

Estimating N and P emissions to surface water at national scale: methodology and first results

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WFD article 5 report for analysis of agricultural pressures and impacts aims to identify those catchments where prioritized nonpoint-source control measures should be implemented in order to achieve good ecological status by 2015. In France 2004 WFD article 5 report, analysis of nutrients pressures was mostly based on monitoring data and N/P balance assessment, as no emission model was available for application at national scale. Yet, WFD requires member states to develop new methodologies for the assessment of nutrient emissions at catchment scale for 2013 article 5 reviewed reports. Therefore, the French National Agency for Water and Aquatic Environments (ONEMA, French acronym) and French National Institute for Agricultural Research (INRA) are currently developing a model able to estimate N nonpoint-source emissions to surface water, using readily available data.

This model is inspired from US model SPARROW (Smith, Schwarz et al. 1997) and European model GREEN (Grizzetti, Bouraoui et al. 2008), i.e. statistical approaches consisting of linking nitrogen sources and catchment's terrestrial and river system characteristics. As the model will be run with national databases, the quality of estimation is expected to be better than GREEN's. The first expected improvement is due to the fact that nitrogen diffuse sources consist of a nitrogen balance instead of nitrogen input in SPARROW and GREEN. In addition, land characteristics (soils parameters, climate and riparian wetlands distribution) and river system characteristics (rivers, lakes and reservoirs' residence time and depth) are expected to be more accurately described when using national databases than European-wide harmonized databases. Finally, deep aquifers discharge to streams will be described as a separate runoff component like in the RIVERSTRAHLER model (Billen, Garnier et al. 1994), because the associated N fluxes cannot be directly derived from N soil surface balance.

Model calibration and validation on 200 French catchments will be performed by the end of 2011, and model run at national scale by mid 2012. The results presented here were obtained in Brittany region, where the model was first tested.

Billen, G., J. Garnier, et al. (1994). "MODELING PHYTOPLANKTON DEVELOPMENT IN WHOLE DRAINAGE NETWORKS - THE RIVERSTRAHLER MODEL APPLIED TO THE SEINE RIVER SYSTEM." *Hydrobiologia* 289(1-3): 119-137.

Grizzetti, B., F. Bouraoui, et al. (2008). "Assessing nitrogen pressures on European surface water." *Global Biogeochemical Cycles* 22(4).

Smith, R. A., G. E. Schwarz, et al. (1997). "Regional interpretation of water-quality monitoring data." *Water Resources Research* 33(12): 2781-2798.