Spatial and temporal dynamics of nutrient fluxes in aquatic ecosystems of the Dambovnic catchment

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It is well documented that changes occurred in the development of the socio-economical systems lead to changes in the quality and quantity of water resources. One of most severe problems of aquatic ecosystems consists in the increase of nutrient loads and their evolution towards eutrophication. This process is strongly related to diffuse nutrient emissions and agriculture is the main contributor to this kind of pollution. Therefore, lot of effort is put to improve the knowledge on sources, fate, stocks and sinks of nutrients at catchment level in order to elaborate proper management plans for protection of the surface waters and groundwaters. An intensive study was carried out at the level of Dambovnic River, aiming to characterize the spatial and temporal dynamics of nutrient fluxes in correlation to the catchment hydrogeomorphological characteristics and to obtain an improved process-understanding of nutrients pathways. Dambovnic River is a third order tributary of Danube River, previously characterized by high specific nutrient emissions. The monitoring program was conducted over a two year period and revealed the influence of point and diffuse emission sources on nutrient loads as well as of local particularities of adjacent ecosystems. Although the nitrogen specific emissions were not high at the catchment level, increased concentrations of ammonium were identified upstream the river (up to 15 mg N-NH4+/l), being correlated with the industrial discharges of waste water. Total nitrogen showed a seasonal dynamics, especially downstream the river and its concentrations were below 20 mg TN/l. Phosphorous levels were often exceeding the limits for very good and good quality of surface waters and reached very high values during summer periods (up to 1 mg P-PO43-/l). Key factors influencing both nitrogen and phosphorous dynamics were investigated. Regional nutrient balance was developed and MONERIS model (MOdelling Nutrient Emissions in RIver Systems) has been applied in order to identify the main pathways of nutrients, the area specific emission and share of nutrient emissions by anthropic activities in the basin. The results of the mathematical modeling revealed the contribution of both point and diffuse sources to the nutrient load of the river. Waste water treatment plant is the main pathway for nitrogen, which is characterized by the highest area specific emission in the upper part of the Dambovnic catchment. The highest phosphorus emission stems from agriculture, which accounts for more than 50% of the total with the exception of sub-cathment located upstream the river (Suseni), characterized by equal contribution of agriculture and point sources (industry and population). Mathematical modeling proved to be an useful tool in the assessment of nutrient balances at catchment level and an important steps towards a comprehensive control of nutrient fluxes and development of sustainable management plans at the regional scale.