

# Hydraulic and morphological model investigation of the River Oder along the Polish-German border

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The River Oder between the mouth of the Lusatian Neisse and the bifurcation at the Westoder represents the border between Poland and Germany on a 160 km long stretch. A river training system of groynes, longitudinal dykes and bank protections fixes the river bed and should provide uniform water depth for shipping and navigation purpose. Parts of this river training system originate from the 19th century [1]. The maintenance of the training structures on both river banks is conducted by the respective national riverine waterway administrations. Insufficient maintenance in the last several decades leads to a degradation of shipping conditions. This degradation is not only negative for commercial shipping, but also for measures of flood protection in winter by operating ice-breakers. The ice breaking measures are conducted with a fleet of icebreakers under Polish respective German flag. Due to these difficulties a Polish-German thesis paper was prepared with the aim of a bilateral treaty for measures to improve the shipping conditions on waterways in the Polish-German border area. On this basis a task force was built with representatives of the Polish and the German waterway administrations, RZGW (Regional Water Management Authority) and WSV (Federal Waterways and Shipping Administration), respectively. The mandate of the task force was to redesign and update the concept of the existing river training system at the border reach of the River Oder. For the scientific work the BAW (Bundesanstalt für Wasserbau, Federal Waterways Engineering and Research Institute) in Karlsruhe was assigned.

The aim of the scientific investigation was the development of nominal training structure design parameters like the heights and the slope of e.g. groynes and nominal mean water widths of the river that leads to a defined nominal depth for shipping and navigation purpose. The challenge within the hydraulic and morphological investigations was to consider and to estimate the huge amount of sediment which is transported by the river in form of large sand dunes properly. The BAW had used two model types for investigation, first a 1-dimensional hydronumerical model (1D-HN) for large scale (152 km) and long term simulations (40 years) and a scale model [2] with fully movable bed (8 km in natural scale, 80 m in model scale) for detailed morphological issues.

The 1D-HN-Modell with capabilities to simulate transportation of sediment, suspended sand and wash load and resulting changes in the river bed, was used for investigations of different structure design, different spatial and chronological sequences of the construction sites, dredging measures and different climatic conditions. The scale model with the movable bed was used to investigate the impact of different structure design on the shape and dynamics of sand dunes and sediment transport in detail. In May 2014 the investigation conducted by BAW was completed and a new and updated concept for a river training system was provided to the task force.

The proposed contribution to SedNet Conference 2015 aims at presenting the project characteristics and derived project approach, the used data base, model types and strategies to develop an updated river training concept, at providing evidence to meet the nominal depth requirements and at indicating different side effects of training measures like the induced increase in high water level.

## References:

- [1] Hüsener T., Hentschel B., Ewe A. (2010) Morphologische Entwicklung der Grenzoder. Proceedings Wasserbauliche Mitteilungen 40, TU Dresden
- [2] Hentschel B. (2008): Hydraulische und morphologische Untersuchungen an der Oder mit Hilfe eines hydraulischen Modells mit beweglicher Sohle. Bundesanstalt für Gewässerkunde, Proceedings Veranstaltungen, Sedimentologische Prozesse, Koblenz 2009