klaipeda port contamination map was developed (Fig. 1).

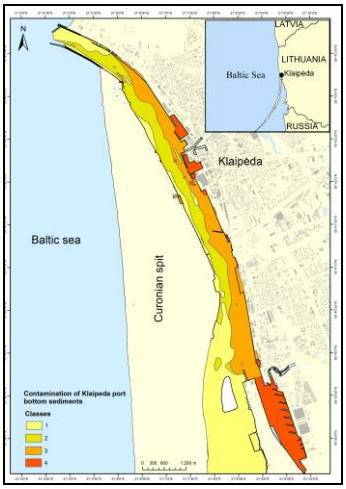

Fig. 1: Contamination of Klaipeda port bottom sediments

Highly contaminated sediments were identified in the semi-enclosed areas and coves of port enterprises. Local contamination by different hazardous substances was detected in several places of the port. Lowest concentrations of nearly all chemical substances typical for the places of intrusion of sea and lagoon waters, which are quite far from the ship building and cargo facilities.

Discussion: Investigation results showed current situation with regard to sediment contamination in Klaipeda port area. Essential problem, which has an impact on planning and implementation of dredging works in port area is strong sediment contamination with TBT compounds. More than 60% of analysed sediment samples had an increased TBT values, which are much higher than existing threshold values for mentioned substance.

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References: [1] Engler et al. (1991). *Environ Professional* **13** :317-325 ; [2] Lapinskiene et al. (2002). *Sustainable development of Klaipeda port (in Lithuanian)*