Nutrient emissions in the Zala River Basin (Hungary)

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River Zala is located in the western part of Hungary, it belongs to the watershed of Lake Balaton. River Zala is conducting water into the smallest, western bay with 5 % of the total lake volume from almost half of the watershed (2622 sqkm). Water quality began to deteriorate in the late 1960`s in the western bay, and eutrophication spread out to the whole lake in the later decades with its worst period in the late 1980` s and early 1990`s. Significant improvement has been achieved since then, due to the reduced nutrient load but the water is still eutrophic to hypertrophic in the most sensitive tourist season especially at the lakeshore.

Total P load from the Zala river basin changed dramatically in the past 30 years. There was a sharp increase between the 1960`s and 1980`s both from diffuse and point sources. In 1985, the Upper Kis-Balaton reservoir was inundated in order to protect Lake Balaton against high nutrient loads carried by the river Zala. Total P retention in the reservoir is 20-50% (depending on the inflow P concentration). In 1992, phosphorus precipitation was introduced at the largest wastewater treatment plant (Zalaegerszeg) of the Zala catchment. Now all of the collected wastewaters are treated biologically and chemically (additional P removal). Economic changes in 1989/90 resulted in a significant drop in fertilizer use. The previous P surplus of approximately 26 kg/ha/yr in the 1980`s has been replaced by mining of soil P reserves within a few years and only slight improvement has been achieved for the last few years. The nutrient deficit limits the agricultural production to-date thus increase of the fertilizer use is expected in the near future.

Even though load reduction resulted in considerable improvement in water quality of Lake Balaton (particularly in the western bay), the current P load is about two times higher than the desirable value. Due to the control of point sources, the major portion of P emissions is now associated with diffuse sources. Therefore future water quality management of the lake must reduce the non-point pollution.

Catchment models were applied in order to estimate nutrient emissions from different sources and economic sectors in the Zala catchment. Results indicated that agricultural activity has significant impact on the total P budget of the catchment. The area is sensitive to soil erosion by water and the majority of the watershed is agricultural area, in particular arable land which is 54 % of the catchment. The late 1980`s and early 2000`s have been compared regarding the P loads and their sources. Since the main P sources are related to erosion, BMP must focus on erosion protection.